A THEORY-BASED EXPLORATION OF ADDING SUGAR TO BEVERAGES IN LEBANESE PUBLIC SCHOOL CHILDREN

PhD Thesis

by

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Abstract

The studies presented here explore the behaviour of adding sugar to beverages and especially milk which has already been observed in the Middle East, but only anecdotally in Lebanon. This dissertation investigated adding sugar behaviors to beverages in the diet of Lebanese children and from the perspectives of parents and children.

This dissertation consists of a mixed methods study, a quantitative study and a systematic review of the literature. The aims of these three studies were to (1) explore parental and children reported behaviour of adding sugar to the beverages of children using a dietary recall sheet (2) identify significant predictors of the adding sugar behaviour by primary caregivers to beverages served to children using the Theory of Planned Behaviour (TPB), and (3) conduct a systematic review of the existing literature on the effectiveness of interventions aimed to reduce the intake of sugar sweetened beverages among children and adolescents.

Five themes emerged from the qualitative component of the first study, namely: (1) parental practices of adding sugar to various types of beverages at home, (2) knowledge, attitude and belief related to adding sugar to beverages, (3) ingrained behaviour of adding sugar to beverages, (4) parental feeding practices and parental style, and (5) taste perception. In the quantitative study, a multiple linear regression showed that at time 1, perceived behavioural control predicted behaviour. However, at time 2, none of the TPB variables predicted the behaviour. The systematic review of existing literature showed that most of the interventions were effective in reducing the intake of sugar sweetened beverages even though the meta-analysis was not significant.

Adding sugar behaviour to children's beverages is a common practice by parents, and an inherited habit among low socioeconomic status Lebanese families. Findings of this dissertation inform the development of prevention interventions to reduce the behaviour of adding sugar to beverages of children in order to control the risk of chronic diseases associated with chronic high sugar intake.

Contents

List of Abbreviations

AHA	American Heart Association
ANOVA	Analysis of Variance
ASB	Added Sugar Beverages
ATP	Adenosine Triphosphate
BCW	Behaviour Change Wheel
BMI	Body Mass Index
CVD	Cardio Vascular Disease
DKK	Danish Krone
DMFT	Decayed Missing and Filled Teeth
EAR	Estimated Average Requirements
EFSA	European Food Safety Authority
GSHS	Global School-based Student Health Survey
HDL	High density lipoprotein
HBM	Health Belief Model
HFCS	High Fructose Corn Syrup
IMB	Informed Motivational Behaviour
IOM	Institute of Medicine
Kcal	Kilocalorie
LDL	Low density lipoprotein
MEHE	Ministry of Education and Higher Education
Ml	Millilitre
MetS	Adolescent Metabolic Syndrome
MENA	Middle East and North Africa
MRC	Medical Research Council
NCD	Non-communicable disease
NDNS	National Diet and Nutrition Survey
NMES	Non-milk extrinsic sugar
NSCH	National Survey of Children's Health
OR	Odds Ratio
RCT	Randomized Control Trials
SCT	Social Cognitive Theory
SoFAS	Solid Fats and Added Sugars
SPSS	Statistical Package for Social Change
SSBs	Sugar Sweetened Beverages
SSSD	Sugar Sweetened Soft Drinks
TG	Triglyceride
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TTM	Transtheoretical model
USDA	United States Department of Agriculture
WHO	World Health Organization

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Dedication

To the soul of my father, I promised you I would do it and I did. To my mother whose prayers are what have sustained me thus far. I extend from the depths of my heart a special thanks to my family. Words cannot express how grateful I am to my beloved husband, Jawad, for all of the sacrifices that he has made. For the sleepless nights when you were always my support in the moments when there was no one to answer my queries or reassure me. I would also like to thank my children, Ali, Mohamad and yara, who supported me with their understanding when I could not be there for them during this long and heavy period. I love you all dearly, and only hope that I can support you one day during this same process.

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I dedicate this research to the children of Lebanon; lost between the past and present, war and politics. Only with the dedication of our generation can we find a way to better their future in health, education, and welfare for the future of our beloved country

Chapter 1

Introduction & Literature Review

1.1 Introduction

This thesis investigates the behaviour of adding sugar to beverages in Lebanese children including the perspective of caregivers. The rapid physical and cognitive development during childhood requires energy provided by an appropriate nutrient intake. The dietary pattern at this early age is highly affected by social and cultural influences. Exploring dietary habits among children is important because food related habits start before birth in the uterus and continue to be further ingrained through breastfeeding. This is the time period when food and taste preferences are established and become habitual (Cooke, Haworth, & Wardle, 2007). An unhealthy diet during childhood can affect growth, development, and performance at school, while establishing the inception of risk for the development of chronic diseases later in life (Nicklas & Hayes, 2008; Liu & Stein, 2013). Parents are usually included in studies investigating dietary behaviour related to children because of their important role in influencing the food choices of their children (Savage, Fisher, & Birch, 2007). Furthermore, parents from deprived communities are less likely to choose healthy food and drinks, creating an increasing public health concern (De Genna, Stack, Serbin, Ledingham, & Schwartzman, 2006; LaRowe, Moeller, & Adams, 2007).

The consumption of sugar sweetened beverages (SSBs) has become a global problem. Consumption of SSBs among children and adolescents puts them at risk of a myriad of chronic illnesses (Te-Morenga, Mallard, & Mann, 2013; Malik, Pan,

Willett, & Hu, 2013; Brown, Dulloo, & Montani, 2008; Malik, Popkin, Bray, Després, & Hu, 2010).

Childhood presents an exceptional opportunity for parents to initiate the adoption of healthy eating behaviours to be maintained through adulthood. Hence the exploration of what could influence an unhealthy feeding behaviour among primary caregivers of children is important, and informs the rationale for this dissertation. This dissertation consists of a mixed methods study (2 phases quantitative and 1 phase qualitative), a quantitative study, and a systematic review of the literature. The aims of these three studies were to (1) explore parental and children reported behaviour of adding sugar to the beverages of children (2) to identify significant predictors of the adding sugar behaviour by primary caregivers to beverages served to children using the Theory of Planned Behaviour (TPB), and (3) to conduct a systematic review of existing research literature on the effectiveness of interventions aimed to reduce the intake of sugar sweetened beverages (SSBs) among children and adolescents. Throughout this dissertation, the adding sugar to beverages behaviour is referred to as ASB behaviour.

1.2 Overview of the dissertation

The dissertation is divided into 5 chapters as follows:

Chapter 1: Introduction and Literature Review. This chapter outlines the rationale for conducting this research. It presents the results of a narrative review of the literature on the importance of healthy eating habits among children, and the impact of sugared beverage intake on health. The unstandardized methods of measuring sugar intake are discussed, and studies that provided the best estimates are

highlighted. In addition, determinants of sugar-containing beverages intake are critically discussed.

Chapter 2: An exploratory mixed methods study examining the behaviour of adding sugar to beverages served to school aged children attending Lebanese public schools. This chapter presents the findings of two quantitave phases and one phase qualitative that were conducted to establish whether sugar had been added to milk and other beverages in a sample of Lebanese children and primary caregivers, and to explore the determinants of this behaviour in a sample of Lebanese parents/grandparents of public school children who reported consuming beverages with added sugar. Data were collected using a 24-hour dietary recall diary from two samples: (a) mothers recruited from dental clinics (n=30), and (b) children aged 9-12 years (n=144) recruited from public schools. Furthermore, in-depth interviews were conducted with parents and grandparents of children ages 9-12 years (n=26) attending public schools throughout the geographical areas in Lebanon. Summative and thematic content analyses were used to analyze the obtained data.

Chapter 3: A quantitative study using the Theory of Planned Behaviour (TPB) to investigate the predictors of the adding sugar to beverages behaviour among mothers of Lebanese children in public schools. A structured questionnaire guided by the TPB was developed to collect data in relation to the TPB constructs, participants' demographic characteristics, and variables related to the behaviour of adding sugar to various beverages. At time 1, cross-sectional data were collected from 237 mothers of school children ages 3-7 years, data of participants complete for all variables were analyzed (N=184). After 5 months (time 2), a follow-up interview was conducted with 197 out of the 237 mothers, to measure the behaviour of adding

sugar to beverages of children. The analysis at time 2 included 197 participants who had complete data for all variables. Regression analyses were conducted to identify significant predictors of the intention to stop/reduce adding sugar to beverages, and the self-reported behaviour of adding sugar to beverages.

Chapter 4: A systematic literature review on effectiveness of behavioural interventions to reduce the intake of sugar sweetened beverages among children and adolescents. This chapter presents findings of a systematic literature review on the effectiveness of behavioural interventions to reduce the intake of sugar sweetened beverages among children and adolescents. Published studies on children and adolescents, ages 4 to 16 years, who participated in behavioural or health educational interventions administered in schools or other community settings were included. The systematic literature search identified 6863 abstracts from studies after removal of duplicates (11807 total number of titles retrieved), 73 full texts were assessed for full eligibility. Fifteen papers met the inclusion criteria for data extraction, of which 12 papers were narratively synthesized and 3 papers were meta-analyzed.

Chapter 5: Discussion and recommendations. This chapter discusses the findings on determinants of ASB. It puts into perspective the qualitative and quantitative findings compared to the systematic literature review findings. The strengths and limitations of each study are addressed. This chapter ends with an overall conclusion and recommendation for future studies.

1.3 Definition of terms

Added sugar: "Added sugars are, but not limited to, sucrose, white or brown sugar, corn syrup, high fructose corn syrup (HFCS), maple or pancake syrup,

fructose sweetener, liquid fructose, and anhydrous or crystal dextrose" (Ervin & Ogden, 2013, p. 4).

Free sugars: Is defined as all "monosaccharides, disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrup and fruit juices" (WHO, 2003, p.4)

Table sugar: Sucrose, a disaccharide, formed of one molecule of fructose and one molecule of glucose connected by glycosidic bond (Plaza-Diaz, Augustín, & Hernández, 2013). It is water soluble and easy to crystallize which makes it suitable for manufacturing into table sugar (Schorin, Sollid, Edge, & Bouchoux, 2012).

Sugar Sweetened Beverages (SSBs): SSBs include any beverage containing added sugars (fructose, glucose, sucrose in the form of honey, table sugar or syrup), examples of SSBs are flavored milk, fruit juices, sweetened tea, sweetened coffee, soft drinks, flavored carbonated beverages, and energy and sports drinks (Rampersaud, Kim, Gao, & House, 2014).

Theory of Planned Behaviour: This theory is derived from the theory of reasoned action (Fishbein & Ajzen, 1975) and then updated by Ajzen (1991). This theory postulates that subsequent behaviour is predicted indirectly by perceived behaviour control through the mediation of intention as well as directly by intention (Ajzen, 1991). Three antecedent cognitions (attitude, subjective norm and perceived behaviour control) can independently predict intention which is considered as a proxy determinant of the behaviour (Ajzen, 1991).

Behaviour: The behaviour could be a single action or a set of actions (Ajzen & Fishbein, 1980). To fully understand the behaviour, whether a single action or a set of actions, it should be clearly defined in terms of target, action, context and time.

Intention: It represents the motivational factor influencing a behaviour and how hard people try to perform the behaviour. The stronger is the intention, the more probable is the performance of behaviour (Ajzen, 1991).

Attitude: This construct as described by Ajzen (1991), refers to "the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behaviour in question" (Ajzen, 1991 p.188).

Subjective norms: This reflects "the perceived social pressure to perform or not perform the behaviour" (Ajzen, 1991, p.188).

Perceived behavioural control: This determines how easy or difficult a person perceives his own ability to perform the behaviour (Ajzen, 1991). It reflects external factors such as the environment, social support, ability and skills (Ajzen & Timko, 1986).

The ASB has not been explored in-depth in the literature, and hence is the subject of this dissertation conducted in Lebanon. Given the paucity of research regarding ASB, this behaviour was explored in the context of a proxy behavior, such as the added sugar in sugar sweetened beverages. Thus the literature in the following sections covers the definition of the problem, the consumption of added sugar, the determinants of the ASB, the theory of planned behaviour and its applicability to predicting the ASB, and the rational for this research dissertation.

1.4 Description of the problem

1.4.1 Sugar and adverse health outcomes

Sugar sweetened beverages (SSBs) are considered to be the number one source of added sugar consumption in the United States, United Kingdom, and

Australia, with adolescents being the main consumers (Ambrosini, 2014). The high consumption of sugar sweetened beverages (SSBs) is an omnipresent behaviour among children and adolescents worldwide (Popkin & Nielsen, 2003; Nielsen & Popkin, 2004; Wang, Bleich, & Gortmaker, 2008; Feferbaum, de Abreu, & Leone, 2012; Han, Kim, & Powell, 2013). Evidence has shown that the consumption of sugar sweetened beverages among children and adolescents replaces other healthier options such as vegetables, fruit juices and water (Ballew, Kuester, & Gillespie, 2000; Bowman, 2002; Rampersaud, Bailey, & Kauwell, 2003). However, careful interpretation is deemed necessary in the aforementioned papers, as data were collected based on a 24 hour recall for 2 non-consecutive days which can result in lack of establishing a defined pattern of diet intake (Bowman, 2002).

Studies have shown a relationship between SSB consumption and the onset of diabetes, hypertension, coronary vascular disease (CVD), dyslipidemia, and renal dysfunction (Brown et al., 2008; Malik et al., 2010). But in the paper by Brown et al. (2008), the mechanism by which fructose induced cardiovascular dysfunction has not been elucidated. In addition, in this review the potential influence of other dietary nutrients on the intake of SSBs was not elaborated. Malik et al. (2010) reported that the association of SSB intake with weight gain might be weakened by the undereporting of SSB intake and the awareness by the participants of their overweight status. Another limitation of this study stems from either missing data or adjustment for various lifestyles leading to an overestimation of the positive association between SSB intake and weight gain. In addition, evidence has shown a relationship between SSB consumption and metabolic syndrome (Ambrosini et al., 2013; Chan et al., 2014; Mirmiran, Yuzbashian, Asghari, Hosseinpour-Niazi, &

Azizi, 2015). Despite the strength of the longitudinal design in the Ambrosini et al. (2013) study, the small sample size at follow up could be a limitation. First the data were collected from guardians of 14 years old adolescents and after a 3 year follow up, data were collected from 17 year old adolescents emphasizing the possibility of underreporting which is common among adolescents. Chan et al. (2014) suggested that to avoid methodological limitations, anthropometric measures and clinical outcomes should be taken more than once. Despite the fact that the food frequency questionnaire can be used to collect data from a large sample of population, this tool also presented a limitation in the Mirmiran et al. 2015 study. First this tool cannot reflect the actual intake of participants, but was used to classify individuals based on their self- reported intake of SSBs. Furthermore, the FFQ used in this study did not differentiate between 100% fruit juices and sugar sweetened synthetic juices, opposed to those that contained fructose or sucrose. Systematic review studies showed that the intake of free sugars was associated with increased weight and obesity (Te- Morenga et al., 2013, Malik et al., 2013). The main limitation in these two systematic reviews is the lack of consistent units of assessment and the high level of heterogeneity across studies. Several assumptions were made to obtain constant units and this limited the validity of estimates. Meta-analysis in systematic reviews is always subject to publication bias (Cooper et al, 2013). However, Malik et al. (2013) tried to minimize this bias by presenting visual funnel plots. In another systematic review, Moynihan and Kelly (2014) showed that there has been less tooth decay (dental caries) with a reduced intake of free sugars to less than 10%, but even better results with an intake of less than 5%. The results of these systematic reviews, however, are inherently limited by the quality of original research such as the

methods of the interventions, and the unstandardized measurements of levels of sugar intake. This systematic review presented other limitations such as the low number of papers included in the meta-analysis due to the lack of consistent units that could be aggregated across papers. Another limitation stems from the difficulty of assessing publication bias due to the lack of RCTs included in the review and the impossibility of doing funnel plots. In addition, there is also growing evidence that the excess intake of added sugar or table sugar has been associated with the academic performance of children (Hochuli et al., 2014). This is caused by the inefficient metabolism of fructose which is the major sugar added to SSBs, and one of the monosaccharide molecules in the chemical makeup of table sugar (sucrose) (Tappy & Mittendorfer, 2012). Evidence from animal testing has shown that the intake of fructose negatively affected the hippocampus, the memory center of the brain (Stephan, Wells, Brayne, Albanese, & Siervo, 2010; Page et al., 2013). This indicative evidence should be carefully interpreted because the fructose dementia hypothesis outlined in this article was tested on animal models and this could present a limitation in this study. So before the implementation of any public intervention, this hypothesis should be tested outside animal models (Stephan et al., 2010). High consumption of fructose has also been attributed with adverse affects on the cognitive functions of children (Agrawal & Gomez-Pinilla, 2012).

1.4.2 Variation in Sugar Intake Limits

Despite the increasing attention to ‘added sugar’ intake in the research community worldwide, there is no universally agreed upon sugar intake limits. In fact, sugar intake recommendations vary among countries (Hess, Latulippe, Ayoob &

Slavin, 2012; Erickson & Slavin, 2015). The WHO has recommended that adults and children reduce their calorie intake from free or added sugars to less than 10% of their total energy intake (WHO, 2003). A further conditional reduction to less than 5% or roughly 25 grams (6 teaspoons) per day was proposed in a recent report as it could establish a healthier body balance and provide additional health benefits (WHO, 2015), however such guidelines and recommendations are still pending awaiting further scientific evidence.

A maximum of 11% of the calorie intake from added sugar is recommended in the United Kingdom (UK). The European Food Safety Authority Panel on Dietetic Products, Nutrition and Allergies (EFSA, 2010) has not specified an upper limit for European Countries; individual European Countries have adopted their own limits. A maximum intake of 25% of calories of total intake of daily energy from added sugars is proposed by the Institute of Medicine (IOM) in the United States of America (U.S.A) in its dietary reference intake report for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Canada adopted the same U.S.A recommendation (IOM, 2005). The underlying rationale behind the IOM guidelines for lowering the intake of energy from added sugar consumption to less than 25% of daily calories is based on concerns related to micronutrient intake data. Micronutrient intake modeling data in the U.S.A. found that Americans who consumed 5% to 10% of energy from added sugars had the highest amounts of micronutrient intakes. However, micronutrient intakes significantly decreased when more than 25% of the energy source was added sugar (Von Elm et al., 2007).

Many countries rely on qualitative recommendations to limit or reduce the intake of added sugars (Hess et al., 2012). The food based dietary guidelines for

Lebanon specify the maximum limit for daily sugar intake to be less than 10 teaspoons of added sugar per day (<50 g of added sugar or 10% total energy based on a 2000 calories diet) (FAFS, 2013). This report does not specify the maximum 'added sugar' by age group or for children. The American Heart Association (AHA) recommendations for added sugar range as low as 3 teaspoons (in children) to 9 teaspoons (adults) depending on age, gender, and total energy expenditures per day as well as consideration of and physical activity (Johnson & Yon, 2010; Von Elm et al., 2007).

Strict limits on dietary intake of added sugars have not been prescribed across countries for different reasons such as (i) lack of agreement on the definition of sugars and accepted measures for total sugars, added sugars, and free sugars (Erickson & Slavin, 2015), (ii) inconsistent scientific evidence (Slavin, 2015), and (iii) conflicting dietary guidance messages or inconsistency with accepted dietary guidance for other foods that are likely to confuse consumer understanding of nutrition and their ability to build healthy diets (Slavin, 2015). To elaborate further, researchers addressed the confusing nature in the nomenclature of carbohydrates (Hess et al., 2012) or terms in literature describing sugar (Howard & Wylie-Rosett, 2002; Wittekind & Walton, 2014). A universally unified or accepted definition for added sugars is lacking (Erickson & Slavin, 2015; Von Elm et al., 2007). Studies on sugar consumption have used different terminologies (Cummings & Stephen, 2007; Plaza-Díaz et al., 2013; Wittekind & Walton, 2014) which might have affected the generalizability of studies' findings across countries. Terms such as free sugars, added sugars, SSBs with different types of excluded or included beverages, soft drinks, non-milk extrinsic sugars and total sugars were used in the cited studies

addressed in this review. The misinterpretation of ‘total sugars’ with ‘added sugars’ had been reported when comparing results of older national surveys with more recent surveys (Barclay & Brand-Miller, 2013). Erickson and Slavin (2015), considered that confusion in the definition of sugars will continue to challenge researchers. From a health perspective, existing evidence is either insufficient (e.g. to link with obesity, cardiovascular risk, hypertension) or not strong enough (to link with dental caries) to confirm a cause-effect association. This has been reported by different review panels and specialized committees in the U.S.A. and Europe such as the Institute of Medicine (IOM, 2005); the American Heart Association (AHA, 2014) and the European Food Safety Authority (EFSA, 2010) among others. This limitation is in regard to the paucity of data establishing causality between the intake of SSBs and adverse health outcomes, and the lack of distinction between definitions of free sugars in foods and drinks that prohibit the establishment of setting the upper level of total or added sugar intake. From a nutritional perspective, the strict limits on the intake of sugar tend to be inconsistent with other dietary guidelines such as dairy products and fruits that also contain sugar in considerable amounts (Hess et al., 2012).

1.5 Overview of added sugar /Sugar Sweetened beverages (SSBs) as proxy of unbalanced nutrient intake

The last decade has witnessed a surge of attention to the intake of added sugar in solid food and beverages. Many studies have analyzed added sugar intake from both solid food and drinks. In some studies, it was difficult to separate added sugar from its sources: food or drink. Since the focus of this dissertation is ASB

behaviour, only representative example data of added sugar intake from drinks or SSB intake will be briefed in comparison to recommended added sugar intake limits and health indicators.

The majority of published studies investigating trends in energy intake from sugar added to drinks by socio-demographic and health outcomes have been conducted in the U.S.A (Duffy et al., 2012). This is largely attributed to the availability of periodically updated national databases of food consumption (Kearney, 2010) (e.g. the National Health and Nutrition Examination Surveys NHANES and the USDA's My Pyramid Equivalents Database, MPED). Findings from these cross-sectional nationally-based data in the U.S.A were reported (Marriott, Olsho, Hadden & Connor, 2010; Welsh, Sharma, Grellinger & Vos, 2011; Han & Powel, 2013; Slining & Popkin, 2013; Kit, Fakhouri, Park, Nielsen, & Ogden, 2013).

Published studies on the prevalence of total energy intake from added sugar in many countries are on the rise (Duffy et al., 2012). Such emerging studies are either based on national data sources, cohort data sources or smaller population based studies (i.e. multi-centered, school based or regional based studies). Example of cross- sectional studies based on national data sources include one study in South Korea (Han et al., 2013), two in Brazil (Levy, Claro, Bandoni, Mondini, & Monteiro, 2012; Duffey et al., 2012); and one in Britain (Bates et al., 2014). Multi-centered or multi-country based studies include one study in Europe (Duffey et al., 2012) and one within the Nordic countries (Rasmussen et al., 2006). School, residence or regional smaller scale population size studies included one in Brazil (Feferbaum et al., 2012), one in Australia (Savige, Ball, Worsley, & Crawford, 2007), one in

Taiwan (Chan et al., 2014), two in Jordan (Kilani, Al-Hazzaa, Waly, & Musaiger, 2013; Tayyem, Al-Hazzaa, Abu-Mweis, Bawadi, & Musaiger, 2014) and two in Lebanon (Nasreddine, Hwalla, Sibai, Hamzé, & Parent-Massin, 2006; Nasreddine et al., 2014). Examples of cohort studies include one in Australia (Ambrosini et al., 2013), one in Norway (Bjelland et al., 2013), one in Britain (Laverty, Magee, Monteiro, Saxena, & Millett, 2015) and one in Iran (Mirmiran et al., 2015). Although the quality of reporting (in terms of description of study objectives, sampling scheme, recruitment, foods and drinks consumption data, added sugars estimation, data analysis, limitations, delimitations) is relatively similar across these cited studies, the quality of their methodological design differs. The following paragraphs focus on the methodological designs in terms of sampling schemes, recruitment efforts, periods of investigation, added sugar/SSB intake measurements, as well as estimated exposure-outcome relationships.

Sampling Scheme and Recruitment: The majority of studies were based on multistage stratified sampling and cluster based sampling methods to lend evidence of representativeness to the populations of their respective countries. The sample size in the 18 cross-sectional studies (Marriott et al., 2010; Welsh et al., 2011; Han & Powel, 2013; Slining & Popkin, 2013; Kit et al., 2013; Han et al., 2013; Levy et al., 2012; Pereira, Duffey, Sichieri, & Popkin, 2014; Duffey et al., 2012; Rasmussen et al., 2006; Feferbaum et al., 2012; Savige et al., 2007; Chan et al., 2014; Kilani et al., 2013; Tayyem et al., 2014; Nasreddine et al., 2006; Nasreddine, et al., 2014) ranged from 831 to 55,970 subjects aged 2 to 65 years or more. Whereas, the sample size of the 4 cohort studies (Ambrosini et al., 2013; Bjelland et al., 2013; Laverty, Palladino, Lee, & Millett, 2015; Mirmiran et al., 2015) ranged from 424 to13170 subjects aged

1.5 to 17 years. The sample sizes in the reviewed studies were sufficiently large enough to detect statistically significant associations-between the investigated variables within and between their study groups.

Except for the Iranian study, the 3 selected cohort populations (Ambrosini et al., 2013; Bjelland et al., 2013; Laverty et al., 2015) were live births of pregnant women recruited at birth (Western Australian Pregnancy Cohort (Raine) Study; Norwegian Mother and Child Cohort Study (MoBa); UK Millennium Cohort Study respectively). Participants in the Iranian study were from a prospective community-based cohort, Tehran Lipid and Glucose Study, (Mirmiran et al., 2015). Subjects' recruitment or sampling protocol (i.e. inclusion and exclusion criteria) was fairly defined and uniformly applied to all participants. For example, the Mirmiran et al. (2015) study design excluded participants in the cohort already identified with metabolic syndrome or other symptoms or risk factors (high triglycerides, low high density lipoprotein cholesterol, high fasting plasma glucose, or abdominal obesity) that were likely to influence or bias their overall study results or findings. By doing so, their recruitment protocol lends evidence of accounting for sampling bias in their study design that is likely to affect the strength and direction of any observed association (if it exists). Thus, all 4 cohort studies can be considered to be relatively free of the outcome of interest at time of recruitment according to the National Heart Lung and Blood Institute at the National Institute of Health assessment criteria in the U.S.A (NHLBI-NIH, 2014).

Cohort Time Frame & Loss to Follow Up: Participants in the cohort studies were evaluated over time to determine their exposure status. The time period followed in the 4 cohorts ranged from 2-7 years. Thus, the period investigated in

these studies can be considered to have allowed a sufficient time frame (≥2 years) for the exposure variable (e.g. SSB or added sugar intake) and to have a biological effect on the observed measured outcome (NHLBI-NIH, updated 2014). The loss of follow up after the baseline year being investigated in each study was less than 20% in 3 cohorts except in the Norwegian cohort by Bjelland et al. (2013). In this cohort, compared to the number of participants at age 1.5 years, data were only available for 77% at age 3 years and 21% at age 7 years (suggesting loss to follow up of 23% and 79% at age 3 and 7 years, respectively). Nevertheless, the large sample size in this cohort was sufficient to detect a significant association based on their study objectives (i.e. detecting a significant difference in stability of SSB intake by gender and maternal education).

Added Sugar/SSB Intake Measurement: There is no universally agreed upon ideal method for estimating nutrient intake (Henrique-Sanchez et al., 2009; Serra-Majem et al., 2009). Nutritional assessment involves evaluation of consumed drinks then converting the drink intake into nutrient intake using standardized conversion procedures (Merchant & Dehghan, 2006). Such conversion of drink intake into nutrient intake requires the availability of consumption data, as well as the food and drink composition databases which list the mean nutritional values for a given food/drink portion (Merchant & Dehghan, 2006).

Sources of Sugar Consumption Data: Studies in the present review relied on different acceptable sources of self-reported dietary intake and food composition information (Vandevijvere et al., 2013). Each information source entails inherent complexities in diet inclusion and exclusion criteria, variations in estimation techniques, and covariate assumptions or adjustments underlying the employed

estimation methods of sugary intakes. In countries such as the U.S.A, the UK, South Korea, and Brazil, sugar intake studies were based on household food purchase and consumption data collected across representative socioeconomic status groups, at the national level in a periodic manner to guide geographical, health and nutritional policies. Sugar intake patterns were also estimated from data obtained from individual dietary intake questionnaires specifically designed for research purposes in both developed and developing countries and regions (Europe, Nordic, Australia, Taiwan, Lebanon, Iran, and Jordan).

The number of days needed to estimate usual intake of nutrients depends on the study purpose and desired precision of the estimate (IOM, 2002). Studies in the present relied on different periods of retrospective consumption data that ranged from 24-hours recall data to one-year recall data (24 hours, 4 days, 7 days, one month, 6 months, and one year). Longer periods were used in the studies addressing added sugar estimates for biological or health indicators (metabolic syndrome and cardio-metabolic measures) compared to prevalence studies. For example, in the Taiwanese study, Chan et al. (2014) relied on one-month usual intake of SSBs to assess its relation to the risk of developing metabolic syndrome among other biological indicators. The Australian and Iranian prospective cohort studies (Ambrosini et al., 2013; Mirmiran et al., 2015) relied on a previously validated one year drink frequency questionnaire to assess its relation to biological indicators of cardio metabolic risk, and metabolic syndrome, respectively. The estimate of SSB intake based on one-year recall data is reasonably better than the reference period of measures used in the UK Millennium (Laverty et al., 2015) and Norwegian cohorts (Bjelland et al., 2013). These two cohorts (Laverty et al., 2015; Bjelland et al., 2013)

studies relied on parent-reported SSB usual intake (e.g. how often do you offer a sweetened beverage per week?) that was analyzed and reported as on a per week basis. Laverty et al. (2015) acknowledged that their study questionnaire was not designed with a nutrition focus; their collected data were based on the snacking behaviour at age 7 years which might not accurately reflect snacking at age 11 years. Bjelland et al. (2013) also acknowledged that their dietary questions were continuously updated or changed over the follow up time periods.

Sources of Drink Composition Data: The predictive accuracy of intake measurement is not only influenced by the inherent differences in dietary intake data sources. It is also influenced by the inherent differences in the estimation of sugar in the original solid food and drink sources and how such data (e.g. real values unmodified, simple average or weighted average of sugar) is maintained in the composition database (Greenfield & Southgate, 2003). As an example of such a drink composition database, American studies relied on the USDA's My Pyramid Equivalents Database (MPED), and its beverage codes and subgrouping classifications. Studies outside the U.S.A. relied on equivalent national databases (as available) or borrowed information from other countries. Drink composition databases derive their information using a combination of direct and indirect methods (Greenfield & Southgate, 2003), from industry nutritional labeling, and a limited number have actual compositional studies in published reports or scientific journals (Pennington, 2008). For example, sugar concentration data based on original analytical values from reliable laboratories studies tend to have better quality than imputed or calculated values (Greenfield & Southgate, 2003). Studies in the present review varied in their detailed description of how they estimated 'added sugar',

energy or SSB intake. It is important that researchers clearly describe the drink items being evaluated, as well as thoroughly document any imputations, calculations, weightings or averaging and/or provide referencing to original source of borrowed values. A thorough description of estimation procedures including source information and revision status of borrowed values allow its use by other researchers thereby ensuring consistency in measurements methods and enabling comparisons to be made across studies (Greenfield & Southgate, 2003). Compared to other studies, the Brazilian study (Levy et al., 2012) and the South Korean Study (Han et al., 2013) were remarkably thorough in their description of measurement of sugar intake. Unlike other studies, Welsh et al. (2011) were notable in their attention to the effect of any revisions in the nutritional value in the food composition data sources they used to estimate the concentration / percentage of added sugars when earlier trends in intake were compared to newly identified data. It could be assumed that researchers in other studies might have considered that they had accounted for such changes by the establishment of a standardization of sugar intake estimates for the different time periods investigated.

Assessment of Exposure-Outcome Relationship: All 22 reviewed studies more or less properly presented the different SSB or added sugar intake patterns /categories by the investigated socio-demographic predictors, health or biomedical predictors. They attempted to control for potential confounding variables as applicable to their studies. Such analysis of different levels of SSB intake enabled investigators to assess trends (and where applicable dose response) between exposures and outcomes in an attempt to lend credibility to their hypothesized causal relationship between exposure and outcome (NHLBI-NIH, updated 2014). For

example, using standardized procedures, the American studies estimated the amount of added sugar consumed in each beverage and presented its results as a proportion of total energy intake in an attempt to minimize the effect of any underreporting of added-sugar intakes (Welsh et al., 2011). By doing so, they controlled for the possibility that differences in the intake across added sugars categories were driven by differences in total energy consumption across these categories, rather than by differences related to added sugars consumption. Australian, Brazilian, European, Taiwanese, Iranian and Lebanese studies also measured total energy intake.

The included studies in the present review relied on different measures of sugary intake (percentages, adjusted regression median versus mean scores; gram intake per day, calorie or joule intake per day, and servings per day) which are not readily comparable across studies. Studies on the prevalence of added sugar intake by children and adolescents are presented below. Data from the U.S.A showed a gradual increase in intake of added sugar as people age; however, data showed an overall decrease in these trends over recent years. For example, Welsh et al. (2011) showed an overall decrease in added sugar intake from 68.4 g in survey cycles of 1999-2000 to 51.6 g in 2007-2008 among 2-5 years old children. Han and Powel (2013) found that the SSB consumption of ≥500 kcal/day (considered as high consumption) by children aged 2-11 years slightly increased from 4% (1999-2000) to 5% (2007-2008). This 500 kcal SSB intake per day represents around 50%, 41.7%, 33.3%, 27.7% and 25% of daily energy intake of those children and adolescents on 1000 Kcal,1200 Kcal, 1500 Kcal, 1800 Kcal and 2000 Kcal per day respectively. It is much higher than the WHO (10%) and the U.S.A added sugar intake maximum limits (25%). Kit et al. (2013), found that SSBs contributed only 8.0% of daily

energy intake in the survey cycles of 2009-2010 among the U.S.A. youth (aged 12-19 years) reflecting a statistically significant decrease compared with 1999-2000 data. Youth consumed a mean of 155 kcal/day from SSBs equivalent to a decrease of 6 kcal/day from 1999-2000 (Kit et al., 2013). This 155 kcal SSB intake per day represents around 10.3%, 8.6% and 7.7% of daily energy intake of those children and adolescents on 1500 Kcal, 1800 Kcal and 2000 Kcal respectively per day.

Compared to data from U.S.A studies in the present review, higher consumption has been identified in studies from other countries as possibly attributed to a nutrition shift towards a westernized diet. In South Korea, SSB consumption by 12-19 year old adolescents increased from 31% in 2001 to 38% in 2009 (Han et al., 2013). The SSB definition in this South Korean study is similar to the SSB definition in American studies including: non-alcoholic beverages with added sugar such as soda, fruit drinks, energy and sports drinks, coffee and tea drinks, flavored milk (but not white milk). The intake of miscellaneous SSBs (i.e. energy drinks, coffee/tea products, flavored milk) contributed to the greatest calorie intake by adolescents; yet, its prevalence was still lower than regular soda and milk in both 2001 and 2009 (Han et al., 2013). Such consumption pattern by adolescents suggests a difference in cultural consumption patterns particularly with respect to prevalent consumption of milk across two time periods (Han et al., 2013).

According to Bates et al. (2014), data from the National Diet and Nutrition Survey (NDNS) showed that non-milk extrinsic sugars (NMES) intake was 14.7% of total energy intake energy for 4-10 year old children and accounted for 15.6% for 11-18 year adolescents in UK. These findings exceed the 11% recommended values of food energy intake. Among the group of 4-10 years old, ‘non –alcoholic beverages’

accounted for a range of around 30% as the main sources of NMES. Whereas among the group of participants aged between 11-18 years old, 'non-alcoholic beverages' accounted for 40% as the main source of NMES. It is worthy noting that soft drinks constituted 30% of these beverages and fruits juices constituted only 10% -14% (Bates et al., 2014).

Feferbaum et al. (2012) found that SSB intake accounted for 37% and 45% of the total Kcal intake from fluids by Brazilian school children aged 3-6 years and 7-10 years respectively. In this Brazilian study, the SSB definition included carbonated beverages, nectars and flavored beverages by different types of sugar. The intake of carbonated beverages constituted around 42% of total energy intake by those aged 11-17 years from liquids. Among 11 to 17 year olds, the intake of SSBs constituted 14.5% of the recommended daily energy (higher than the 10% WHO limit). The researchers noted that with an increase in participants' age, the consumption of carbonated beverages accounted for a 20% increase in energy intake. This finding is relatively similar to an observation of U.S.A. data that showed as people aged an increased added sugar intake occured (Welsh et al, 2011; Hen & Powel, 2013; Kit et al., 2013).

Duffey et al. (2012), found that the percentage of consumption of SSBs such as (sweetened soda and sport drinks) is the highest of all beverages ingested in a European global study including data from 9 different countries (Spain, Austria, Sweden, Hungary, France, Belgium, Germany and Greece). Adolescents aged 12 to 17 years consumed 53% SSBs, 47% fruit juices, 32.5% sweetened milk, 18% sweetened tea, and 8% sweetened coffee. European adolescents consumed an average of 1455 ml/day of beverages. The amount of calories (384 kcal/day)

determined from these beverages is considered higher than the 10% WHO recommended upper limit.

Data from relatively large sized (i.e. 3,614-3,784 in Ambrosini et al., 2013; Chan et al., 2014) to smaller sized studies (i.e. 424-868 in Mirmiran et al., 2015; Nasreddine et al., 2014) investigating SSB intake in reference to health indicators were not indicative of trends of intake at the national level and thus could not be compared to the selected studies in the U.S.A, South Korea, Brazil and Europe. SSB intake measures are presented in the form of overall serving size, (ml) or gram intake per day or average frequency of weekly intake which is not directly compared to gram intake of added sugar per se because it would entail creating assumptions of overall drink size and amount of added sugar per SSB item to enable conversion to gram or calorie intake of added sugar.

Results of these relatively large to smaller sized studies (Ambrosini et al., 2013; Chan et al., 2014; Mirmiran et al., 2015; Nasreddine et al., 2014) do not reflect that the observed SSB intake is higher than their age group calorie intake or WHO limits (10%) but rather reflect the association of an increased intake with increased body weight, cardiometabolic risk and metabolic syndrome. In the Australian cohort study, Ambrosini et al. (2013) found that the majority (89%) of adolescents aged 14-17 years consumed an average of 335 grams /day of SSBs. In this cohort study, SSBs contributed around 4–5% of the total daily energy intake. Soft drinks constituted more than 50% of the total calories calculated from SSBs. Furthermore, girls aged between 14-17 years old and who consumed 1.3 serving/day of SSB had a 3.8% increase in body mass index (BMI) and a 3.2% greater overall cardio-metabolic risk (Ambrosini et al., 2013).

In Taiwan, Chan et al. (2014) found that high SSB intake is associated with adolescent metabolic syndrome (MetS) among boys. Increased SSB intake by adolescents aged 12-16 years was linked to a greater waist circumference in both sexes but to a higher systolic blood pressure in boys only. In this study, adolescents were classified as high consumers of SSBs if they consumed more than 500 ml and were considered moderate consumers if their SSB consumption is between 1ml and 500 ml. A higher level of triglycride was observed among high consumers compared to moderate consumers and boys who are classified as high consumers had a 10.3 times and 5.1 times higher risk of contracting MetS compared to non-drinkers.

In the cohort study in Tehran, children and adolescents aged 6-18 years had an average intake of sugar sweetened soft drinks (SSSD) of 38.5 g/d. The odds ratio of the incidence of MetS (3.2) is highest among those who are high consumers of SSSD (> 40 ml/day SSD) compared to an odds ratio of 3 among low consumers of SSSD (Mirmiran et al. 2015). In addition, high consumers presented a higher odds ratio of 2.49 for abdominal obesity and a higher odds ratio of 2.79 for hypertension compared to low consumers (Mirmiran et al. 2015).

SSB intake data from cohort based studies (Laverty et al., 2015; Bjelland et al., 2013) are presented in the weekly intakes that are not directly comparable to the results of other studies. Laverty et al (2015), in the UK Millennium Cohort, examined associations between SSB consumption to changes in adiposity in children aged 7-11 years using data collected in 2008 and 2012. The Laverty et al. (2015) study found that daily SSB consumption was associated with an average increase of 0.57% in the percentage of body fat between ages 7 and 11 In the Norwegian cohort study, Bjelland et al. (2013) noted an increase in SSB intake (times/glass per week)

with increase in child age (1.5 years, 3 years and 7 years). Children who were originally classified in specific strata in terms of frequency of SSB consumption such as low, medium or high at 18 months continued to be in the same group at age 36 months and 7 years" (Bjelland et al., 2013).

Similar to the UK Millennium and Norwegian Cohort studies, data from Lebanese and Jordanian smaller sized cross- sectional studies are based on an average frequency of SSB intake per week that is not easily understood or compared to data from studies at the national level and thus it cannot be compared to the selected studies in the U.S.A or other studies in the present review.

In Jordan, Tayyem et al. (2014) analysis showed that children aged 14-18 years in public schools had a weekly mean SSB intake of 5.2 days/week similar to those in private school 5.1 days/week. In Lebanon, the SSB intake by 6-19 year old Lebanese children and adolescents (n=868) accounted for a mean daily energy intake of 6.48 (Nasreddine et al., 2014). Children aged 6-11 years and those aged 12-19 years had mean daily energy intakes from SSBs equivalent to 6.52% and 6.45% respectively (Nasreddine et al., 2014). In this study, it is mentioned that food group intakes are based on the percentage of contribution to a daily energy intake. The odds of obesity, and excessive weight are evaluated as low, medium, and high referring to the first, second, and third tertiles, respectively. But this study does not specify any description of energy intake for the first, second or third tertile and the contribution by SSBs or other food categories.

In brief, comparing the consumption patterns of 'added sugars' from its SSB sources across studies is a challenging task due to different terminologies of sugar, differences in research methodologies, underlying assumptions and differences in

measures of reporting added sugar or SSB intake. Each information source entails inherent complexities in diet inclusion and exclusion criteria, variations in estimation techniques and adjustments underlying the employed estimation method of sugary intake. Additionally, the studies rely on different measures of sugary intake (percentages, adjusted regression median versus mean scores; gram intake per day, calorie or joule intake per day, and servings per day) which were not readily comparable across studies.

The epidemiological evidence from the cross-sectional studies in the present review was informative of trends in sugar intake suitable for policy making decisions for energy intake guidelines. Self-reported cross-sectional energy intake from added sugar estimates data were prone to confounding and reverse causation (Malik et al., 2013). Thus the relationship of added sugar or energy estimation with a specific health outcome could not be confirmed (Sigman-Grant & Morita, 2003). This limitation was acknowledged by different investigators and review panels (IOM, 2005; US-DGAC, 2010; EFSA, 2010) evaluating the evidence of the relationship of sugar intake with different health outcomes or indicators. Only five of the reviewed studies: the Australian, Taiwanese, Iranian, Lebanese, and British cohort (Ambrosini et al., 2013; Chan et al., 2014; Mirmiran et al., 2015; Nasreddine et al., 2014; Laverty et al., 2015) suggested epidemiologic evidence that high intake of SSB can be associated with some risk factors of cardio vascular disease, and/or metabolic syndrome including changes in adiposity (as applicable to the specific study outcome measure). These cross-sectional based or cohort based observed associations are biologically plausible and to certain extent clinically relevant. Prospective data from participants in the Australian, Iranian and British studies provide better evidence of

the hypothesized temporal relation that cause (added sugars intake) precedes the effect relationship (cited diseases such as metabolic syndrome; and changes in adiposity as applicable to each study) than cross- sectional Taiwanese, and Lebanese data. Compared to the cross- sectional design, prospective cohort studies are better able to control the effect of potential confounders. Yet unmeasured residual confounding in the cohort data can still influence its study findings**.** Nevertheless, these findings were also consistent with findings from systematic reviews and meta-analyses (Malik et al., 2006; Malik et al., 2013; Te-Morenga et al., 2013).

To reiterate, the high consumption of SSBs is presented as a worldwide emerging problem because of its increased possible association with health problems. It was followed by a brief description of sugar intake recommendations in some example countries and underlying reasons for variations in such sugar intake limits. A critical overview of selected studies focusing on SSBs or added sugar intake was presented as a proxy of unbalanced nutrient intake. Out of five Middle Eastern studies in the present review (Kilani et al., 2013; Tayyem et al., 2014; Nasreddine et al., 2006; Nasreddine, et al., 2014; Mirmiran et al., 2015), only the studies by Nasreddine et al. (2014) and Mirmiran et al. (2015), were compared to representative studies of other countries as applicable to their intended research objectives. Comparison of added sugar/SSB data in the reviewed studies proved to be a challenging task due to inherent differences in research methodological quality and reported measures of added sugar or SSB intake. The available published literature on public health in the middle-high income developing Mediterranean countries is very limited. This is possibly attributed to the limited periodic national surveys (Kearney, 2010). Limited availability of published data can be attributed to access

restrictions to unpublished data reports and to the unavailability of datasets for evidence health systems accessible to public (Saleh, Alameddine, & El-Jardali, 2009).

The ASB behaviour in this study also serves as a proxy indicator behaviour potentially pertaining to unbalanced nutrient intake in daily diet. This ASB behaviour is influenced by parental and cultural beliefs. In line with its focus on parental perception and beliefs about the behaviour itself, this dissertation used the Theory of Planned Behaviour (TPB) as the theoretical framework. The next section 1.6 describes the TPB and its applicability with a briefing about other health behaviour theories such as the health belief model (HBM), the social cognitive theory (SCT) and the transtheoretical model (TTM). Section 1.7 elaborates on the demographic, socio-economic and behavioural factors influencing ASB (habituation, taste perception, socioeconomic status, parental and mother education, child personality, age, gender, availability of SSBs, and parenting style). Section 1.8 presents the rationale of the study. Section 1.9 lists the research questions. Section 1.10 briefs the overall mixed method research.

1.6 Theory of Planned Behaviour: Theoretical framework of the ASB behaviour

The Theory of Planned Behaviour (TPB) is an individual level theory that aims to explain and predict behaviour. This theory was selected in this dissertation because it best fit the purpose of this research in terms of focus on socio-cultural norms and psychological correlates that are likely to influence behavioural norms.

Icek Ajzen was the father of this theory, and the first to describe it as an extension of the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1975). The

TRA and the TPB posit that the intention is the proxy determinant of the behaviour (Ajzen & Fishbein, 1975). Both assume that intention is in turn influenced by attitude and subjective norms, while the TPB add an important factor that is 'perceived behaviour control'. Intention describes the amount of willingness the person is ready to put in order to modify a behaviour (Rodgers, Conner, & Murray, 2008). Attitude is a positive or negative evaluation of the behaviour, and researchers found that this variable tend to be the best predictor of the intention to do the behaviour in most cases. Two components form an attitude, instrumental (desirable-undesirable) and affective (pleasant-unpleasant). Ajzen and Fishbein (2005), recommended that researchers use both aspect of attitude as they disagree about which aspect of attitude is more useful. In order to account for the behaviours that are not under volitional control, the construct of perceived behavioural control was added to the theory of Reasoned Action (TRA) by Ajzen (1991). As the volitional control over the behaviour decreases, the utility of the perceived behaviour construct increases. The relation between the perceived behaviour control and the behaviour is complex due to its direct and interactive effect on the behaviour via intention (Armitage & Conner, 2001).

Other cognitive based theories such as the Health Belief Model (HBM) (Rosenstock, 1974), Social Cognitive Theory (SCT) (Bandura, 1999), and the Transtheoretical Model (TTM) (Prochaska, Redding & Evers, 2008) were also considered but deemed less suitable for the purpose of this study. The section below explains briefly the reasons for this.

The health belief model (HBM) is one of the earliest health behavior theories constructed during the 1950s to explain why people were failing to adhere to tuberculosis screening programs (Hochbaum, 1958). The HBM focused on several key concepts to predict or explain health behaviour: perceived susceptibility, perceived severity/seriousness, perceived benefits, perceived barriers, cues to action, and self-efficacy (Rosenstock, 1974). The model predicts that people can acknowledge the threat that a certain health damaging behaviour imposes: people who consume high caloric beverages and added sugar are susceptible to develop risk factors such as obesity for subsequent diseases such as diabetes. These conditions are thus perceived to be serious and severe. However, even if the threat is accepted, individuals will only adopt an action plan to change the unhealthy behavior if they are convinced that it leads to health benefits that reduce the threat (i.e., reducing addition of sugars to child home prepared beverages will be effective at preventing certain diseases or medical conditions). People need to believe that they can successfully take a recommended health action if they are able to afford it and implement it, and have sufficient self-confidence (i.e., he/she can reduce intake of sugar or minimize addition of sugar to their child drinks comfortably and with confidence). However, the HBM does not take into account behaviours performed for non-health related reasons. In addition, HBM has been criticized for failing to account for the influence of personal attitudes, beliefs or unconscious motivations on a specific health issue (Munro, Lewin, Swart and Volmink, 2007). Moreover, variables such as social pressure and intention had been excluded from the model (Conner and Norman, 1996).

Social cognitive theory (SCT) considers the triadic reciprocal causation between personal factors such as cognitions, emotions and biology, behaviour itself and environmental factors such as family, peers, school or society (Bandura, 1986). This theory posits that all these influences operate on one another bi-directionally. The SCT focuses heavily on learning processes (from environment and experience) to alter behavior towards a targeted behavioral goal through self-efficacy (i.e. confidence in ability to do the targeted behavior) (Bandura, 2002). In the social-cognitive view, interactions with the environment influence individual dietary intake patterns by continually reforming expectations about the likely outcomes of future modifications of dietary intake behavior. The modified eating behavior itself further interacts with the personal factors and environmental factors. SCT adds to our understanding of how environmental influences in the form of social persuasion and modeling alter individuals' inclinations and thinking (Bandura, 1999). SCT addresses many factors that interact together at different levels: individual level, family level, community level, or wider society cultural level to affect behaviour. While it is considered as the most comprehensive among other cognitive based health theories, SCT is difficult to operationalize fully due to the complexity of its interacting factors (Munro et al., 2007).

The Transtheoretical Model (TTM) focuses on the stages of behaviour change. It is also known as the Stages of Change (SOC) model because it incorporates principles and theories of changes into various stages of change. It was initially developed in late 1970's from the experimental work of Prochaska and colleagues, and was well established by the 1990s (Prochaska et al., 2008). The TTM is a more complex model than the other models and hypothesises that individuals

move through six stages of change: pre-contemplation, contemplation, preparation, action, maintenance, and relapse prevention (Glanz, Rimer and Viswabanth, 2008). The theory ignores the social context in which change occurs, such as SES income. Its stages have been criticized for being illogical (i.e.no set criteria on how to determine a person's stage of change) and with no clear sense of a time frame needed for each stage (i.e. how long a person can remain in a stage). Hence, it is not the most suitable model to explore the determinants of the ASB behaviour.

There is a debate in the literature as to whether or not the TPB should be 'retired' eventhough a significant amount of empirical health behaviour research adopted this theory as explanatory variables. More recently there have been published discussions in this regard (Sniehotta, Presseau, & Araujo-Soares, 2014). Sniehotta et al. (2014) reported that experimental tests of the TPB were rare and existing literature in experiment studies didn't support the assumptions of the theory. However, other authors have argued that this should not lead to the retirement of the theory but rather calls for more research to fill existing gaps (Armitage, 2014). In this dissertation, the TPB was used to explore a pre-defined behaviour (ASB) and not to develop an intervention. The main criticism attributed to the TPB is that it focuses on rational reasoning and does not account for unconscious influences on behaviour. Despite this limitation, the TPB can be considered a broader framework assisting in the understanding of human action.

The selection of the TPB over other health behaviour theories was introduced in the previous paragraphs. The following section will address the predictive abilities of the TPB model across a range of social, health and dietary behaviours. Four systematic reviews of the TPB were selected to discuss its effectiveness.

1.6.1 Effectiveness of the Theory of Planned Behaviour.

Evidence showed that intention typically explains 20-40% of the variance in behaviour, whereas attitude, perceived behavioural control and subjective norms explained 40% to 50% of the intention (Ajzen, 1991; Godin & Kok, 1996; Armitage & Conner, 2001; McEachan, Conner, Taylor, & Lawton, 2011).

Ajzen (1991) reviewed 16 studies and reported that perceived behavioural control and intention explained on average 34% of the variance in behaviour. Variance explained the range from 16% in clinical and screening behaviours to 42% in HIV- related behaviours. Intention was not an independent predictor of behaviour in only two studies (Schifter & Ajzen, 1985; Netemeyer, Burton, & Johnston, 1991). A significant amount of variance in intention was explained by subjective norms, attitude and perceived behavioral control. These variables accounted for 19% of the variance in intention for behaviours such as participating in elections, to 88% in other studies such as playing video games or exercising after giving birth.

Godin and Kok (1996), in reviewing 56 health related behaviours showed that the TPB was not consistent in predicting behaviours. Clinical screening was poorly predicted (15.6%) compared to screening for HIV-AIDS (42.1%). Behaviours were best predicted by intention and perceived behavioural control accounting for an average of 34% of the variance in behaviour, though these findings are similar to other reviews where intention and perceived behavioural control explained 26-43% variance in behaviour (Conner, Kirk, Cade, & Barrett, 2001; Hagger, Chatzisarantis, & Biddle, 2002). The TPB constructs of attitude, perceived behavioural control and subjective norm have been shown to account for 46%, 34%, and 46% of variance in intention.

In a meta-analytic review, Armitage and Conner (2001) examined 185 distinct empirical tests of the TPB across different types of social and health behaviours. They found that, on average, intention and perceived behavioral control together accounted for 27% of the variance in behaviour with a strong correlation between intention and perceived behavioural control. When controlling for attitudes and subjective norms, perceived behavioural control accounted independently for 6% of the variance in behaviour and it explained an additional 2% of variance in behaviour above the intention. In addition, the TPB constructs (attitude, subjective norms and perceived behavioural control) accounted for 39% of variance in intention (Armitage & Conner, 2001).

A more recent systematic review by McEachan, et al. (2011) included 207 papers in relation to physical activity, dietary behaviour, safer sex, abstinence such as smoking or binge drinking, and other types of health related behaviours. It was evaluated as to whether the type of behaviour or the moderators of age of sample, or length of follow-up, and type of behaviour assessment (self-reported or objective) were explored. The Findings showed that the TPB constructs predicted 40% to 49% of intention and intention predicted 26%-36% of the behaviour. Physical activity and dietary behaviours were generally best explained by the TPB (23.9% and 21.2% variance explained, respectively). Attitude remains the most important predictor of intention followed by perceived behavioural control and then subjective norm. In addition, this review found that for dietary behaviours, the behaviour construct exhibited stronger correlations with intention, perceived behavioural control and attitude in adults than in adolescents. In the adult sample, 26.7% of dietary behaviour variance could be explained compared to 9.6% in adolescents. The systematic

reviews mentioned previously showed that the TPB can predict up to 60% variance in intention but the prediction didn't go over 36%.

As a summary of the systematic reviews discussed in the previous section, the ability of the TPB model to predict behaviour varied by the type of behaviour such as educational performance, physical activity, health risk behaviours and dietary behaviours. Specific predictors of the investigated behaviour such as stability of the behaviour over time, accessibility, factors affecting this behaviour and ability to control it played a role in the variance explained. Type of intention towards implementation, habitual construct, self-efficacy among others such as personality and other cognitive variables could be included in the model to improve the percent explained variance. The predictive abilities of the TPB are also influenced by specific limitations underlying each study design (cross sectional, longitudinal, intervention). Furthermore, measurement tools used, underlying socio-economic factors and psycho cultural differences in studied population groups can be accounted for in the explained variance that predicts behaviour.

In the above reported systematic reviews, the prediction of intention ranged from 41% to 62% with attitude as a main predictor, and the prediction of behaviour ranged from 34% to 55% with intention as the main predictor of behaviour. It was recommended to establish guidelines to assess perceived behavioural control as different methods were used such as assessing self-efficacy or perceived barriers or using only one scale to assess the construct. Godin and Kok (1996) reported only data related to health behaviours and had the tendency to include only papers with significant findings. McEachan et al. (2011) included in their review only prospective measures of behaviour to overcome the limitation of the other reviews

that included cross- sectional and other types of designs (Godin & Kok, 1996; Ajzen, 1991; Armitage & Conner, 2001; and McEachan et al., 2011). In addition, the McEachan et al. (2011) review had strength over other reviews because the authors used random effect (RE) meta-analysis that is a more conservative method than fixed effect (FE). This allowed for a more accurate way of summarizing the findings.

The application of the TPB in dietary behaviour studies and SSBs will be discussed next.

1.6.2 Applicability of the Theory of Planned Behaviour in social and health related sciences

Researchers in the social sciences and health psychology, practitioners, and students have successfully applied the TPB over the past three decades to a wide variety of health contexts, including physical activity, eating and drinking behaviours among other health risk behaviours (Kim et al., 2003; Rah, Hasler, Painter, & Chapman-Novakofski, 2004; Pawlak, Malinauskas, & Rivera, 2009; Povey, Conner, Sparks, James, & Shepherd, 2000; Kassem, Lee, Modeste, & Johnson, 2003; Kassem & Lee, 2004; Nejad, Wertheim, & Greenwood, 2004; Bogers, Brug, van Assema, & Dagnelie, 2004; de Bruijn & van den Putte, 2009; Blanchard et al., 2009; Seo, Lee, & Nam, 2011; Dunn, Mohr, Wilson, & Wittert, 2011; Zoellner, Estabrooks, Davy, Yi-Chun, & Wen You, 2012; Sharifirad, Yarmohammadi, Azadbakht, Morowatisharifabad, & Hassanzadeh, 2013; Basset-Gunter et al., 2013; Tipton, 2014; Zoellner et al., 2014). Most of these studies were cross-sectional with few longitudinal and very few intervention studies. Glanz, Rimer and Viswanath (2008) suggest that researchers using the TPB as a theoretical framework adopt a

longitudinal design. The variables will be clearly measured when the TPB variables and behaviour are assessed at different time periods (Glanz et al., 2008). The literature review described in the following section was not comprehensive and the studies reported presented an illustration of the TPB.

Longitudinal studies: Conner, Norman and Bell (2002) examined the power of the TPB in predicting long term healthy eating behaviour and intention. In addition, they investigated the possible contribution of intention stability and perceived past behaviour to these predictions. Concerning the prediction of intention, the TPB constructs explained 43% of the variance with attitude and perceived behavioural control being independent predictors, but this did not hold true for subjective norms. This study showed that the TPB is able to predict healthy eating behaviour over a long period of time (6 years). However, unaccounted for factors such as personality, knowledge, confidence, perceived self-efficacy or maturation level might have confounded the results. Another study by Blanchard et al. (2009), including 511 university students, explored the behaviour of eating 5 servings of fruit and vegetables per day. Socio-demographic characteristics and data related to the TPB variables were collected at time 1, and after 1 week the data related to the behaviour was collected. They concluded that intention and perceived behavioural control explained 11% of the eating fruits and vegetables behaviour, with intention being a significant predictor of the behaviour. Concerning the prediction of intention, the authors concluded that the TPB explained 50% of the variance in intention, with only attitude and perceived behavioural control significantly predicting intention. According to Nejad et al., (2004), intention explained 45 % of the dieting behaviour

among 256 female students. The TPB constructs explained 77% of the variance in intention.

Cross sectional studies: In cross-sectional studies investigating dietary behaviours, Povey et al. (2000) examined the extent to which the TPB was a useful model in predicting the intention and behaviour to adopt healthy eating. The results showed that intention and perceived behavioural control together explained 15% of the variance in behaviour with perceived behavioural control being the most important predictor. The other TPB constructs explained 42% of the variance in intention of healthy eating. In another study, intention explained 61% of the variance in dairy product consumption among adults with attitude being the strongest predictor of intention (Kim et al., 2003). Rah et al. (2004) similarly found that attitude explained 59% variance of soy consumption and 57% of the variance in intention. Furthermore, in an original paper by Hewitt and Stephens (2007), the TPB was used to predict healthy eating behaviour and intention in 261 children aged 10 to 13 years. Again, a significant amount of variance in behavioural intention was predicted by the TPB constructs. The model accounted for 51% of the variance explained by intention and 44% of the variance in healthy eating behaviours. Another empirical study used the TPB to understand the behaviour of fruit consumption among a sample of 583 undergraduate students with a mean age of 21.3 years in the Netherlands (De Bruijn, 2010). The results of this study added to a growing body of research for the TPB investigating the effects of habit strength on fruit consumption in a four steps regression. Intention and perceived behavioural control explained 22% of the behaviour under study with both variables being independent predictors of fruit consumption. Attitude and subjective norms were added leading to a 27%

explanation in variance in intention. At the last step, when habit strength was added to the regression this model explained 30% of variance with intention and habit strength remaining as an independent predictor of behaviour.

Focusing on dietary behaviours (healthy eating or fruit consumption), the range of percent variance in predicting behaviour in these studies ranged from 9% (Conner et al., 2002) to 45-% (Nejad et al., 2004). The longitudinal design of the following studies was a strength (Conner et al., 2002; Nejad et al., 2004 and Blanchard et al., 2009), but the cross- sectional design of the other studies (Povey et al., 2000; Kim et al. 2003, Rah et al., 2004, Hewitt et al., 2007 and De Bruijn et al., 2010) presented a major limitation violating the concept of the TPB in predicting future behaviour. Concerning sampling procedures, the sample in the Conner et al. (2002) study was self-selected resulting in a sample with a higher degree of motivation. Likewise, in De Bruijn et al. (2010), the sample was a limitation because it was considered a convenience sample leading to a lesser generazibility of results. And in Nejad et al. (2004), the sample was biased as overweight woman were less likely to participate in the study. In addition, self- reported measures of behaviour were considered a limitation in most of the studies (Povey et al., 2000; Conner et al., 2002 ; Nejad et al., 2004; Hewitt et al., 2007; Blanchard et al., 2009 and De Bruijn et al., 2010). Hence, it was recommended for future studies to use objective measures of behaviours. Underlying beliefs concerning the intake of fruits and vegetables were not included in the TPB model which presented a limitation in the Blanchard et al. (2009) study. Despite the anonymity steps taken to ensure confidentiality in the Nejad et al. (2004) study, and the procedure taken in collecting data, social desirability cannot be completely avoided in self-reported data.

1.6.3 Applicability of the TPB in predicting the intake of SSB

Few key studies were identified tackling a similar behaviour to that under exploration in this study (De Bruijn, Kremers, de Vries, van Mechelen, & Brug, 2007; Kassem et al., 2003; Kassem & Lee, 2004; Zoellner et al., 2012; Tipton, 2014). The majority of these studies focused on adolescents, children and their primary caregivers. Soft drink consumption was explored among 208 students in Netherlands (De Bruijn et al., 2007). In this study, even though intention was significantly associated with soft drink consumption, it failed to predict the behaviour when controlling for the influence of parenting practices and personality (De Bruijn et al., 2007). Kassem et al. (2003) and Kassem and Lee (2004) explored the factors influencing soda consumption among adolescents in North Los Angeles County public schools. The details of this research are reported in two papers. The first one in 2003 aimed to understand the soft drink consumption among female adolescents (Kassem et al., 2003), and the second one aimed to understand the soft drink consumption among male adolescents, both using the Theory of Planned Behaviour (Kassem & Lee, 2004). For the first study, the author used the TPB as the theoretical framework to identify the factors which could influence regular soft drink consumption among female adolescents in public schools. When independently assessed in a multiple regression, intention and perceived behavioural control were positively correlated with the behaviour (Kassem et al., 2003). When combined, they explained 28% (R^2=0.28) of the variance of soda consumption with intention being the only independent predictor of the behaviour (ns for perceived behavioural control). Attitude, subjective norms and perceived behavioural control were each significant independent predictor of intention to drink soda explaining 64% of its

variance (R^2=0.64). The second study reported the results of the data collected from 606 males in the same public schools. Together intention and perceived behavioural control explained 15% (R^2=0.15) of the variance in soda consumption with intention being the sole independent predictor of behaviour (ns for perceived behavioural control). Concerning the prediction of intention, attitude, perceived behavioural control and subjective norm explained 61% of this variance (R^2=0.61).

Another study described by Zoellner et al. (2012) predicted sugar sweetened beverage consumption using the TPB in a sample of 119 adults, but included implementation intention. At Step 1 implementation intention was added and explained 16% (R^2=0.16) of SSB consumption without being an independent predictor (β= 0.18, ns). At Step 2, however, when behavioural intention was added, 27% (R^2=0.27) of the behaviour was explained with intention being an independent predictor. At Step 3 perceived behavioural control was added resulting in a model explaining 32% of variance in behaviour. Subjective norms and attitude were significant independent predictors of sugar sweetened beverage consumption when added together at Step 4 as the last step. When considering all constructs, they accounted for 38% (R^2=0.38) in the behaviour variance. When entered into the model, age, sex and education level slightly increased the amount of explained variance to 41% (R^2=0.41), but did not appear as significant predictors of behaviour (Zoellner et al., 2012).

Tipton (2014) also used the TPB to predict the intention of preadolescent caregivers who served sugar sweetened beverages to their children investigating the association between attitude, subjective norms, perceived behavioural control and intention in a cross-sectional study. The behaviour examined in Tipton's (2014)

paper is similar to a certain extent to the ASB behaviour which is explored in the research of this paper with one further step consisting of explaining the variance in behavioural intention and actual behaviour. The study aimed to predict the intention of 165 non-Hispanic Black mothers in the state of Louisiana to serve sugar sweetened beverages to their pre-school children (2-5 years) using the direct measures of the TPB constructs. Attitude and subjective norms were shown to predict intention and explained 48% of the variance in intention (Tipton, 2014). Both of these constructs were positively correlated. Perceived behavioural control was not correlated with intention, but the path indicator concluded that the intention to serve SSBs increased as the PBC decreased. The lack of correlation between PBC and intention coupled with the inability of control beliefs to predict the PBC encouraged the author to remove PBC from the analysis. In light of these results, Tipton (2014) concluded that the TRA was a better model to predict the intention to serve SSBs to preschoolers.

The review presented above pertained to key studies that have investigated the intake of SSBs across a sample size ranging from 556 to 1763 participants (De Bruijn et al., 2007; Kassem et al., 2003; Kassem & Lee, 2004; Zoellner et al., 2012; Tipton, 2014), one paper addressed adults Zoellner et al. (2012), and one paper addressed caregivers (Tipton, 2014). The range of variance in these studies ranges from 15% to 38% explaining the intake of sugar sweetened beverages and from 38% to 66% explaining the variance in intention. This range incorporates only the effects of the TPB constructs (excluding the intention construct). However, Zoellner et al. (2012) added the effect of implementation intention on the behaviour. All the studies presented above were cross-sectional in nature, and this presented a limitation in the

ability of the TPB to predict the behaviour. Another limitation was the use of self-report from respondents which could be influenced by social desirability (Van de Mortel, 2008). According to Kassem et al. (2003), the small number of students who did not report any drink could slightly bias the association between the constructs of the TPB model. Another limitation presented by Tipton (2014) was that only one single item measuring the perceived behavioural control was used after doing the reliability analysis.

Based on the above review of literature, the TPB has been proved to be an established model for predicting behavioural intention as well as behaviour, especially within the health sciences. Although the overall model is notably a powerful predictor of both intention and behaviour, the specific predictors of intention and behaviour are not totally consistent across studies. However, even when extending the model and adding new variables such as anticipating regrets, self-efficacy, past behaviour and habit strength, the model was still able to explain a significant amount of the variance in behaviour. On average, the TPB was a good model to predict 26-36% of variance in behaviour and 40-49% of the variance in intention (Ajzen, 1991; Conner et al., 2002; Godin & Kok, 1996; Hagger et al., 2002). In addition, standardized tools to measure the constructs of the TPB theory have also been established (Ajzen, 2006; Francis et al., 2004).

Reviewed studies showed small to medium effect to explain SSB intake, except for the Tipton (2014) study that attempted to predict caregiver behaviour of serving SSBs to children. There is no study that explained caregiver serving behaviour using the TPB model.

As such, the quantitative study using the TPB in this dissertation investigated the TPB's ability to predict adding sugar behaviour to homemade beverages offered to children.

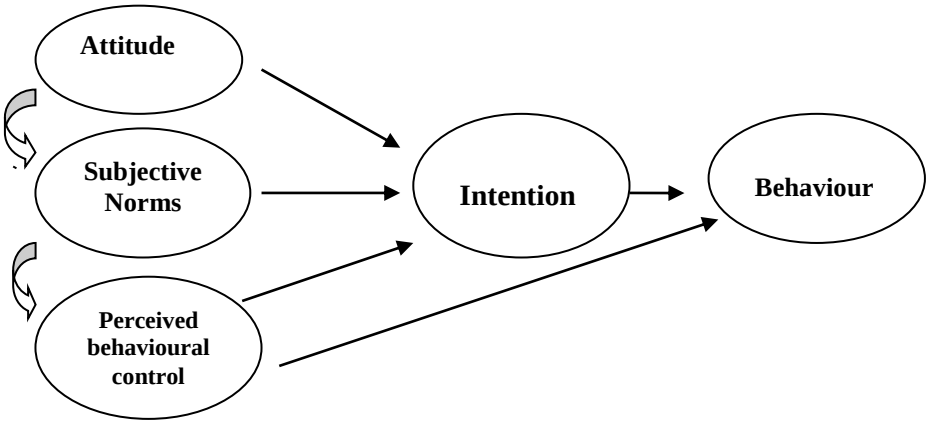


Figure 1.1: Theory of Planned Behaviour (Ajzen, 1985)

1.7 Other Behavioural Influences

Nutritional status, food and drink consumption as well as dietary habits are influenced by several factors such as individual and environmental factors (Story, Kaphingst, Robinson-O'Brien, & Glanz 2008; Haerens et al., 2007; Hallstrom et al., 2011). Social determinants of health are assumed to influence an individual's health at multiple levels throughout the years of life (Hernandez & Blazer, 2006). According to Bruss et al. (2005), dietary behaviours are influenced by many complex factors including biological, personality, and developmental causes indicating who, when and how to eat or drink. People tend to pattern their eating habits after and imitate those who are living around them.

McClain et al. (2009) conducted a systematic review where they aimed to identify the psychosocial correlates of eating behaviors among adolescents and children. One of the behaviours included was the consumption of SSBs which was defined as the intake soft drinks, juices and sugar sweetened beverages. Ten out of

77 studies explored the intake of SSBs. The major correlates with SSB intake were attitude (positive association in 2 studies), intention (positive association in 2 studies), perceived modeling (positive association in 4 studies), liking (positive association in 2 studies) and peers norms (positive association in 6 studies). The major limitation in this review, however, was that most of the studies identified were cross-sectional studies where causality couldn't be established. In addition, cross-sectional designs can result in systematic error and the overestimation of association between variables and eating behaviour (Weinstein, 2007). Another limitation in this review is that most of the studies relied on the self- report of dietary intake which has a high rate of under reporting (Livingston & Robson, 2000). McClain et al. (2009), reported in their review the lack of theory related to the understanding of health behaviours to provide the suitable framework to examine the relationships among various constructs.

Another recent systematic review of 44 studies (intervention, prospective and cross-sectional) identified 12 correlates including: a child's preference for SSBs, TV viewing/screen time, snack consumption, parents' lower socioeconomic status, lower age, SSB consumption, formula milk feeding, early introduction of solids, using food as rewards, parental-perceived barriers, attending out-of-home care, and living near a fast food/convenience store to be positively associated with higher SSB consumption (Mazarello et al., 2015).

1.7.1 Habituation

A habit can be defined as an automatic behaviour acquired after repetition in a constant setting (Lally, van Jaarsveld, Potts, & Wardle, 2010; Lally & Gardner,

2013). The time to reach the maximum behaviour automaticity was found in one study range from 18 to 254 days (Lally et al., 2010). This was related to the frequency of behaviour performance as not all study participants repeated the behaviour consistently enough to develop the 'habit'. Therefore, once a habit is developped, automaticity underpins the behavioural action resulting from this habit (Aarts & Dijksterhuis, 2000; Ajzen, 2002). Thus if parents reinforce their children's behaviour relative to sugar containing products, it is likely that this may develop into an automatic response for the child in future life (Aarts & Dijksterhuis, 2000). The same can be applied to consuming SSBs as sugar containing products (the action) in order to feel satiety (the goal) when these children receive such food frequently for meals (the habit). The habituation of consuming products with added sugar can play an essential role in the children's food selection. Usually the children's exposure to and experience with food and beverages dictate their future food preference (Birch, 1999). In addition, acquired food preference and taste make food selection and consumption a pleasurable experience and thus sustained (Birch, 1999). Repeated exposure to sweetened beverages may enhance desire for it and thus increase a preference for sweet tasting beverages (Park, Pan, Sherry, & Li, 2014). In a longitudinal cohort analysis of 1333, US children using data from the 2005-2007 (Infant Feeding Practices Study II) and the 2012 follow–up study at 6 years of age, sweet drinks such as juice drinks, sweet tea, soft drinks and other powdered drinks were evaluated over a 7 day period carried out by Park et al. (2014). They examined whether SSB intake during infancy predicts SSB intake at 6 years of age. SSB intake at age < 1 year or during infancy (2 to 12 months) was measured in a series of surveys, by maternal reporting of feeding their infant sweet drinks such as juice

drinks, sweet tea, soft drinks and other powdered drinks over the past 7 days. The intake of these beverages at age 6 was assessed by parental reporting of their child's usual intake over the past month. Overall results revealed that children who were fed SSBs during infancy compared to those who were never fed SSBs had a 2.22 times higher odds of consuming SSBs at least once per day at 6 years of age (Park et al., 2014). This study, however, also presented limitations such as the use of a convenience sample where all mothers included in this study attained more than high school education, were non-Hispanic and white. This presented a limitation as previous studies showed that the intake of sugar sweetened beverages was higher among Black children with parents with lower education level. In addition, the tool used to collect data was not a validated tool and missing data were imputed for the exposure variables (i.e. intake of sugar sweetened beverages during infancy) leading to an estimation of the missing data which may have resulted in overestimated results.

A well-established habit, resulting from frequent repetitions of the related behaviour, can have a great impact on later behaviours (Ajzen, 2002) and these habits become more difficult to overcome with time (Lally & Gardner, 2013). Consequently, the earlier in this stage of development that behaviour is subject to change, the more likely the desired change is to succeed. Otherwise, it would take more effort and time to change this behaviour by following the steps suggested by Lally and Gardner (2013). The suggested steps involved, in making a decision to take action include translation of the decision into action, repeating the targeted behaviour, and finally, the achievement of automaticity following behaviour repetition within the presence of a consistent context. This can explain why stopping

SSB intake failed to maintain after 24 months among adolescents in some studies (Ebbeling et al., 2012).

1.7.2 Taste perception

Taste preference is considered among the most noticeable factors influencing food choice. This preference may lead to unhealthy dietary choices in particular among children who are dependent on making their choices (McCarthy, 2014). It is important to understand how a child's sweet taste preference develops with time. Before the domestication of animals and the use of their milk, and long before the development of infant formula, human breast milk was the only available nutrient for infants (Short, 1994). Infants were born with an innate taste preference creating a natural affinity for their mother's milk (Mennella, Finkbeiner, Lipchock, Hwang, & Reed, 2014). Taste and flavor are acquired in the very early stages of life, particularly in utero and infancy (Cooke, 2007). Therefore, providing the fetus and infant exposure to healthy foods can greatly influence their future healthy dietary life and life-long eating choices and habits (Cooke, 2007). In addition, if a mother eats fruits and vegetables during breast-feeding, the infant receiving the breast milk will be exposed to these tastes and thus acquire their flavors (Beauchamp & Mennella, 2009). The same applies to weaning foods. Thus children tend to eat what their taste buds recognize and like. In addition, Mennella et al. (2014) pointed out that ingesting something sweet activates the pleasure generating area of the brain. For example, a study showed that among 8-13 year-old children and adolescents, those who strongly liked the taste of a particular drink (soda, milk, or water) were 4.5 times more likely to consume it compared to those who disliked it (Grimm, Harnack, & Story, 2004).

However, the results of this study cannot be generalized due to the fact that the sample was a convenient sample among US children. Other confounding variables such as ethnicity and socio-demographic variables were not known. In another recent study, Nickelson, Lawrence, Parton, Knowlden and McDermott (2014) reported that 94% of children consumed flavored milk which is considered intensely sweet as each 250 ml of sweetened milk contains the equivalence of 6 teaspoons of sugar. The inherent inborn sweet taste among infants and children can shape the environmental influences that limit or promote accessibility of sweetened drinks.

1.7.3 Socioeconomic status

Socioeconomic status (SES) is believed to be another major predictor of dietary intake and food choices among different populations. The Socio Economic Status (SES) of a certain population impacts their health (Caprio et al., 2008). According to Darmon and Drewnowski (2008), children and adolescents of a low SES have a tendency to go for less healthy dietary options. The possible association between SES and an increased intake of sugar sweetened beverages could be explained by the fact that poorer families seek less expensive products. Andrieu, Darmon and Drewnowski (2006) in their observational study analyzed the dietary data (French national food consumption survey) of 1474 French participants who filled a 7-day diet record. The authors found that poorer families reported a greater intake of added sugar and sugared drinks. De Coen et al. (2012) analyzed the data of 1639 parents of 2.5-7 years old children recruited from primary Flemish centers and found that parents from high SES consumed 0.42 less SSBs than families from low SES. However, this relation was mediated in this study by many behaviour practices

such as parent intake of sweetened drinks and accessibility of this type of beverage. The major limitation in this study was the high non- response rate (51%) and the fact that 21.5% of participants had missing data in relation to SES. In addition, the data was self-reported and could trigger high social desirability bias.

Another study by Pinard, Davy and Estabrooks (2011) showed that low income parents and their 9-17 years old children tended to exhibit similar beverage consumption in a sample of 95 parent-child dyads. The parents' intake of beverages averaged 451 Kcal, whereas, the children's intake of beverages was 457 Kcal (Pinard et al., 2011). A study conducted in Canada showed that children from low-income families who regularly consume SSBs between the ages of 2.5 and 4.5 years are more than three times more likely to be overweight at age 4.5 years compared to children from higher income families with a low consumption of SSBs (Dubois, Farmer, Girard, & Peterson, 2007).

The authors in Dubois et al. (2007) relied on the 24-hour recall sheet to collect the energy intake which presented a limitation in this study despite its longitudinal design. A study carried out in Jordan has shown that children from the low social classes and whose mothers had less education, consistently had more dessert, squashes, and tea with sugar, and less healthy drinks than did less disadvantaged children (Sayegh, Dini, Holt, & Bedi, 2002). Data on Lebanese preschool children showed that children with low socioeconomic status (SES) had a high intake of soft drinks which constituted the largest source of daily caloric intake for these children (Baba, 1998). In the U.S.A, studies have also shown that children of families with low SES consumed significantly more added sugars in their diet compared to high SES children who consumed a more nutrition-rich healthy diet

(Xie, Gilliland, Li, & Rockett, 2003). Socioeconomic status is postulated to be a determinant of unhealthy eating habits such as the intake of sugar sweetened beverages. The economy theory can further explain how SES influences the consumption of SSBs. The intake of sweetened drinks could be attributed to cost which is a major determinant of diet choice (Darmon & Drewnowski, 2008). For example, the intake of fruits and vegetables as snacks may be more costly than the intake of sugared beverages (Maillot, Darmon, Vieux, & Drewnowski, 2007).

1.7.4 Parental and mother education

Fundamentally, parental education plays an important role in a child's health (Cribb, Jones, Rogers, Ness, & Emmett, 2011). In the Norwegian Mother and Child Cohort (MoBa) by Bjelland et al. (2013), children of mothers with a low education consumed SSBs more often compared to children of mothers with a high education at 18 months of age. Even though this study is strengthened by its longitudinal design, the association of maternal education and high SSB consumption could be influenced by the fact that the intake of SSBs was low in general in this sample.

In a secondary analysis of the data of the national Australian survey (Commonwealth scientific industrial research organisation, 2007) that investigated the health and nutritional status of 4,834 Australian children and adolescents from 2 to 16 years of age from a representative random sample, children were classified as non-consumers, low to moderate, or high consumers of SSBs (Hafekost, Mitrou, Lawrence, & Zubrick, 2011). Logistic regression was used to determine the association between the factors and the level of consumption. Children of parents with a higher education level were consuming less of carbonated beverages

compared to children with parents with a lower education level (Hafekost et al., 2011). However, this relation was not consistent with sweetened juices and flavored milk. Hafekost et al. (2011) study, presented a number of limitations such as data collection was based on a 24-hour dietary recall where there is a possibility, that the data collected on the survey days were unable to reflect the typical intake pattern of this group of children. In addition, the cross-sectional nature of the study and the classification of beverages could have biased the results (Hafekost et al., 2011). In another longitudinal study, data was collected from 678 children (7-9 years) in 2008 and later in 2010, 555 children returned the questionnaire (Moraeus, Lissner, Olsson & Sjoberg, 2015). The overall findings showed that consumption of SSBs 4-7 days/week increased overall from 7% at age 7-9 years to 12% for 9- 11 year olds (Moraeus et al., 2015). Maternal education as a proxy measure of SES was significantly associated with the change in the intake of SSBs. The consumption of SSBs 4-7 days/week more than doubled from 7% to 16% in low SES families while remaining stable in the group representing a higher SES. The limitation presented in this study was that the Food Questionnaires (FQs) were not validated and this could bias the data collected concerning SSBs and other included items (Moraeus et al., 2015). A good parental educational level is thus a corner stone on which children's good eating and drinking habits can develop as this should stimulate a change in the behaviour, attitude, and values that come with an increased education as well as active parental involvement (Goodell, Pierce, Amico, & Ferris, 2012).

1.7.5 Other factors: child personality, age, gender, availability of SSBs, and parenting style

On the other hand, parenting by itself is affected by the child's or adolescent's personality and emotional stability (De Bruijn, Kremers, De Vries, Van Mechelen, & Brug, 2007), in addition to age, gender, and perception of their peer's norms among other behavioural factors. De Bruijn et al. (2007) noticed that the strict application of SSB consumption rules was mainly successful in adolescents who had a moderately agreeable personality, while those with low levels of agreeableness were less obedient to their parents' rules. Furthermore, many studies have highlighted age and gender differences as factors in SSB consumption. Regarding gender, it appears to affect dietary habits as girls prefer to eat more fruits and consume less soft drink when compared to the SSB consumption of boys (Vereecken, Inchley, Subramanian, Hublet, & Maes, 2005) especially among adolescents. This could be related to the higher caloric needs of boys during adolescence. In addition, as the child grows toward adolescence, their eating habits shift toward more soft drinks consumption and less fruit consumption (Vereecken et al., 2005). These findings are supported by numerous studies. In the UK Millennium Cohort Study by Laverty et al. (2015) boys 11 years old (62.3% out of 4061) were more likely than girls at the same age (59.1% out of 6651) to consume SSBs at least once per week. Male children and adolescents in the U.S.A were also shown to have a significantly higher mean energy intake (362 Kcal/day) when compared to females (282 Kcal/day) of the same age group (Marriott, Fink, & Krakower, 2014). This energy intake was shown to be ascending with increased age among children and adolescents in both gender groups. Furthermore, in Denmark a 2005-2008 survey

showed that 13-15 year old boys consumed about 60% more SSBs than girls of the same age (Fagt et al., 2012). In Lebanon, in both the 2005 and 2011 national studies, boys consumed more soft drinks than girls (GSHS, 2005; GSHS, 2011).

Access to soft drinks and SSBs is another factor contributing to their intake by children and adolescents (Erkkola et al., 2008). Such products are extensively produced and widely available on the market. For example, 82% of the sources of added sugar in the diet of Finnish children with type 1 diabetes came from sugar-containing manufactured foods and beverages (24% from beverages), while naturally occurring and consumer-added sucrose accounted for 15% and 3%, respectively (Erkkola et al., 2008). This imposes a threat since the wide availability of high-energy, sugar-containing drinks can nurture unhealthy food preferences and create habitual unhealthy dietary behaviours early in life (Birch, 1999). However, market convenience is not the only factor to consider here, but home availability as well. For example, of 560 children and adolescents aged 8-13 years (Grimm et al., 2004), 79% had soft drinks available in their house. Studies have shown that children who ate more fruits and vegetables at home had parental restrictions on access to fruit juices and high fat/sugar snacks (Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008). Thus the family environment and eating habits play an essential role in children's diets (Hebden, Hector, Hardy, & King 2013). However, it is crucial to investigate not only what the children are drinking, but also where, when and how they are doing so (Kime, 2008). Interestingly, adolescents' behaviour of drinking fruit juices was shown to be highly correlated with the consumption of these beverages by their mothers (Vagstrand, Linne, Karlsson, Elfhag, & Lindroos, 2009). Likewise, 8-13

year-old children had a 2.88 times greater propensity to drink soft drinks 5 or more times per week when their parents did so (Grimm et al., 2004).

Parenting feeding style presents another influence on the intake of SSBs. Collins, Duncanson and Burrows (2014) reviewed the association of parenting style with child feeding behaviours. In a systematic review of the association between parenting style and child feeding behaviours in 7 studies with a main focus on children less than 12 years, a negative association was found between the permissive parenting style of mothers and fathers and the monitoring of child dietary intake (Collins et al., 2014). In addition, Tylka, Eneli, Van Diest and Lumeng (2013) found that mothers with permissive feeding styles were less likely to control their child's food and beverage intake.

1.8 Rationale

Added sugar and SSB consumption has been associated with the consumption of unhealthy food rich in fats and sugars and savory snacks, and poor in fresh fruits and vegetables (Piernas, Ng, Mendez, Gordon-Larsen & Popkin, 2015; Marriott et al., 2010; Mathias, Slining & Popkin, 2013). Studies from different countries have shown that eating and feeding practices are influenced by sociocultural norms (Arrendondo et al., 2006; Osman, El Zein & Wick, 2009; Musaiger, 2011). Different researchers have addressed the need for better understanding of the socio-cultural factors of dietary behaviors essential for the development of interventional program to modify unhealthy eating habits. Zoellner et al. (2012) have highlighted the scarcity of research on behavioural factors affecting sugared beverage consumption among children and adolescents. Newens and Walton (2015), have also called for further

research into the dietary patterns contributing to the added sugars intake in children and adolescents.

The addition of sugar to home prepared beverages and offering them to infants and children is a potentially unhealthy feeding practice by caregivers (mothers, fathers, grandparents), that is likely to shape their child's preferences for sweetened drinks as they grow, affecting their nutritional status and influencing the likely risk of developing diseases later in life. As the addition of sugars to home prepared beverages is influenced by socio-cultural beliefs, it is essential to have a better understanding of the socio-cultural beliefs underlying the early intake patterns of sugar containing drinks among infants and children. Such an understanding of how the socio-cultural beliefs about the behavior influence mothers ASB behaviour can be of value to those concerned with the development of interventional programs that focus on altering the subjective norms of dietary intake patterns in general, and unhealthy intake patterns such as adding sugar to beverages behaviour.

This dissertation sought to gain a better understanding of parental perceptions and beliefs underlying the ASB behaviour from a group of household representative of Lebanese low socio-economic families. To the best of the knowledge of this researcher, parental beliefs and perceptions about the ASB behaviour have not been explored in the various Lebanese communities. This dissertation hopes to contribute to the limited existing literature from the MENA area on ASB behaviour to home prepared beverages or drinks. An understanding of local beliefs, customs and traditions related to early SSB intake habits from the parents, and extended family members' perspectives is essential to inform preventive interventions tailored to the cultural-/religious diversity within the Lebanese community. Such an understanding

of the socio-culture patterning of early intake of SSBs can offer keys to designing culturally specific and theory based intervention programs (Nilsen, Krokstad, Holmen & Westin, 2009; Hackman & Knowlden, 2014). In addition, any interventional programs aiming to modify the unsafe/unhealthy adding sugar behaviour need to consider the strength of the socio-cultural beliefs influencing it. Brug, Oenema and Ferreira (2005) argued that most of the theories that are applied in behavior nutrition provide information on *what* needs to be changed to promote healthy behavior but not *on how change* can be induced. In line with Brug et al. (2005) reasoning and understanding how change can be induced necessitates a better understanding of the local beliefs and traditions towards the adding sugar to beverages behaviour.

1.9 Research Questions

This dissertation sets out to identify the key determinants of adding sugar to beverages offered to children by Lebanese mothers, as well as to identify effective interventions for changing this behaviour.

This dissertation answered the following questions:

Chapter 2: What are the views of parents and grandparents about adding sugar to beverages offered to children and grandchildren, particularly milk?

Chapter 3: What are the predictors of the adding sugar behaviour to beverages (milk, hot drinks and home-made juices) offered to children by their mothers using the theory of planned behaviour (TPB)?

Chapter 4: What are the most effective behavioural interventions aimed to reduce the intake of sugar sweetened beverages among children and adolescents?

In order to answer the above listed questions, a mixed methods design was selected to address questions one and two. A systematic review was conducted in order to address question three.

1.10 Research Methodology

1.10.1 Overview of a mixed methods design

Given the overall purpose of this current research and in an attempt to obtain a better understanding of the adding sugar behaviour, a mixed methods study design was employed. The three arms of this project (qualitative, quantitative and systematic review) are reported consecutively in chapters 2, 3 and 4. There is disparity between qualitative and quantitative designs emerging from their inductive or deductive paradigmatic position. However, the mixed methods design offers a distinct research paradigm that stands by itself benefitting from both objective and subjective knowledge. The two methodologies use different strategies towards understanding and analyzing knowledge, each serving a particular purpose. The qualitative design, with its inductive ability leads to generating theories and exploring complex phenomena. There are various thematic frameworks in analyzing qualitative data such as ethnographic narrative, as well as content analysis and framework analysis (Corbin, Strauss, & Strauss, 2008; Silverman, 2011). In contrast, the quantitative approach is based on a deductive perspective where data is obtained from experimental design and structured questionnaires testing existing theory or hypotheses providing an objective and rigorous investigation. This said, the qualitative foundation, and understanding the subjective meanings helps in clarifying

the multiple perspectives for the research quiery (Broom & Willis, 2007; Creswell, Klassen, Plano Clark, & Smith, 2011).

The concept of a mixed methods design as an independent research paradigm supports data integration and drawing inferences from both qualitative and quantitative findings (Creswell, 2009). Hence, this scholarly fusion is founded on the greater effectiveness of utilizing a blend of both qualitative and quantitative research results (Johnson, Onwuegbuzie, & Turner, 2007; Sosulski & Lawrence, 2008). Integrating the two methods strengthens the reliability of the findings (Creswell, Klassen, Plano Clark, & Smith, 2011). The mixed methods approach has been used by many researchers in different fields including health care, social science, public health and medical sociology (Barbour, 1998; Ivankova, Creswell, & Stick, 2006; Palinkas & Soydan, 2011). According to the Office of Behavioural and Social Science Research (OBSSR) at the *National Institutes of Health (NIH),* mixed methods research is most effective as a study design for research questions that need cultural influence (Creswell et al. 2011). However, the specific design of mixed methods chosen does not necessarily mean combining their paradigms (Morgan, 1998; Johnson & Onwuegbuzie 2004).

Applying a mixed method approach can achieve what often cannot be accomplished through one approach (Johnson & Onwuegbuzie, 2004). A mixed methods design takes advantage of the inductive and deductive approaches in order to corroborate findings; generating more complete data and using results from one method to enhance insights attained by the complementary method (Curry, Nembhard, & Bradley, 2009; Abowitz & Toole, 2010). As a result, a more powerful conclusion and explanation to the main research question utilizing a comprehensive,

holistic perspective are obtained (Happ, Dabbs, Tate, Hricik, & Erlen, 2006; Dunning, Williams, Abonyi, & Crooks, 2008).

1.10.2 Rationale for using mixed methods and setting the scene for this dissertation.

The methodological design of a study plays an essential role in influencing the validity and reliability of the research. Various studies have adopted this approach in social and health research (Pace, et al. 2011). According to Curry et al. (2009), the mixed methods design helps in giving new insights to a complex phenomenon and investigates potential mechanisms leading to the behaviour under study. The three most common approaches used to integrate the data in mix methods are merging data, connecting data, and embedding data (Creswell et al., 2011).

This dissertation has followed a sequential exploratory (Qualitative-Quantitative). Utilizing this perspective, the qualitative component offered contributions to the research process developing a deeper understanding of the studied ASB behaviour and presented the explicit opinions of the participants. The quantitative (TPB study) necessitated the reliance on data collection (standardized questionnaires), and statistical methods to investigate the impact of cognitive (attitude, subjective norms and perceived behavioural control) variables on the intention to stop or reduce the ASB behaviour. Together the mix of methods was able to provide a more complete picture and thus a greater comprehension of ASB behaviour. Details about sample size and recruitment of participants are described in the respective chapters (chapter 2 for the mixed methods study and chapter 3 for the quantitative study using TPB). The paragraph below gives an overview of the

country where the studies were conducted, namely, Lebanon and the public schools in Lebanon.

Lebanon is a middle-income country located in the Middle-East, on the Eastern shores of the Mediterranean Sea. It occupies 10,452 square kilometers, and area23 times smaller than the United Kingdom (UK). The estimated population in Lebanon is around 4.3 million people (Hwalla, 2007). Lebanon has been known as the land of milk and honey (Lebanon-thelegend.blogspot.com). Hwalla, Deligia, Palma, Solal-Céligny & Dop (2007) reported that in the last 10 years a shift occurred in the eating habits of the Lebanese populatuions, the trend shifted from consuming the traditional Lebanese food to consuming more ready made foods and westernized recipes. In 2011, data showed that there was a high increase in SSB consumption and increased prevalence of obesity among children and adolescents, as well as a high prevalence of dental caries (GSHS, 2011; Nasreddine et al., 2014). A brief overview of public schools and the school health program in Lebanon follows as the core setting for this thesis.

Historical background of education in Lebanon

The Ministry of Education and Higher Education (MEHE) is one of the largest ministries in Lebanon in terms of size, employees and staff, number of relevant institutes, and tasks and budget. According to the national statistics for the 2010-2011 school year, prepared by the Center for Educational Research and Development, the MEHE was directly responsible for 1,365 public or state schools from pre-school to secondary levels. The MEHE regulates all educational institutes in the public sector through a regional education system that serves as liaison

between the directorates of education at the ministry's headquarters and the public schools throughout the regions.

As far back as the year 1736, education in Lebanon was theoretically structured by missionaries. The start of public education was delayed until the end of the 19th century. Before World War I, there were about 125 elementary schools in Beirut and very few high schools.

Public Schools and the school health program

In Lebanon, parents choose a school for their children according to their social level whereby the middle and upper-middle-income families seek private schools. On the other hand, Lebanese families with lower middle income and lower SES seek public schools. The main reason families resort to private schools is the desire for a higher quality education; the educational level and teaching competency of public school teachers are lower than those in private schools, especially at the pre-secondary level.

The ministers of Public Health and National Education, Youth and Sports developed a national committee specialized in school health in order to design and implement a program for the public school system in Lebanon.

The availability of health programs at public schools, whether provided as services or education, is needed for the students enrolled in these schools. It is the right of each child to have access to a proper education, however the wellbeing of children in public schools is equally as important. Investing in a health program in public schools improves the quality of the student' s lives. In 2001 a school health

program entitled *"A Healthier School"* (HS) was officially launched in Lebanon.The HS was financially supported by the United States Department of Agriculture's (USDA) in collaboration with the International Orthodox Christian Charities (IOCC) and the University of Balamand. The HS program was developed in stages to include additional components including much needed educational materials for students, parents, and teachers to support their school health related initiatives and activities. This school health program included different concepts in relation to general health such as messages related to healthy dietary habits and increased physical activity. The most important and productive activity that was performed under the "*A Healthier School*" program was the launching of a large campaign aimed to promote oral health named: The National Oral Health Campaign.

Nithila et al. (1998) reported that the Global Oral Data Bank (GODB), 1986-1996, showed that from the 12 Mediterranean countries included in the report, Lebanon had the highest mean number of Decayed, Missing and Filled Teeth (DMFT), with a mean of 5.7 indicating that 93% of 12 year old children experienced tooth decay. Doumit and Doughan (2002) suggested, following a survey of a representative sample of school aged children, the need for launching a National Oral Health Campaign in Lebanon, and the establishment of an action plan emphasizing preventive measures. In 2005, a five-year National Oral Heath Campaign (NOHC) targeting 35,000 students was officially launched and it included the integration of health messages about oral hygiene and fluoride varnishing. Despite the efforts of the NOHC, the cause of poor oral health of Lebanese children in public schools has remained unclear. In 2008, findings from a survey conducted in the majority of public schools among students aged 8 to 10 year old, showed continued poor oral

health among surveyed students (unpublished work of the Ministry of Education and Higher Education (MEHE). These results were thought to be attributed to factors such as the complexity of dietary habit, oral hygiene and fluoride intake. In 2012, MEHE reported that dental caries was a persistent problem highly influenced by food and drink habits in addition to other factors for this specific age group of children such as oral hygiene. In addition, the report of the global school based student health survey conducted by the MEHE in 2005 among 3754 students aged 13-15 years in 50 Lebanese public schools showed that the intake of sugary drinks (two times /day) was 37.9% for grade 7, 36.7% for grade 8, and 32.4% for grade 9.

The data in the mixed methods study (chapter 2) was collected in three phases. In phase 1, a convenience sample of mothers of children aged 4-6 years participating in the NOHC were recruited from a public dental clinic to get access too children with tooth decay. In phase 2, children from 5 different public schools participating in the NOHC were recruited. In the first two phases of the mixed methods study and in the third qualitative phase, access to public schools to explore if the ASB behaviour was possible through the National Oral health campaign. This campaign was dedicated to improve the oral health of Lebanese children through different activities in relation to dietary intake and oral hygiene. The age group of children included in the first phase was 4- 6 years as it is known that the intake of milk is high, and therefore the occurrence of the ASB might be noticeable. The age group of children participating in the second phase was between 9 and 12 years in order to interview children that could be able to understand the questions and provide reliable answers. The age group of children included in the TPB study (chapter 3) was between 4- 7 years due to the fact that the data generated from the interviewed

mothers in the mixed methods study showed that the ASB milk occurred at an early age. In fact, parents reported putting less emphasis on offering milk to children with age 9-12 years. Hence, we opted to explore the determinants of this behaviour (ASB) among this age group. As stated earlier, the sample size, recruitment of participants and rationale for each phase are described in the relevant chapters of each study. The diagram below represents all studies reported in this dissertation including information on participants and type of study guided by the MRC framework for complex interventions (Campbell, 2008).

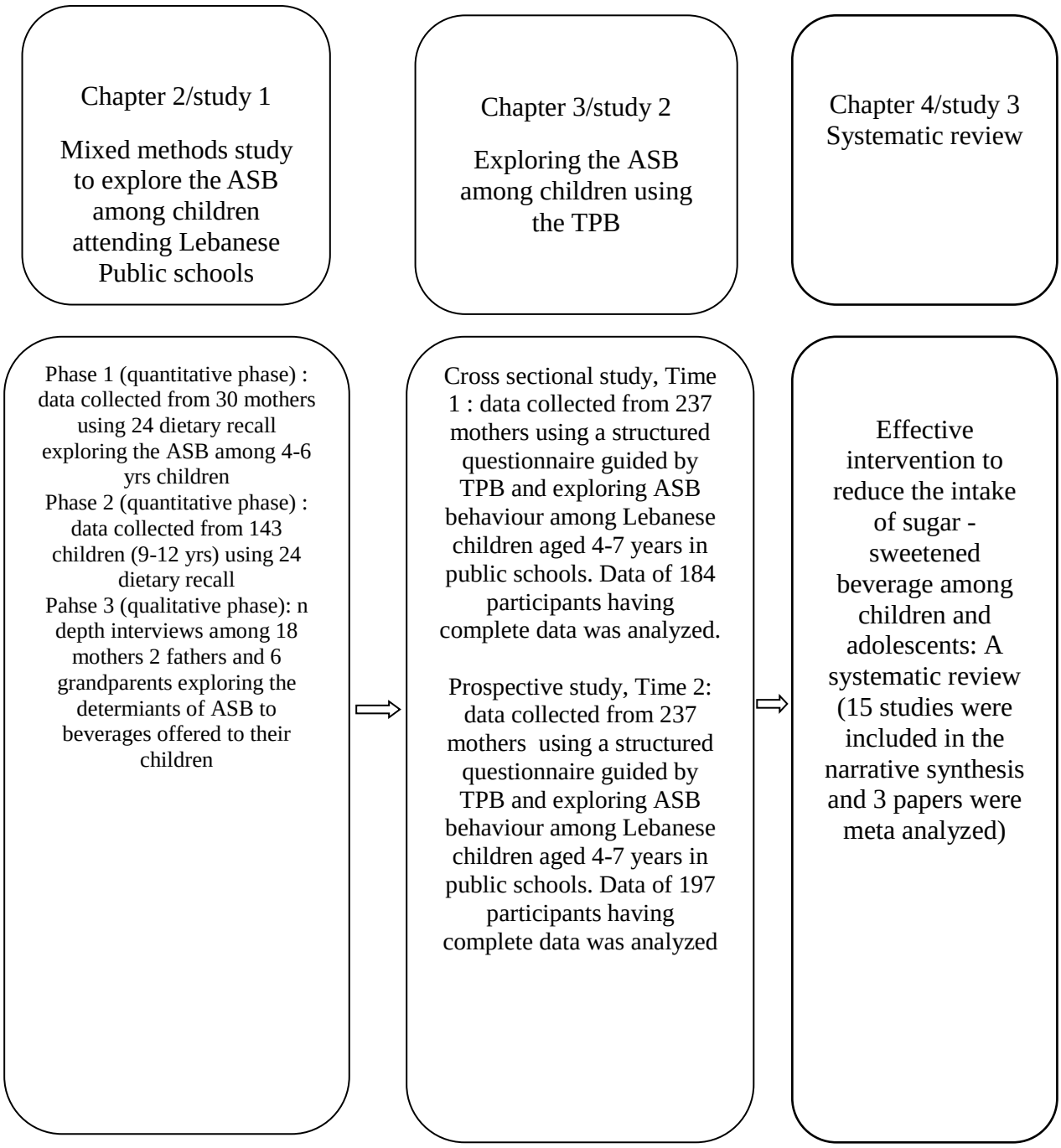


Figure 1.2: Diagram for all studies included in the dissertation

1.11 Conclusion

Eating behaviours established during childhood have been shown to persist and become further ingrained in adulthood (Birch, Savage, & Ventura, 2007). The increased intake of added sugar to beverages or SSBs is a growing health concern worldwide because of its possible association to risk factors of different chronic non-communicable diseases (NCDs) such as obesity, (CVD), diabetes and insulin resistance, cancer, and dental diseases (Brown et al., 2008; Malik et al., 2010; Welsh et al., 2011; Levy et al., 2012). The Theory of Planned Behaviour was selected as the theoretical framework to explore the predictors of intention and ASB behaviour. From the perspective of 'added sugar' intake, comparing the consumption patterns of 'added sugars from their SSB sources is a challenging task because of different terminologies of sugars, and differences in research methodologies. The variation in research methodologies were related to reliance on different sources of self-reported dietary intake and food composition information. Each information source entailed inherent complexities in food inclusion and exclusion criteria, variations in estimation techniques and covariate assumptions or adjustments underlying the employed estimation methods of sugary intakes.

Chapter 2 presents a qualitative study. The aim of this study was to explore parental and children reported behaviour of adding sugar to the beverages of children, and identify determinants of this behaviour among a sample of Lebanese parents/grandparents whose children attend public schools.

Chapter 2

A Mixed Methods Exploratory Study Examining the Addition of Sugar to beverages in School Aged Children attending Lebanese Public Schools

2.1 Introduction

The focus of this mixed methods chapter (data collected in the first two phases using 24-hour dietary recall constituted the quantitative part, and data collected in the last phase using in depth interviews constituted the qualitative part) to observe and understand the adding sugar behaviour to beverages (ASB) among Lebanese mothers of a sample of public school aged children. The factors affecting this behaviour among the Lebanese population, especially children have been seldom researched. In this exploratory study, the first two phases aimed to observe if the ASB behaviour is present and to what extent in this population, the third phase explored the origins and development of the behaviour using one to one interviews among a sample of Lebanese mothers, fathers and grandmothers. The following sections summarize the intake of SSBs in the family environment and school setting among low socioeconomic families.

2.1.1 Sugar sweetened beverage consumption in the family environment

The complex process of eating behaviour development is influenced by social, cultural, biological, ecological and personal factors. Social influences gain a greater effect as the child gets older; however, the parental influence remains strong

throughout the time period of childhood and adolescence (Assari, Caldwell, & Zimmerman, 2015). A child's eating behaviour is strongly influenced by parents and the family environment (Brown & Ogden, 2004). The characteristics of this environment mainly include parents' eating styles and child-feeding practices. One of the most influential social-environment factors for adolescents is their parents who play an important role in the adolescent's healthy eating behaviour (Kodl & Mermelstein, 2004; Young, Fors, & Hayes, 2004).

The immediate social context for young children with the family includes the parent's actual feeding practices, their personal dietary habits, as well as the beliefs and attitudes that are verbally conveyed influencing eating behaviour. Parental influences can be conveyed through behaviour modelling as social norms or directly through the food served at meals (Cooke, Wardle, & Gibson, 2003; Gibson, Wardle, & Watt, 1998; Jingxiong et al., 2007). Parents can encourage the development of healthy eating habits and thus healthy weight or they may put their children at risk of obesity through unhealthy eating behaviours (Scaglioni, Salvioni, & Galimberti, 2008). Blissett, Haycraft and Farrow (2010) examined the relation between children's emotional eating and parents' feeding practices. In the absence of hunger, children whose mothers often used food to regulate emotions ate more chocolate and more cookies than did children whose mothers did not use food for emotional regulation. The inability of the author to include participants from different ethnic groups presented a limitation as it was not possible to generalize the results. In one study among 902 adolescents and their parents, the association between parental report of household food availability and adolescent intake was examined. The intake of fruits, vegetables, and dairy products increased among adolescents as their parents

reported these foods to be frequently available at home. On the other hand, when soft drinks were also available in the majority of homes, they registered a lower intake of dairy products especially among girls, as the soft drinks were readily available (Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005). In this study, the cross sectional nature of the study presented a limitation. Risk of bias was minimized by the use of daily reporting separately by adolescents and parents. However, adolescents in the lower SES and non-White race were not as prevalent in the final survey due to lack of parental response. Another limitation is that there may have been social desirability bias due to self reporting. Lastly, the tool used to assess home availability was new and had not been validated.

Bauer, Neumark-Sztainer, Fulkerson, Hannan and Story (2011) specifically examined the relationship between the family environment and soft drink intake among girls. A positive association was found between home availability of soft drinks, parent soft drink intake and the girls' soft drink intake. Therefore, further clarifying that this strong relationship observed is not merely due to the availability of soft drinks in the home environment, but is rather adopted because of parental modeling. In this study the cross- sectional design and the use of self-reporting may have been subject to reporting bias. In a study examining the association between parenting strictness or involvement and adolescents' consumption of SSBs, it was shown that adolescents who perceived their parents to have strict practices consumed less sweetened beverages (Van der Horst et al., 2007). However, other studies found that strict parents do not have a great effect on limiting their young children's consumption of SSBs (Birch & Fisher, 2000). This contrasting outcome could be due to the difference in parenting practices during the adolescent and childhood phases.

During early childhood parents might use pressure to have their children consume more restricted foods, however, during adolescence parents might use more straightforward rules on what, when and how to eat (Van der Horst et al., 2007). Van der Horst et al. (2007) study was the first study that explored the parenting practices and the intake of sugar sweetened beverages among adolescents; however, there were several limitations in this study. Inference of causation between parenting practices and intake of SSBs among children was inconclusive due to the cross-sectional design of the study. In addition, classes and schools were not randomly selected. The tool used to assess the intake of SSBs relied on self-reporting; hence data could be subject to social desirability. Furthermore, the child behaviour itself could mediate the influence of parenting practices on the intake of SSBs. Lastly, when it comes to the measurement of parenting practices, adolescents themselves reported their parenting practices which could differ from the parent's perceptions of their own pactices. Therefore, future research might consider collecting data from different sources such as parents, adolescents and siblings.

In China, when grandmothers cooked the family meals, they did so according to their personal history and habits, choosing items familiar to their area and customs. Those who liked salt added more salt and those who liked sugar added more sugar. The younger children followed these preferences as they were most familiar with the cooking style and taste (Jingxiong et al., 2007). This contributes to the conclusion that the strongest influence in behavioural modeling is affected by parents, grandparents and peers (Baker, Little, & Brownell, 2003; Jingxiong et al., 2007).

2.1.2 Sugar sweetened beverage consumption in the school environment

Although up to 70% of all SSB calories are consumed at home (Wang, Bleich, & Gortmaker, 2008), the school environment has a significant impact on the eating behaviour of children. In a cross-sectional observational study examining the association between the use of school vending machines and SSB intake among students, 71% of the students who used the school vending machines admitted purchasing SSBs. In fact, SSBs were the most commonly purchased product from the vending machines (Wiecha, Finkelstein, Troped, Fragala, & Peterson, 2006). A survey on food opportunities during the school day, completed in six different high schools in Minnesota, showed that more than 60% of the foods and beverages sold in the vending machines and stores at these schools were categorized as foods and beverages that should be limited in consumption according to the USDA Dietary Guidelines for Americans (Arcan, Kubik, Fulkerson, Davey, & Story, 2011).

Moreover, the students were shown to regularly consume soft drinks more than 10 times a week. Overall, students who reported buying from the vending machines and school stores frequently had a higher overall consumption of soft drinks, sports drinks, and other SSBs, in addition to high-fat foods and food from fast-food restaurants (Arcan et al., 2011). This increased availability of SSBs in the school environment is greatly affecting the choices of children, which calls for an urgent implementation of school health policies to curb or redirect adolescent food choices and dietary intake. In addition to home availability, the predominance of SSBs in schools was also observed in a study conducted on a large group of Dutch secondary schools, van den Berg, Mikolajczak, & Bemelmans (2013) showed that in 2006-2007, 91% and 81% of these schools had soft drinks and sweets/candy bar

vending machines respectively. These percentages did not significantly decrease by 2010-2011 becoming 89% and 79% respectively. The strength of the van den Berg et al. (2013) study was its longitudinal design. The authors suggested modification of the school environment such as the provision of water coolers. However, in this study, recall bias and social desirability presented a limitation in this paper. In a study examining the influence of school food policy in primary and secondary schools in Belgium-Flanders, three factors were found to have a significant effect on the consumption of soft drinks. Students were more likely to consume soft drinks on a daily basis; if the school had a low SES, if soft drinks were available at school, and if there were no school rules regarding the consumption of sweets and SSBs (Vereecken, Bobelijn, & Maes, 2005). Even though there was a larger response of students included in the survey, the extensive number of questions may have prevented greater participation by schools. Evaluating the initiation of a policy that restricted the sale of SSBs in public schools around Boston, high school students reported daily consumption of 1.71 servings of SSBs in 2004 and 1.38 servings in 2006. Therefore, a noticeable decline in consumption of soda and all SSBs was able to be achieved by these actions between 2004 and 2006 (Cradock et al., 2011).

Although the high consumption of added sugar, and specifically sugar sweetened beverages, is extensively covered by the literature, the behaviour of adding sugar to milk and other beverages (ASB) is underreported. Building upon the above literature, the family environment and the school environment have a crucial impact on children's dietary intake and should be considered as important areas in exploring the ASB behaviour. There are possible predictors of this behaviour, one being socio-cultural and the other being habit (Mello et al., 2008). Literature also

shows evidence that cultural beliefs and local traditions are important in understanding these health behaviours Feldens, Giugliani, Vigo, & Vitolo, 2010).. Studies from different countries have shown that differences in eating and feeding practices are influenced by cultural norms and sociocultural issues, whether an infant breastfeeding, a small child in parental care, or an adolescent making his own decisions and choices (Al-Hazzaa & Musaiger, 2011a; Osman, El Zein, & Wick, 2009).

2.2 Aim and Objectives

The aim of this study was to explore parental and child reported behaviour of adding sugar to the beverages of children, and identify determinants of this behaviour among a sample of Lebanese parents/grandparents whose children attend public schools. This mixed methods study consisted of three phases.

Phase 1: Explored the adding sugar behaviour to beverages offered to children in a sample of mothers of children recruited from the public dental clinic at the Lebanese University

Objective of phase 1: to identify whether or not Lebanese mothers of children with tooth decay do add sugar to milk before offering it to their children?

Phase 2: Explored the adding sugar behaviour to beverages in a sample of children recruited from public schools located in different geographical areas in Lebanon.

Objective of phase 2: to establish whether the adding sugar behaviour to beverages was reported by the children in Lebanese public schools?

Phase 3: Explored the adding sugar behaviour to beverages offered to children by parents and grandparents of a sample of children who participated in phase 2

Objective of phase 3: To explore the reasons for adding sugar to milk offered to children by mothers, fathers and grandparents of Lebanese children within the public schools

2.3 Methodology

2.3.1 Rationale for study design

The mixed methods study at hand was devised by way of three phases, commencing with two exploratory quantitative stages investigating the occurrence of ASB behaviour amongst parents and children attending Lebanese public schools. Schools were selected to reflect the diverse culture and religious landscape of three regions in the greater Beirut area. The author found this approach the most convenient to explore the establishment of the ASB behaviour. The first phase explored the ASB behaviour among a selected sample of mothers and the second phase among a selected sample of children and both phases used 24-hour dietary recall to collected data. Based on insights generated by the aforementioned stages of data collection, the results of these first two stages percolated into the last phase. The third phase which is qualitative, structured on in depth interviews, was administered in order to fully understand the perceptions that dictated ASB behaviour amongst those selected from the exploratory stages.

As it relates to the enquiry at hand, the extent to which sugar-laden drinks are consumed or how much sugar is added to drinks (e.g. milk) by Lebanese parents and

children is still not clear. To fully understand the beliefs and cultural factors initiating this behaviour requires a qualitative approach to explore it in depth. Hence, the third phase is qualitative using face to face in depth interviews to explore the determinants of the ASB behaviour among parents and grandparents. Lincoln and Guba (1986) have stated that qualitative research is a system of disciplined enquiry that researchers undertake in order to resolve an identified problem with the intention of either achieving an understanding of the said issue or facilitating action. As stated by Jaye (2002), a qualitative approach is desired when little is known about the topic and the problem calls for the identification of factors that affect the outcome. Thus, qualitative methods are considered when questions are not answered by clinical epidemiology or experimental methods. In addition, the approach of qualitative research allows the researcher to explore the responses of participants in depth and gives the researcher the opportunity to learn more about the personal, environmental, and cultural factors that may have shaped the participants' opinions and viewpoints (Corbin et al., 2008). It helps in understanding an unfamiliar behaviour in a community or given culture (Malterud, 2015). According to Willig (2008), a qualitative approach is underpinned in order to acquire deeper insights about people, perceptions and beliefs. According to Creswell and Miller (2000), an exploratory investigation establishes its validity on the basis of the viewpoint of participants in the study. The objective of this type of research is to rely as much as possible on the participants' views of the situation being studied. The more open-ended the questioning, the better, as the researcher listens carefully to what people say or do in their life setting.

Furthermore, qualitative studies have proven to be an effective method for gathering information about the choice of dietary intake and the factors influencing these choices (Bisogni, Connors, Devine, & Sobal, 2002). Bisogni, Jastran, Seligson and Thompson (2012) reported that the qualitative approach was best in order to explore eating behaviour and physical activities in low income populations. White et al. (2011) adopted qualitative research using six formative groups and later six evaluative focus groups in order to develop nutritional messages to be integrated into interventions for low-income mothers of pre-schoolers.

Another merit of doing qualitative research is the variety of means that can help in collecting in-depth data on a specific topic or issue of interest. These methods comprise interviews, focus groups, observations, videos, drawings, internal and external documents, photography, autobiographies, inspections, and many other relevant sources (Silverman, 2003; Bradley, Curry, & Devers, 2007). The most popular methods are focus groups and interviews. Focus groups are very effective in obtaining the views and insights of participants especially with children (Vangeepuram, Carmona, Arniella, Horowitz, & Burnet, 2015). Six to twelve participants are ideal to be included in a focus group and a trained interviewer is recommended to moderate the discussion within the focus group to ensure consistency when generating data and to avoid any form of bias when posing questions (Mack, Woodsong, Macqueen, Guest, & Name, 2005). On the other hand, interviews can be individual, structured, or semi-structured and they can include open- and close-ended questions (Mack, Woodsong, M., Guest, & Name, 2005). The main aim of the interviews, as in all means of data collection, is to gain insight on the individual's perception and experience of a particular issue or behaviour (Creswell,

2003; Pommier, Guevel, & Jourdan, 2010). Corbin and Morse (2003) define the four phases of the interview as follows. In the pre-interview phase, the purpose of the research is explained and consent forms are reviewed and signed by the participant. This is then followed by the tentative phase where the real time of the interview starts and people start telling their stories. Afterwards, there is the immersion phase where people start reliving what they have already told and are encouraged to give more details about those stories. The last phase in the process is the emergence phase where both the participant and the interviewee feel at ease and there is less stress. The complexity of the questions during the interview follow a similar pattern; it starts with questions which can be answered easily before moving to more difficult questions and topics in the last phase of the interview as the interviewee feels more comfortable (Britten, Stevenson, Barry, Barber, & Bradley, 2000).

The real value of qualitative research as compared to quantitative research has been widely debated and criticized. Recent efforts have focused on emphasizing the methodological rigour, generalizability of results, and trustworthiness of qualitative research (Nastasi & Schensul, 2005). However, the focus should be on the research objectives and whether the qualitative data collection tools are most effective in answering these objectives. Moreover, a significant element for the researcher who decides to use qualitative methods is the concept of culture and how culture affects the context of the behaviour under study (Nastasi & Schensul, 2005). In this chapter the focus is on exploring the origin of the ASB behaviour over many generations that has led to the current behaviour among Lebanese families.

2.3.2 Study design

Qualitative research, regardless of approach, is unified by several features hereby outlined according to the work of Malagon-Maldonado (2014) as well as Creswell and Miller (2000): The primacy of data is paramount, whereby the investigation's framework depends on deductions that are not predetermined prior to data collection. The researcher is required to take into consideration the context of the research in order to account for results that may not be generalizable in variable settings. Furthermore, the researcher is expected to immerse himself in a prolonged period of exposure to the perceptions and perspectives of participants in order to appreciate their viewpoints, or the 'emic perspective' (Malagon-Maldonado, 2014), for the purpose of rigorous analysis and interpretation.

2.3.3 Ethical approval

Approval for all phases of the study was obtained via the University of Salford's Ethics Committee (Appendix A) and the additional appropriate approvals were acquired in Lebanon for each phase of the study. The participation of parents and children in the first and second phase of the study was approved by the Ministry of Education and Higher Education (MEHE) because they were part of the National Oral Health Campaign as an already approved health study. Parents had been informed that during and after the implementation of the NOHC, they would be contacted as well as contacting their children to collect information on dietary habits in addition to teeth brushing habits. Therefore, this qualitative study was seen as an extension of this campaign. The third phase of the study and its protocol were consented to by MEHE as a first step, specifically approved by the Department of

School Health Programs, as the authoritative body that would provide the initial consent to contact public schools in Lebanon (Appendix B). As a second step, MEHE sent a hard copy of the approval to all schools, and the original copy was kept filed in the department of School Health, at the Ministry of Education in addition to the copy kept by the researcher of this study. As a third step, the researcher met with the school principals and explained the overall nature of the study and its objectives. During these visits, the researcher asked for a verbal approval from the principal allowing access to the student list for grade year 6, aged 11 years, and the contact information for their parents. Although parents were asked to consent in writing to phase 3 of the study, MEHE allowed a verbal consent from grandparents who were interviewed for reason of illiteracy (AbiHabib, Chemaitelly, Jaalouk, & Karam, 2011).

2.3.4 Phase 1: Exploring ASB behaviour from a sample of mothers of children from the public dental clinic at the Lebanese University

As described in section 2.2 (aims and objectives) of this chapter, the purpose of this phase was to identify whether or not Lebanese mothers of children with tooth decay added sugar to milk before offering it to their children. The findings of this phase were briefly presented as the purpose for the quantitative part of this study was to establish the presence of the ASB behaviour among the group of participants as discussed below.

2.3.4.1 Participants

The sample of primary caregivers in the first phase consisted of a convenience sample of 30 mothers of children, ages 4 to 7 years, recruited from the waiting room in the Paediatric Dental Clinic at the Lebanese University. Over a period of two months, mothers were approached in the waiting rooms and asked to participate in the study. The mean of the level of education of mothers was 6 years; all mothers were housewives, living with their husbands and they were the primary caregivers. When the ASB behaviour was obviously recurrent among recruited mothers, data collection was stopped. A total of 16 mothers of boys and 14 mothers of girls participated in this phase, with children having the mean age of 6.5 years.

2.3.4.2 Procedure

Mothers attending the paediatric dental clinic were approached on Mondays and Thursdays by the researcher (AAR). Consent for participation was obtained prior to the initiation of the interviews to complete a 24-hour beverage intake recall. All mothers consented were part of a National Oral Health Campaign which already had ethical approval. The researcher read the consent form to the mothers and explained the aim of the research at the beginning. It was made clear that participation was voluntary and confidential; they could withdraw at any time during the interview and the information collected and reported would never be traced back to any particular mother and/or child. All mothers consented in writing before completion of the 24-hour beverage recall.

2.3.4.3 Data collection

A 24-hour beverage intake recall was used to collect information regarding current dietary activities of children in order to document the ASB behaviour for beverages among this population (Biró, Hulshof, Ovesen, & Cruz, 2002). This form was developed in Arabic using the colloquial form of the language. The researcher completed the form by asking the participants about the dietary consumption of their child attending the dental clinic. The dietary consumption included the types of food offered at breakfast with an emphasis on different types of beverages the child consumed and if they added sugar to these beverages. The researcher collected beverage intake covering the period of one day; before going to school, during recess hours, at lunch, as afternoon snack, for dinner, and before bed time.

It is imperative to complete multiple 24-hour food/beverage recalls to establish a balanced collection of data (Shim, Oh, & Kim, 2014). Therefore, meeting with parents to complete the form was conducted on a Monday in order to be informed about the daily beverage intake during the weekend (Sunday), and on a Thursday to collect beverage intake on a school day (Wednesday). Mondays and Thursdays were also deemed most effective as these were the days assigned for children to receive services from the paediatric dental clinic (Appendix C).

Concerning the collection of data during the weekend, parents were asked the same questions, but the questions concerning recess hours were replaced by questions about mid-morning snack. Parents were simply asked if their child(ren) drank anything with breakfast during the morning, at lunch, between meals, and at dinner, and whether they consumed drinks with added sugar or if they add sugar to

beverages offered to their children such as milk, home-made juices and hot drinks (Appendix D).

2.3.4.4 Data analysis

Data concerning the beverages consumed by children attending the paediatric dental clinic were collected, first during breakfastat home or at school. Data were collected to show the frequency of beverages consumed. In addition, the beverages consumed at lunch, at dinner, and during recess hours or between meals were also collected. Data were analysed for two days (a week day and a weekend day) in order to determine beverages consumed during Sundays and during a week day. Moreover, the researcher was interested to know if parents added sugar to the beverages offered to their children (mainly milk, fresh juices, and hot drinks such as tea). Hence, the data were analysed in order to obtain the frequency of the intake of sweetened milk on a weekend day and on a week day.

2.3.5 Phase 2: Exploring ASB behaviour from a sample of children from public schools located in Greater Beirut

As described in section 2.2 (aims and objectives) of this chapter, the purpose of this phase was to establish whether adding sugar to beverages was reported by children in the Lebanese public schools. The findings of this phase were briefly presented as the purpose of this quantitative part of this study was to establish the presence of the ASB behaviour among participants as discussed below.

2.3.5.1 Participants

Five public schools were randomly selected from a list of public schools from three regions across the country to cover different geographical areas and their specific variances in culture, as well as their diversity in religious affiliation. Each public school was assigned a number randomly selected. Three schools were additionally randomly selected from the Greater Beirut region. The first randomly selected school was in Jal El Dib, a largely Christian area; the second school was in Burj Hammoud, a largely Armenian area; the third randomly selected school was in Jinah, a largely Muslim Sunni area; the forth randomly selected school was in Aley region, a largely Druze area; the fifth randomly selected school was in the Haret Hreik region; a largely Shia area. This diversity was specifically designed to obtain a balanced representation across cultures in a multicultural country. There are so many imbedded cultures within Lebanon, it cannot be said that there is just a "Lebanese" culture as Lebanon has long been the crossroads of the Middle East.

A sample of 143 students aged between 9 and 12 years were recruited in this phase. In each of the five randomly selected schools, there was only one classroom for year 6 (aged 11-12 years) except at the school in Jal El Dib where there were two classes; all students of year 6 were included in phase 2.

2.3.5.2 Procedure

An appointment was scheduled with the school administration before the researcher's visit to discuss details of the data collection. As in the first phase, the parents of the students had already consented before the data collection process as they were part of the National Oral Health Campaign (NOHC) as described

previously. Parents were informed that during and after the implementation of the NOHC, they would be contacted as well as their children to collect information on dietary habits in addition to teeth brushing habits. Before entering the classroom and starting to collect data from children, an information sheet was sent to parents informing them of all details, and that their children's participation in the study was totally on a volunteer basis. The researcher obtained approval to enter the public schools from the MEHE and from the school principal. Moreover, the confidentiality of the study was assured, meaning that the information collected and reported could never be traced back to any particular student.

The researcher was allowed to collect data from students during either the drawing class or the physical activity class. The researcher interviewed each participant alone in a classroom or a separate room, depending on the space available on the school premises.

2.3.5.3 Data collection

The 24-hour dietary recall sheet was in Arabic. The researcher independently collected the data from every student using colloquial Arabic. While the students were reporting their dietary intake, the researcher completed the 24-hour dietary recall, without the need to digitally record the oral interviews. Each sheet took between 10 to 12 minutes to be completed. Students were asked about what they had eaten and drunk during weekdays (Appendix E) and weekends (Appendix F) and if they add sugar to milk, to hot beverages and to fresh juices prepared at home. The majority of the students recalled what they had consumed and drank before coming to school and what food they brought with them to eat during the school recess hour.

Concerning weekends, students were asked the same questions; however, the questions concerning recess hours were removed. Instead, they were asked if they drank or took any snack between breakfast and lunch and whether they added sugar or not to the beverages consumed.

2.3.5.4 Data analysis

Similar to Phase 1, data collected using the 24-hour dietary recall were collated for types of beverage and foods consumed during breakfast, recess, lunch, and dinner. The analysis focused on beverages (milk fresh or powdered milk, fresh juices, and infusions) if consumed with or without sugar. Data were compiled in four groupings according to religious orientation, representing the different Lebanese cultures. These included Christian (n=29), Muslim Sunni (n= 36), Muslim Shia (n = 45), and Druze (n = 33). Even though the fifth school was in an Armenian district most of the students were coming from neighbouring areas and were mostly Muslim Shia. So, Armenian students were excluded as an uncapturable minority.

2.3.6 Phase 3: Exploring ASB behaviour as perceived by parents and grandparents of children who participated in phase II

2.3.6.1 Participants

Four out of the five public schools that were included in Phase 2, were included in the study representing the different religions and consequently reflecting the different subcultures of the country. In qualitative research, there are no strict rules defining sample size; the sample is usually small as it is determined by data saturation rather than by statistical power analysis (Tuckett, 2004). Therefore, from

each of the four schools, seven students were randomly selected and their parents or grandparents were contacted by phone to request an interview. The contact information of the seven students was provided by the school principal. From each school, mothers, fathers, grandmothers and grandfathers of both female and male students were contacted to be recruited in this phase. Two mothers of female students and two mothers of male students would be interviewed in addition to one father of a male or female student. Beside the parents' interviews, two grandparents would be selected randomly from each school.

Therefore, a total of 26 caregivers of the children who participated in Phase 2 of the study were recruited from the four participating schools between October 2011 and March 2012. They were divided as follows: 18 parents (16 mothers and 2 fathers) and 8 grandparents (all grandmothers). Fathers are the patriarchal figure of the household and generally in employment so were therefore not available during the weekdays when the interviews took place. Moreover, it would be inappropriate to interview fathers during the evening when they came back home to have dinner and rest after a long day at work as per cultural tradition. As for the weekends, most of the families leave their homes and go to their villages, mainly in the mountains. It was difficult to recruit grandfathers due to their unavailability; their families were living in the city, but they were living in their villages to take care of the family land and farms, or because they didn't accept to participate seeing this as a woman's duty. So, all of the grandparents included in the study were grandmothers.

2.3.6.2 Procedure

At the beginning of the study, an approval was obtained from the University of Salford research ethics and from the Ministry of Education and Higher Education School Health program. Important consideration was given to the language as it is crucial to use a language understood by all participants in order not to lose any potential candidates (Temple, 2002). According to Clarke and Iphofen (2005), an informed consent ensures a sound research process. In this exploratory study, it was explained to the participants in detail what the study involved in order for them to make an informed decision whether or not to participate (Temple, 2002). So in order to proceed, an appointment for each of the families was made via a phone call. Consent for participation was obtained prior to the initiation of the interviews. The researcher read the consent form to the participants, explained the purpose of the research, that participation was voluntary, and that they could withdraw from the study at any time without any repercussions to them or their children. All participants were assured that the involvement of their families would remain confidential (Appendix G). Families were also guaranteed that the content of their interviews remained confidential. Confidentiality was ensured by concealing the name and contact details of all participants taking part in the study. Moreover, any information obtained in connection with the study would be treated with utmost confidentiality. All data collected would only be used for the purpose of the research and that in any publication or disclosures in conferences and meetings, data would be presented in an aggregated form and would not identify any individual participant. Once the parent interview procedure had been completed, the researcher asked them about the possibility of obtaining contact details of the child's grandparents.

All parents consented in writing. In contrast, among grandparents, a verbal consent was deemed sufficient, in case of the infeasibility of written consent. This is usual in Lebanon because of the high illiteracy rate among elderly people due to the war and circumstances (AbiHabib, Chemaitelly, Jaalouk, & Karam, 2011). The possibility of seeking verbal consent was stated clearly in the consent form in case data were collected from grandparent(s).

2.3.6.3 Construction of the topic guides

Prior to conducting the in-depth interviews, the researcher tried to identify any relevant information on similar studies exploring the assumptions and beliefs related to ASB sugar behaviour with no success. Therefore, the preliminary findings of the exploratory phases 1 and 2, in addition to relevant literature, were used to design the questions and the probes of the topic guides.

Studies about the factors affecting the food choices in children and their eating behaviours were mainly used to support the design of the topic guides. Among the important themes emerging from these studies were habit, parental influence on the choices of food, including culture and religion, food availability, beliefs about the health benefits of food (Neumark-Sztainer, Story, Perry, & Casey, 1999), parenting style and how it affects consumption of sugar-sweetened beverages (strictness vs. involvement) (Van der Horst et al., 2007), breastfeeding practices influenced by cultural norms(Al-Hazzaa & Musaiger, 2011a; Osman et al., 2009), and how sugar consumption might be more acceptable for older children among other themes (Wang et al., 2008).

Probes about the following issues were discussed with the participants: children's usual food choices and drinks, likes and dislikes, meal patterns and drink patterns, milk and hot beverage consumption, views about the ASB behaviour, the role of peers and family and how it influences this behaviour. The researcher started the interview by talking about the consumption of beverages in general, then moved to the consumption of milk in particular, probing about details on milk intake such as formula milk, fresh milk and the pattern of use (pre-breakfast, breakfast, bedtime, lunch, and dinner). Afterwards, the researcher sought information about provision and preparation of bottled milk and milk consumed by glass. Moreover, the researcher asked about sugar-based ingredients that parents might add to milk, whether table sugar or any other kinds of sweeteners and whether sugar was added only to powdered milk or to fresh milk as well. Later, the researcher asked the participants to try to remember about the history of their breastfeeding; if it was exclusive breastfeeding or bottled milk was fed in parallel. Emphasis was put on how participants prepared bottled milk, what they added to powdered milk (for example table sugar, sweeteners, or something else). If participants reported adding sugar to bottled milk or milk in a cup, the researcher asked about the reasons underlying this behaviour and the motivation behind it.

The interview guide was modified for interviewing fathers because as a rule they were not directly involved in feeding children. Fathers were thus asked about their opinion about the way milk was prepared for their child and if any sugar or sweetener was added to milk or to hot beverages in the home.

The interview schedule was translated from English to colloquial Arabic, using the language familiar to participants in order to ensure full understanding of the

questions and thereby capture the most authentic answers. It was initially developed in English in order to be discussed with the research supervisor and to send the form for ethical approval at the University of Salford. In order to assure that the translation process was adequate, a back translation process was adopted to compare using the two topic guides (Brislin, 1970).

During this phase, data were collected using semi-structured interviews according to tailored interview guidelines developed for mothers (Appendix H1), fathers (Appendix H2) and grandparents (Appendix H3). All the questions of the interview guide were open-ended in order to obtain more themes.

2.3.6.4 Pilot test for the topic guides

The researcher meticulously checked the topic guides, keeping in mind the objectives of the study, the results from the exploratory studies in phases 1 and 2, as well as the relevant literature regarding sugar sweetened beverages. The researcher followed the refining stages mentioned by Krueger and Casey (2009) to finalize the structure and the content of the guides. It was essential to check if the topic guides covered all the objectives of the study. Moreover, in-depth interviewing requires short, open-ended questions, with simple and clear language used for the probes. Finally, the flow of the questions was revised to ensure easy guidance of the interviewees during the discussion and smooth streaming of their ideas regarding the ASB behaviour.

Three mothers were chosen randomly for the pilot testing process. The contact numbers of these participants were obtained from the school principals and contacted by the researcher. It was convenient to pilot test the guidelines in schools

located in the city of Beirut as per the budget of the study. It was indicated that it is easier for parents to start talking about the current situation of their children and what they are drinking, and then to go back and ask about the drinking patterns of their children at a younger age. As a result, the flow of questions was amended as well as a question related to breastfeeding being added to the interview guidelines.

2.3.6.5 Data collection

Before starting data collection, the researcher was trained in the interviewing process in qualitative research at the University of Salford, in Manchester. During that training, the researcher had the chance to interview PhD students in a role play as mothers. These PhD students were qualitative researchers in the WHO collaborative center (University of Salford) and they had previous experience in training qualitative researchers. Interviewing skills and probing were thoroughly practiced. In addition to recording interviews, transcribing the data and discussing the content of the interviews were drilled with the supervisory team (Dr. Cynthia Pine and Dr. Anna Robins). The exercise was repeated many times until the supervisors were confident about the capability of the researcher to do the job in her home country of Lebanon.

Individual interviews were conducted with the mothers, fathers and grandmothers of male and female students. Interviews were the method of choice to collect data rather than any other method, such as focus groups, because it provided an environment where parents could provide information without the fear of being judged about their children's diets as might occur if they were all part of one focus group (Stokes & Bergin, 2006). The interviews brought out in-depth responses from

participants and allowed the researcher to gain insight into the associations the participants saw between a particular behaviour and their beliefs (Mack et al., 2005). In this study it is the ASB behaviour. Moreover, it negated the necessity of conducting separate focus groups for men and women, in a society where it is very difficult to group men and women at the same time due to cultural sensitivity among participants from the different religions represented.

On another note, interviewing grandparents was judged to be crucial in understanding the origin of the ASB behaviour inherited from one generation to another. Moreover, interviewing participants from two different interest groups, such as parents and grandparents in the current study, allowed triangulation by comparing the results from these different data sources. This type of triangulation was believed to improve the validity of this qualitative research (Mays & Pope, 2000).

Whenever possible, interviews occurred in their natural setting (i.e. at home) allowing the researcher to capture the social and cultural dynamics of the ASB behaviour (Frey & Fontana, 1991). Data collection stopped when no new themes emerged and data/descriptive saturation was reached once no new information was being provided (Walker, 2012). In order to ensure rigour and to maximize the quality of data, the interviews were conducted in colloquial Arabic, the first language of the participants (Twinn, 1998). Interviews lasted 40 minutes on average, ranging from 25 minutes to 45 minutes. All interviews were digitally recorded using an Olympus Digital pocket memo VN-8700 PC digital Voice Recorder.

2.3.6.6 Data Analysis

Thematic analysis was used to analyse the transcripts of the interviews conducted in Phase 3. It was mainly a method of identifying, analysing and reporting patterns or themes found in a set of transcripts, ranging from simple organisation and description of the data to more complex interpretation of the topic at hand (Braun & Clarke, 2014). As defined by Braun and Clarke (2006), a theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set.

During the data collection, the researcher can start analysing the data. It is an added value of the qualitative work that the analytical tools are simple and not too sophisticated for clearer analysis. While analysing data, thematic analysis is the most efficient and most frequently adopted structure (Bradley et al., 2007). According to Corbin and Morse (2003), the thematic analysis is initiated when the researcher starts to familiarize himself with the data, and then develops codes and generates ideas. Searching for themes will follow. Then, the base of data is created where reviewing the themes refines the process of capturing the data. Finally, naming the themes is the last and most important step in which the analysis is effected.

Before starting the thematic analysis, all digital files were transcribed verbatim in their original language, Arabic, in order to preserve the richness of the content. The transcription was done by the principal investigator. According to Twinn (1997), in multilingual research, the analysis of the transcripts should be done in the original language of the interview whenever possible. However, in this research, none of the supervisors spoke Arabic; therefore, translation of the transcripts to English prior to analysis was necessary. Transcription was done by the

researcher, who speaks Arabic and English. Later on, all transcripts were translated to English with the help of a certified translator. Several keywords were written in Arabic with English lettering and in italics to preserve the original wording used by the participants. The researcher read through both versions of the transcripts to make sure that all the translated transcripts were complete and that the meaning of the dialogue was accurately conveyed by the translation before proceeding with the analysis (Hilton, Stephen, Barker, & Weintraub, 2007).

The author of this dissertation initiated the thematic analysis by reading the complete set of the English transcripts several times, as well as the Arabic transcripts; it is essential to always retrun and refer to the initial Arabic transcripts to avoid missing any piece of important information in the translation process. This immersion helped to obtain a sense of the whole, obtaining an overall impression from the transcripts. While reading the transcripts, the principal investigator took notes on recurrent ideas and key issues emerging from the discussions. Keeping track of every single note and discussion started from the beginning of the process of analysis till the end.

This was followed by the identification of major themes, focusing on keywords and expressions frequently appearing in the transcripts, in addition to specific behaviours and attitudes. All identified themes were sorted into initial codes.

After the identification of all codes, the transcripts were manually, applied to the coding, whereby selected sections of the discussions were read and annotated according to the numerical index of the coding scheme. Coding is an essential step in the organization, processing and analysis of qualitative information and leads the way for the interpretational phase (Braun & Clarke, 2014).

The analysis of the qualitative data was managed with NVivo 9 (QSR International Pty Ltd, Australia), which facilitated the retrieval of coded sections of the transcripts. Sections of the uploaded transcripts were basically 'cut and pasted' under the appropriate codes. As advised by Braun and Clarke (2006), phrases before and after the coded sentences were also copied in order not to lose context. Moreover, some sections were assigned more than one code when judged applicable.

After all the transcripts were coded and the quotes were brought together under their respective coding, the principal investigator started identifying major themes to rearrange the exhaustive list of codes: refining the scheme and combining several codes under one theme for further clarity. The final coding scheme consisted of 5 main themes. For each theme, a detailed report of the analysis is found in the discussion below. For each quote included in the result section, the researcher went back to the original transcript in Arabic in order to make sure that the real meaning of the quote was not lost in translation and to check any nuance that might have differed between the Arabic and English.

2.3.6.7 Trustworthiness and rigour

The nature of qualitative research is such that the interaction between researcher and participants generates data that will reveal the phenomenological importance of the problem being investigated. Malagon-Maldonado's (2014) review of qualitative research in healthcare referred to the primacy of data, whereby the researcher is required to maintain an open mind and discard preconceptions that are typical of theory-driven studies. Lub (2015) argued that because qualitative research is dependent on the researcher observing the respondents up close and personally,

achieving greater rigour cannot be detached from the immersive degree of interaction between the researcher and the participants.

Qualitative research is considered rigorous when it is conducted with the strategy of sampling being explicit, and systematically analysing the data (Green & Britten, 1998). Several validity procedures are available to researchers, and inherently appeal to the nature of enquiry that is dependent on accommodating the perceptions and attitudes of participants. This includes member checking, prolonged engagement in the field, and rich description provided by participants from their own perspective (Creswell & Miller, 2000; Lub, 2015). However, there is no real agreement on which criteria should be given prioritiy (Barush, Geroge & Gringeri, 2009). The nature of this dissertation's investigation is such that the aforementioned procedures of validity and rigour are inherent to acquiring a comprehensive understanding of ASB behaviour in Lebanon among Lebanese mothers in public schools. Member checking was not feasible in the context of this dissertation with this point being further elaborated in Chapter 5 in the section of strength and limitations. The author was vigilant to ensure prolonged engagement and maximized probing in order to get the utmost rich data from participants.

Transcription can be time-consuming and demanding; however, it was an excellent way for the principal investigator to start the familiarization process with the data (Easton, McComish, & Greenberg, 2000; Braun & Clarke, 2006). The fact that the interviews were recorded and immediately transcribed by the author of this dissertation guaranteed a maximum level of verbal accuracy.

In order to assure further trustworthiness and credibility of the data obtained, peer debriefing was of particular importance, whereby the researcher regularly met

with other researchers to discuss various aspects of the research. Therefore, three transcripts were shared with Dr. Lucy O'Malley, a PhD student at the University of Salford and a qualitative researcher. The themes obtained by Dr. O'Malley were compared with the themes obtained by the main researcher. Afterwards, dedicated series of meetings with the supervisor and Dr. O'Malley were held to finalize the list of themes and subthemes. Additionally, another three transcripts were shared with Mrs. Joanna Khalil who is a qualitative researcher at the American University of Beirut, and themes obtained by Joanna were compared with the themes obtained by the principle investigator. This step was done to ensure the analysis in the Arabic language. Once this process was finalized, a skype meeting was organized with the supervisory team at Manchester. Findings were shared with the supervisors and discussion concerning themes and subthemes ended when inferences became conclusive.

Including personal and professional information in the report of a qualitative study is a debatable subject (Shenton, 2004). However, Maykut and Morehouse (1994) suggested the enclosure of the researcher background in the study process. According to Patton (1990), the researcher himself is a key factor in the credibility of a qualitative research as he is the main instrument in data collection and data analysis. Despite the fact that the author of this dissertation is coming from a health science background, she was vigilant to be in a non-judgmental position when conducting the interviews. A particular attention was given to the fact that the background of the author did not influence the interaction between the researcher and the interviewees. The author reflected continuously on the transparency of data

collection. A continuous evaluation of the effectiveness of the process and reflective appraisal was warranted.

In qualitative research, the credibility begins with an appropriate implementation of the procedure in addition to the self-awareness of the researcher during his exceptional involvement in the process (Mantzoukas, 2005). Maintaining a reflective diary as a research notebook is an expression of reflexivity (Jootun, 2009). The researcher's interests that brought her into the research were accounted for in addition to personal challenges which were experienced and the rationale of each decision. These steps are clearly described in Rolfe's (2006) paper. Through reflexivity, the researcher's personal views and experiences were acknowledged (Houghton, Casey & Murphy, 2013). The nature of the qualitative research increased the level of subjectivity (Shenton, 2004). Hence, in this dissertation, using sticky notes regarding each step made subjectivity transparent. Reasons why decisions were made were documented as well as if any changes in the process occurred. Regular meetings with the supervisor were scheduled to discuss ideas and notes illustrated in the reflective diary. In addition, all meetings were minuted and recorded enabling the researcher to go back and check all feedbacks and comments. The transparency of the process was boosted by the recording of thoughts. The development of themes and subthemes was enhanced by the documentation of thought.

The filing and storage of recorded interviews and transcripts (Arabic and English),including the documentation of the data collection progress, recommendations, decisions made throughout the course of the study, enhancing the confirmability (Houghton et al., 2013). The detailed methodological description of

the study procedure allowed close follow up of the research. Likewise, this allowedthe observer to trace back the research course step by step.

2.4 Results

2.4.1 Phase 1

Self-reported data collected from mothers via a two-day dietary recall interview showed that during school days or regular days of the week, the majority of the interviewed mothers reported providing milk to their children before they went to school (N = 25 out of 30), and most of them added sugar to the milk before it was served to their children (N = 20 out of 25). On the school premises, and during recess hours, about half of the mothers reported that their children bought juice from the school shop (N = 14 out of 30). During weekends, mothers reported putting less emphasis on milk consumption, 16 of the 30 interviewed gave milk to their children and the milk was offered with added sugar. Approximately one third of the mother's offered soft drinks to their children during the weekend mainly because the children were outside the home (10/30).

Table 2.1: Addition of sugar to beverages as reported by parents (exploratory: Phase I)

			Offering of sweetened milk	
Parents	N	Age of children (mean) yrs.	Weekdays	Weekend
Parent of Male	16	5.7	14	10
Parents of Female	14	6	11	6
Total	30	5.8	25	16

2.4.2 Phase 2

The total number of participants included in Phase 2 of the study amounted to 143 young people with a mean age of 10 years. Among all the four subgroups in Jal

El Dib, Aley, Haret Hreik, and Jinah, the consumption of dairy products at breakfast was the highest for three of the four subgroups (Aley, Jal El Dib and Haret Hreik). Around 74% of children said that they ate before going to school even if it was a small bite-sized snack, and 80% needed to drink something before going to school as well. The most common breakfast among all groups was the intake of dairy products, like cheese and labneh (a product made from strained yogurt), 53% of children living in the mountain took fresh labneh as breakfast. Milk was consumed mostly while having breakfast, and rarely at bed time. However, the intake of milk was the highest at 34% (N = 44 out of 143) compared to all other beverages and 91% (44 of the 48 children) of those who consumed milk added sugar to it. The second most popular beverage reported was tea at 23% (33 out of 143). Tea, similar to milk, was consumed with added sugar with 79% (26 out of the 33) of the children reporting adding sugar to their tea. The balance reported the intake of juice with 6% and 10% reporting the intake of water.

During the weekend and mainly because most of the children reported having breakfast, there was less emphasis on milk intake and there was a shift towards tea intake with, however, a similar consumption of sugar.

At school, for lunch, 34% of the students reported eating yakhneh (a healthy dish containing rice, vegetables, and meat or chicken) which is traditional Mediterranean cuisine. Concerning drink at lunch, 35% of the interviewed children reported not drinking anything with their lunch, 21% consumed soda drinks and 19% took their lunch with juice, while only the 2% who took milk with lunch usually had sugar added to it. During recess hours, about half of the children reported not

drinking anything, 34% drank juice with their snack, and 10% reported drinking water.

Most of the interviewed children (87%) reported eating dinner before sleeping and 40% of the students ate dairy products at night, as traditional Lebanese food and custom. The two most popular beverages consumed at night were tea and juice with 90% adding sugar to their tea.

The results of the second phase of data collection showed that the ASB behaviour occurred among a large group of the child population (Table 2).

Table 2.2: Intake of sweetened drinks (addition of table sugar to drinks at home) by children aged 9-12 years in a sample of public schools

BREAKFAST									
Schools	**N**	**Tea**	**Sweetened tea**	**Milk**	**Sweetened milk**	**Water**	**juices**	**Soft drinks**	**No drinks**
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Jal El Dib	29	4 (14)	3 (75)	12 (41)	12 (100)	0 (0)	2 (7)	2 (7)	9 (31)
Jinah	36	7 (19)	7 (100)	13 (37)	12 (92)	3 (8)	4 (11)	3 (8)	6 (17)
Haret Hreik	45	16 (36)	11 (68)	13 (29)	12 (92)	5 (11)	2 (4)	1(3)	8 (17)
Aley	33	6 (18)	5 (83)	10 (30)	8 (80)	7 (21)	1 (3)	4 (12)	5 (16)
Total*	**143**	**33 (23)**	**26 (78)**	**48 (34)**	**44 (91)**	**15 (10)**	**9 (6)**	**10 (8)**	**28 (19)**
RECESS HOURS									
Schools	**N**	**Tea**	**Sweetened tea**	**Milk**	**Sweetened milk**	**Water**	**juices**	**Soft drinks**	**No drinks**
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Jal El Dib	29					1 (3)	14 (48)	2 (7)	12 (43)
Jinah	36						15 (42)	7 (20)	14 (38)
Haret Hreik	45					3 (7)	16 (35)	5 (12)	21 (48)
Aley	33					9 (24)	3 (9)	3 (9)	18 (55)
Total*	**143**					**13 (9)**	**48 (34)**	**17 (12)**	**65 (45)**
LUNCH TIME									
Schools	**N**	**Tea**	**Sweetened tea**	**Milk**	**Sweetened milk**	**Water**	**juices**	**Soft drinks**	**No drinks**
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Jal El Dib	29	3 (10)	3 (100)	4 (14)	3 (75)	4 (14)	1 (4)	7 (24)	10 (34)
Jinah	36			2 (6)	2(100)	4 (11)	2 (6)	15 (41)	13 (36)
Haret Hreik	45	4 (9)	4 (100)	4(9)	3 (75)	3 (7)	11 (24)	6 (13)	17 (38)
Aley	33	5(15)	5(100)	4(13)	3 (75)	1 (3)	13 (39)	8 (24)	2(6)
Total*	**143**	**12 (9)**	**12 (100)**	**14 (10)**	**11 (79)**	**12 (9)**	**27 (18)**	**36 (24)**	**42 (30)**
DINNER									
Schools	**N**	**Tea**	**Sweetened tea**	**Milk**	**Sweetened milk**	**Water**	**juices**	**Soft drinks**	**No drinks**
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Jal El Dib	29	6 (21)	6 (100)	5 (18)	4 (80)	1 (4)	4 (13)	2 (6)	11 (38)
Jinah	36	6 (17)	6 (100)	7 (19)	7 (100)		5 (14)	5 (14)	13 (36)
Haret Hreik	45	6 (13)	5 (83)	5 (12)	5 (100)	2 (5)	5 (12)	9 (19)	18 (39)
Aley	33	4 (12)	4 (100)	3(9)	2 (67)		7 (21)	1 (3)	18 (55)
Total*	**143**	**22(15)**	**21(95)**	**20 (14)**	**18 (90)**	**3 (2)**	**21 (15)**	**17 (12)**	**60 (42)**

** The total number includes the highlighted numbers*

2.4.3 Phase 3

The sample targeted in this phase of the qualitative study was composed mainly of female caregivers. The small number of males recruited to take part in this study might have been due to cultural sensitivity where mothers are the ones who usually take care of their children and are in charge of eating and drinking behaviours, while husbands are usually at work. In addition, there was no participation by any grandfathers due to either their unavailability, their living apart from their families who were residing in the city, or their refusal to participate in the study believing that the issue of ASB behaviour was the women's business

A total of 26 caregivers were interviewed. For mothers, the average age was 39.6 years. Most of the mothers were housewives, 62.5% not currently working and never having done so. Around 19% were working as janitors, either in the same school as their children or elsewhere. One mother worked for only two years as a nurse in a private hospital and one mother was a hairdresser. Most of the mothers had completed 6 to 7 years of education. The highest degree obtained was a mother with a nursing degree from a technical school.

As for fathers, the first one was a driver, 48 years of age, who had completed five years of education, whereas the second father was younger, 36 years old, and had completed 7 years of education and was working in a local shop.

Grandmothers on average were 72.3 years of age. Half of the grandmothers were illiterate and the other half had completed six years of education. All of them had never worked outside home; they worked mainly at home or on their farms, as would be customary for their generation and culture.

A total of five themes emerged from the interviews including: (theme 1), Parental practices of adding sugar to various types of beverages at home; (theme 2), Knowledge, attitude and beliefs related to adding sugar to beverages; (theme 3), Ingrained behaviour passed down over generation; (theme 4), Parental practices in introducing sugar and sugary beverages to food; and (theme 5), Taste perception.

This section will cover the breadth and range of thoughts that were evoked when parents and grandparents talked about the ASB behaviour. For each individual theme, a detailed report of the analysis is found in the coming section. Moreover, quotes from the interviews are included to further illustrate the themes. It is to be noted that the code following each quote is a reference to the specific interview from which the quote has been taken indicating the interviewee, age, educational level and employment status. The table 2.3 describes the themes and subthemes generated from this phase.

Table 2.3: *Coding Scheme*

Theme 1
Parental practices of adding sugar to various types of beverages at home 1.1 Adding sugar to milk (milk in bottle, powdered milk, and fresh milk) 1.2 Adding sugar to juice 1.3 Adding sugar infusions 1.4 Adding sugar to water 1.5 Adding other sweeteners (honey and molasses)
Theme 2
Knowledge, attitude and beliefs related to adding sugar to beverages 2.1 Socially constructed knowledge of the importance of adding sugar to milk 2.1.1. Physiological needs 2.1.2. Health benefits (provides energy, curable characteristics, decrease irritability and bad temper) 2.1.3. Doctors' recommendations 2.2 Attitudes towards adding sugar to beverages 2.2.1. Never tried offering beverages without sugar 2.2.2. Tried it without sugar but children did not accept it 2.3 Beliefs related to adding sugar to beverages 2.3.1. Sugar is healthy 2.3.2. Sugar is healthy if used in moderation 2.3.3. Sugar is harmful but added it to children to let them drinking
Theme 3
Ingrained behaviours throughout generation 3.1 Tradition from grandparents 3.2 Habits from parents
Theme 4
Parental feeding practices and parenting style 4.1 Early introduction of sugar and sugary beverages to food 4.1.1. Early feeding to pacifier, sweets used as or pacifier 4.1.2. After weaning: Introduction to high sugar food items such as Cerelac, Blédina, biscuits and fruits 4.1.3. Established eating habits: Introduction of high sugar food items such as jam, chocolate spread, candies, kaak (a Lebanese sugar cookie), cornflakes, and sugary drinks (juice, carbonated beverages) 4.2 Introduction of alternatives to milk: sweets cooked with milk, Yogurt, cheese and labneh, 4.3 Parenting permissive style, choice of food left to them
Theme 5
Taste Perception 5.1. Sweet Taste 5.2. Help increase acceptability by children (better than totally refusing to drink milk)

2.4.3.1 Theme 1: Parental practices of adding sugar to various types of beverages at home

In this first theme, the ASB behaviour is shown to be a common pattern of behaviour among the interviewed participants; it was so common that it became accepted as normal and appropriate to conform to. The ASB behaviour seems to be applicable to most drinks children consume, ranging from the addition of sugar to milk, juice, tea and other infusions, and even to water. Honey, molasses and other sweeteners were also mentioned by participants.

2.4.3.1.1 Addition of sugar to milk (milk in bottles, powder milk, and fresh milk)

It was very common for participants to add sugar to the formula milk in bottles. This occurred in the early months after birth.

> *"My grandson drinks milk in the bottle, he drinks three times per day. [His mother] used to put a large amount of sugar in the bottle."* (Mother, 50 years, intermediate, home-maker)

However, the ASB behaviour was not clear-cut when it came to fresh milk. Some participants added sugar to fresh milk while others didn't.

"If it's powder milk, it does need sugar. But if it's fresh milk, that's beneficiary and it doesn't need sugar. I accept fresh milk more than powder, without adding sugar. You still feel good and strong, your bones feel good. But once I add sugar to powder milk, I can accept it more. But I told you, fresh milk for me, I don't need to add sugar." (Mother, 39 years, Intermediate, employed)

"At our home, we don't drink milk powder, the brand you find in supermarket, we used to drink fresh milk: we boil it very well, we add sugar and we take it the normal way. She used to add always sugar into milk, yes it is normal and it is a regular thing why you are asking it is normal" (Mother, 35 yrs., illiterate, home-maker)

However, the discrepancy was very clear when it came to ASB behaviour for powdered milk in cups; where very few participants negated the addition of sugar to milk, and the majority confirmed the ASB behaviour.

"No she drinks 2 to 3 cups of milk without adding anything to it. She doesn't add sugar to it. She likes plain milk and drinks it twice or 3 times per week without adding anything to it" (Mother, 48 years, Intermediate, home-maker)

> *"I started giving them powder milk in cups. I stopped giving bottles at the age of 2 years then I used cups. I used to prepare the powder milk with water and little bit sugar because it is powder and it is not sweet."* (Grandmother, 64 years, illiterate, home-maker)

Many participants explicitly stated that they started adding sugar when their children grew up and started drinking powdered milk in cups.

> *"Now that she became older, I started adding sugar because she is drinking her milk in cup. When she was young I did not use to add sugar to her bottle of milk" When it comes to giving the child milk in cup, a little amount of sugar needs to be added* (Grandmother, 63 years, Intermediate, employed)

In addition to the distinction between new-borns and older children, it is observed to be permissible to add sugar for toddlers and pre-schoolers, but not for new-borns. Participants mentioned that the infant formula already contained sugar while powdered milk didn't, that is why they started adding sugar to milk in cups.

> *"The milk I used to give my children already had sugar in it so when I prepared the bottles; I tasted it before and found it bitter. I tried to give my son the bottle without sugar but he did not accept it because the milk was new as well as without sugar. So he drank it after I added half spoon of sugar and mixed it with the milk."* (Grandmother, 64 years, illiterate, home-maker)

2.4.3.1.2 Addition of sugar to juice

Adding sugar to juices was common among participants, especially lemonade as it is sour in taste.

> *"I like to add sugar to juice to make it neutral and moderate taste, in order to let children accept it that's all."* (Mother, 36 years, Primary, home-maker)

> *"Natural and fresh juice is the best kind. They don't include any ingredient and I want my children to take it so adding table sugar will let be really tasty"* (Mother, 35 years, illiterate, employed)

2.4.3.1.3 Addition of sugar to infusions

Tea and anise are highly consumed herbal infusions among children and new-borns, respectively. Tea is usually consumed at night with dinner or in the morning with breakfast, especially during winter. Sugar is always added to tea, ranging from one teaspoon to several teaspoons, because of its bitter taste.

> *"During breakfast and dinner at night, they drank tea. They love tea. […] yes they add sugar to tea, just one spoon per cup of tea. They like it in large amounts."* (Grandmother, 64 years, illiterate, home-maker)

Anise is mainly given to new-borns especially during episodes of uncontrollable crying known as colic. It is known to be soothing and relaxing for babies. Definitely, sugar is always added to anise infusions.

> *"For new-borns we give them anise for colic and upon delivery we give him anise for sleeping longer hours. But anise could not be taken without sugar."Of course we need to add sugar and many teaspoons to the anise* (Grandmother, 63 years, Intermediate, employed)

2.4.3.1.4 Addition of sugar to water

A mixture of water and sugar has had multiple uses for new-borns. It was mainly given shortly after birth, especially among breastfed babies until the milk supply was adequate.

> *"Yes, I gave them water and sugar, but not always, not every day, sometimes. The amount of sugar used is very little, almost 2 spoons! We do not put large amounts."* (Grandmother, 75 years, illiterate, home-maker)

> *"Yes, I used to give them water and sugar. You know when a child is first born, they give them a bottle of milk or water and sugar". This is relaxing and let my child sleep well and deep.* (Mother, 28 years, Intermediate, home-maker)

It was also prescribed for jaundice as water and sugar was thought to alleviate jaundice among new-borns.

> *"I used to give him water with sugar when he had jaundice, my doctor told me to do so. He told me it decreases the jaundice so I stopped giving him this after he became fine."* (Mother, 40 years, Intermediate, home-maker)

2.4.3.1.5 Addition of other sweeteners (Honey and molasses)

Not only sugar was used as a sweetener in beverages, but also honey, molasses, sweetened cocoa powder and instant cereal were among the sweeteners mentioned by participants. Molasses was considered as a healthier alternative to other sweeteners to be added to the milk for children. To note many of the products were home-made, in the mountain villages of Lebanon.

> *"No I didn't use to add honey to the bottle of milk but rather molasses; grapes molasses or carob molasses, just a little amount when they were young."* (Grandmother, 78 years, illiterate, home-maker)

Honey and sweetened cocoa powder were also put in milk, in addition to sugar.

> *"Only the eldest daughter, she used to put her some honey with the bottle of milk and she would drink it, but the rest no."* (Father, 58 years, Primary, employed)

> *"I started adding sweetened cocoa when they grew up like at the age of 2 years or 3 years."* (Grandmother, 64 years, illiterate, home-maker)

Lastly, a few participants added sweetened instant cereal to the bottle of milk, as well as sugar in some cases. Instant cereal was considered to increase satiety among babies and promote good sleep.

> *"For a small bottle of milk, I would put three spoons of formula, and with it I would put one spoon of [instant cereal] which is better at making the baby full. I also added sugar to the bottle"* (Mother, 35 years, illiterate, employed)

2.4.3.2 Theme 2: Knowledge, attitude and beliefs related to adding sugar to beverages

2.4.3.2.1 Constructed Knowledge of the importance to add sugar to drinks

Several ideas related to sugar and its health benefits seem to be constructed through cultural and social practice. Most mothers reported that their children would better accept milk if sweetened, endorsing the beliefs of the grandmothers concerning 'sweet' breast milk and 'bitter' powdered milk. Likewise, several perceptions of the health benefits of sugar seemed to be created and developed by the society and culture in Lebanon.

A. Physiological need of the body

Many participants mentioned that the 'adding sugar' behaviour was about the "Physiological need of the body". Simply put, "*If his body didn't ask for it, he wouldn't take it*" (Father, 58 years, Primary, employed).

> *"I add sugar to provide him with more nourishing products 'milk with sugar' because he has to drink it. It nourishes them, that is why they add sugar. Yes, anything that your child's body needs should be given. I gave my son sugar when he was young as well as honey, so you feel that you did everything to your child. For example, I fed him fruits like banana since he needs them."* (Grandmother, 64 years, illiterate, home-maker)

B. Health benefits

Sugar is considered a "highly nutritional substance" and has numerous health benefits that prompt the ASB behaviour in addition to its curable characteristics. This may come from the history of Lebanon being a major sugar producer many years ago, and how they used sugar for many health reasons.

Provides Energy

One of the major perceived health benefits of sugar is energy. Sugar is perceived to provide energy for children and give them power to be more active, as opposed to sleepy and lazy. Indeed, one mother related the capacity of her child to walk to the sugar added to his milk.

> *"Milk is better if you add sugar to it. First of all, the children become more alert and stronger, instead of being lazy and sleepy. That is why you need to give them sugar. Milk and sugar are very healthy."* (Grandmother, 68 years old, Primary, employed)

Curable Characteristics

One participant mentioned that sugar relieves stomach ache.

> *"Adding sugar to the milk bottles helps in reducing stomach ache for children that's why I used to add sugar to their milk bottles and my kid's health was fine." (Mother, 52 years, Intermediate, home-maker)*

Moreover, sugar was considered as a cure to jaundice among new-borns. Mainly sugar is mixed with water and given to new-borns to reverse jaundice.

> *"I used to give him when he had jaundice water with sugar, my doctor told me to do so. He told me it decreases the jaundice so I stopped giving him this after he became fine."* (Mother, 40 years, Intermediate, home-maker)

Participants affirmed that low levels of sugar in the body would cause dizziness; being the reason behind adding sugar to milk and other beverages consumed by children.

> *"If someone gets dizzy, they tell him to drink some water with added sugar. You add some sugar to a cup of water and give anyone who is dizzy. Then the person becomes more alert and gets stronger and he won't be dizzy anymore. […] I mean if you don't take sugar, how will you survive? Don't you hear how they tell you that your body can get low sugar? Because you don't eat sugar. Children need to take a little bit of sugar, not much but they should."* (Grandmother, 68 years old, Primary, employed)

Irritability and bad temper

Interestingly enough, the ASB behaviour was associated with decreased irritability and bad temper. Children were observed to calm down and relax if they

were given sugar. Therefore, mothers were compelled to provide sugar to their children whenever they were agitated and restless.

> *"When they were younger, they used to eat sugar and feel full, sleep well and feel relaxed and you feel you need it and sometimes you feel that the body needs sugar."* (Mother, 28 years, Intermediate, home-maker)

> *"It's about will. When your child is crying a lot, you just put him sugar. He gives you trouble, you become frustrated so you just use sugar. You just don't have the patience to get him used to it without sugar."* (Mother, 35 years, intermediate, home-maker)

It is to be noted that quite a few participants talked about the numerous benefits of honey and why they added it to milk. Honey is considered to be nourishing and full of vitamins, as well as relaxing.

> *"I used natural honey that didn't change the taste of milk and make it sweeter, the only reason I added honey was for its high benefits."* (Mother, 48 years, Intermediate, home-maker)

C. Doctors' recommendations

Shockingly, a few participants recounted that they had consulted their physicians about adding sugar to milk and their physicians agreed, without any

objection. Some even recommended adding honey to milk, as a healthier alternative to sugar.

> *"I told the doctor that I give milk with sugar to my children and honey as well. He said that it is ok. He told me that I can give them honey and I can add sugar but moderately since he is afraid of the effects of sugar as they get older."* (Grandmother, 64 years, illiterate, home-maker)

2.4.3.2.2 Attitudes towards sugar addition

A. Never tried offering beverages without sugar

Captivatingly, a significant number of mothers never tried offering milk to their children without adding sugar to it.

> *"I think it is not possible that he drinks milk without sugar but he never tried having milk without sugar. I used to add sugar to his milk at the first place, now he does that by himself."* (Mother, 52 years, Intermediate, home-maker)

One common reason behind never trying to offer milk without sugar was mainly the personal taste of the participants: the mothers tasted milk without sugar and they did not like it, so they assumed that their children would not like it either. This is another example of anthropological roots to taste preference, where it has become a "norm".

> *"I never tried giving them milk without sugar; how this could be taken without sugar, my children drinks it the way I do. Do you think it could be taken without sugar!?"* (Mother, 28 years, Intermediate, home-maker)

Nevertheless, a few mothers expressed their regret and wished they had tried to offer milk without sugar to their children.

> *"I say that we are guilty, because we didn't try it without sugar."* (Mother, 50 years, intermediate, home-maker)

For one mother, it was mainly about perseverance: with a little bit more time and patience with the child, he would have accepted his milk without sugar.

> *"In my case, if I had persevered with my son without sugar, eventually he would have taken it without sugar. He would have gotten used to it. But when I put sugar, he'll get used to taking it with sugar."* (Mother, 35 years, intermediate, home-maker)

B. Tried it but didn't accept it:

Lastly, many participants actually tried offering milk without sugar without luck; their children would not accept it and would totally refuse to drink unsweetened milk.

> *"I tried to give her milk without sugar but she totally refused it but when I added sugar she simply accepted it."* (Grandmother, 63 years, Intermediate, employed)

2.4.3.2.3 Beliefs related to adding sugar to beverages

A. Sugar is healthy

Although most of the participants affirmed that they added sugar to the milk and other beverages for their children, their beliefs about the health effects for sugar differed widely. Many participants firmly stated that sugar was not harmful, as the ASB behaviour did not affect the health of their children; they consume sugar but they are totally healthy.

> "*I don't feel that sugar is harmful. My children are in good health. I didn't see any harm to adding sugar to their cup of milk."* (Mother, 35 years, intermediate, home-maker)

Indeed, some participants never thought that sugar might be harmful and they were even surprised by the question about adding sugar to milk and beverages as it was considered a cast-iron truth for them.

> *"I have never thought of [the harms of adding sugar]. The advantages of milk are much more than the disadvantage of added sugar. Do you think that this added quantity is harmful? No, this small quantity in milk is not harmful at all."* (Mother, 28 years, Intermediate, home-maker)

B. Sugar is healthy if used in moderation

Another group of participants were more vigilant and only admitted that sugar was not harmful if used in moderation.

> *"Sugar, like any other substance, it is needed. But every substance, if it is used in excess it is bad for you. But now is it possible that the sugar is bad for him? Maybe, if he adds too much. The body doesn't need too much sugar. But it needs sugar..."* (Father, 58 years, Primary, employed)

Despite the fact that her children had dental caries, one grandmother still denied the harmful effects of sugar on teeth and argued that her grandchildren did not consume large quantities of sugar, but rather that they loved fruits.

> *"Their teeth were infected, their teeth are not good. Do you think it is because of sugar? I don't think so because they are not eating sugar in large quantities. My children love fruits; they eat any kind of fruits."* (Grandmother, 63 years, Intermediate, employed)

C. Sugar is harmful but added to beverages offered to children

Some participants stated that indeed sugar is harmful and should be avoided by all means, while others participants stated that though they knew sugar was harmful, they still added it to their children beverages.

> *"Although we like it and I add and my children add sugar to beverages, but it has many disadvantages and it is not healthy. It causes diabetes, high cholesterol. For instance of course sugar will cause dental caries like chocolate, candies and other sweet things, they said that sugar will cause diseases and salt will cause diseases as well, but sugar in beverages will cause tooth decay, no?"* (Mother, 35 years, illiterate, home-maker)

2.4.3.3 Theme 3: Ingrained behaviour throughout generation

Ingrained behaviours have several apparent sources. The most important one is that the ASB behaviour to drinks is inherited from previous generations, from the old customs and habits of making food in the region.

2.4.3.3.1 Traditions from grandparents

It appears from the data that participants put greater value on behaviours learnt from parents rather than those learnt from peers. As shown clearly in the below quotes, the ASB behaviour, common among the older generation, is mainly related to the belief that sugar is healthy and needed by the body (as discussed under theme 2).

> *"My mother told me to raise my children the same way I was raised. She told me to do this and do that. She used to guide me all the time. She told me to add sugar with milk and with Anise because it will satisfy the children. He will feel relaxed and decrease pain. In her opinion, sugar makes him sleep more and nourishes him. All of us have this habit because it is nourishing, some of them don't like anything without sugar."* (Grandmother, 78 years, illiterate, home-maker)

Indeed, many participants simply agreed that this was an inherited habit that they could hardly break free of and never even questioned.

> *"My husband he inherited this from his parents. His parents loved sweet things. That's how he was raised."* (Grandmother, 63 years, Intermediate, employed)

One mother clearly admitted that she inherited the ASB behaviour from her mother and never asked herself why she was adding sugar in the first place.

> *"With my mother there was no discussion, no doubt milk could not be taken without sugar; it is a fact and no discussion. We raised our children the way our parents raised us. And I have never tried to offer milk or any other beverage without sugar. Children liked sweet taste. I have never thought of it, the way the child is relaxed will be doing it, the advantages of milk are much more than the disadvantage of added sugar. Do you think that this added quantity is harmful? I get married and I saw my mother offering milk with sugar. It is like this, offering milk with sugar"* (Mother, 28 years, Intermediate, home-maker)

The participants very clearly endorsed this ASB behaviour without questioning it, but were now anxious about the health effects of such an inherited habit.

> *"My mother used to add sugar in milk and in tea, and it is an inherited habit, we do this, like our parents used to do. […] My father also likes sugar too much, we were not aware about the risk from taking sugar and used to consume a big amount and added to all drinks. Now we have noticed the risk coming from sugar and we are afraid from the disease"* (Mother, 50 years, intermediate, home-maker)

One participant attributed the ASB behaviour to genetics: the sweet tooth is thought to be passed on from one generation to another by blood.

Rola my daughter likes to drink Qatar. I think this is all about heredity. The main grandfather used to love food, so my uncle became like his father and my husband became like his father, even my children became like their father." (Grandmother, 63 years, Intermediate, employed).

As illustrated in the extract below, grandparents perceived that using sugar and adding it to food was a very old habit in preparing meals, especially when powdered milk was not available.

"My mother breastfed all of us. She didn't bring bottles. They'd make her some sugar and flour... They'd call it "Tineh". There wasn't any milk, powder milk. There weren't any bottles. So whoever had a cow or something would bring some milk or yogurt. Sometimes there wouldn't be any milk. So white flour and sugar, they'd boil it and feed us it. That's "Tineh". They'd feed us that, water and flour and sugar. Without milk. They'd feed it to us." (Grandmother, 81 years, illiterate, home-maker)

Additionally, there are several very sweet desserts prepared with milk and rice. These recipes have been passed down from one generation to another, and nowadays, mothers still prepare these desserts for their children.

2.4.3.3.2 Habits of parents

Parents who add sugar to their children's beverages also add sugar to their own beverages.

> *"I add sugar to both milk and tea, but not to my coffee. I add 2 spoons of sugar to both one cup of milk and tea. Also my husband, he liked tea and sugar; he liked too much tea with added sugar. Children also behave like us and they add sugar to milk. Therefore all of us, add sugar and thus it becomes a habit" What can we do, it is a habit transmitted from us to our children and we know that* (Mother, 36 years, Primary, home-maker)

It seems that parents simply apply the same eating habits to their children's diet.

> *"I never tried to drink milk without sugar. I like it that way and I got my children that way. No way would they accept it without sugar. It's all about what he's used to; what I'm used to, that's what I got my children used to. For example, I drink coffee with sugar. I like to add to it sugar. For tea, I don't like it too sweet, just a little. It's not like I add too much sugar, no, I keep the amount average. My children are like me as well.* (Mother, 39 years, Intermediate, employed)

Likewise, children never fail to imitate their parents; therefore, it is expected that they add sugar to their milk if they see their parents adding sugar too.

> *"My husband and I add sugar to milk, so the children saw us both drinking it with sugar when they were young. They did the same thing as we did. […] My husband thinks it is nourishing as well as it satisfies the hunger, this is his opinion."* (Mother, 40 years, Intermediate, home-maker)

One mother traced back the origin of the "adding sugar behaviour" and the sweet tooth to her pregnancy, where the baby starts to get acquainted to the sweet taste in the womb following what the mother is eating.

> *"They said that the girl or boy is like their parents. It means if parents like sweet, children will like sweets. I would like to tell you a story when I was pregnant I ate 2 kilos of Baklawah (oriental sweet) when I was sitting. I used to eat sweets too much and even after two kilo dozens of sweets. Also children like what you liked to eat while you were pregnant and they start eating what you used to prefer."* (Mother, 35 years, illiterate, home-maker)

2.4.3.4 Theme 4: Parental feeding practices and parenting style

2.4.3.4.1 Early introduction of sugar and sugary beverages to food

A. Early feeding to pacifier, sweets used as a pacifier

The introduction of sugar was reported during the first months for new-borns, when a mother (63 years, Intermediate, employed) reported that "my grandmother, a long time ago, used to give the new-born one teaspoon of sugar to let him sleep for longer hours"; and this would occur as early as 40 days, when mothers would allow their infants to taste sweet food like biscuits and bananas.

> *"After the age of 40 days, I start to make him taste food and get acquainted with the taste of food. I start to let him lick what could be available at home and what I used to prepare for the whole family, for example biscuits and banana, stuff like that or anything he wants to have, not real food."* (Grandmother, 78 years, illiterate, home-maker)

Moreover, honey was also introduced very early into an infant's diet, for its presumed medicinal benefits while teething.

> *"I also used to rub a child's teeth, when they first came out with honey. […] First honey lets the gum become tenderer (that's what they used to tell me)"* (Mother, 35 years, intermediate, home-maker)

Some participants mentioned immersing the pacifier in water and sugar to increase its acceptability. Rose and orange blossom waters are used in making sweets and are here referred to.

> *"I used to immerse the pacifier in a cup of blossom water after adding sugar to it to enhance its acceptability, and sometimes I used to make them drink the blossom water too, just few drops, the new-born will enjoy the taste."* (Mother, 36 years, Primary, home-maker)

Moreover, sugar was introduced to infants with the pacifier to help them calm down, stop crying, and sleep well. Pacifiers were dipped in water and sugar, honey, or even immediately in sugar.

> *"All the time, they used to dip my daughters' pacifiers in water and sugar. Sometimes, they even dipped the pacifiers directly in the sugar in order to make them accept it and not to cry. It is very important for the children not to cry so when they taste sugar they will like it and stay calm and silent for a while, and to make them sleep. Then they started to dip the pacifier in honey when they knew that I like natural things. So I allowed it once per 2 or 3 months although her liver cannot handle honey and digest it at that age, but I found that honey is better than sugar."* (Mother, 30 years, Secondary, employed)

A very interesting finding was revealed in a couple of transcripts that could possibly take us to the origins of the "adding sugar behaviour". The quote below expressively describes how mothers used to go to work leaving their baby sucking on a piece of loukoum (a sugary gelatinous Lebanese sweet) wrapped in gauze. The main purpose was to keep the baby calm and help him fall asleep. When no pacifiers where available, mothers created one with a piece of cloth and sweets, making way for the coming generation to dip the pacifier in sugar and other sweeteners.

> *"Mothers used to go to the plantation of cigars, they had the habit to put children in their small bed and put for them a piece of loukoum into a gauze and tied to the bed, the baby spent hours and hours sucking it like a dummy. He sleeps more, gains weight and becomes a healthy baby. Previous generations were healthier and they were used to the sweetest taste. It was tied to the bed, and was shaking all the time and arrived to his mouth, when he sucked it he felt that it had a sweet taste so he slept and relaxed."* (Mother, 50 years, intermediate, home-maker)

B. After weaning: Introduction to high sugar food items such as Cerelac and Blédina

After weaning, the introduction of high sugar food items, biscuits and fruits started. The introduction of solid food started as early as four months, mainly with instant cereals. The brands of instant cereals mentioned by participants were sweetened such as Cerelac and Blédina.

"With breastfeeding I give any baby-food, like [instant cereals]. At around ten months, I start incorporating solid food in my boy's diet. Before that I'd give him [instant cereals]." (Mother, 35 years, intermediate, home-maker)

At around 6 months, sweetened biscuits smashed with fruits and fruit juice were introduced. Moreover, desserts with rice, milk, and a lot of sugar, like *mouhalabieh (rice pudding with apricots)* and *riz bi halib (rice pudding with pistachios),* were very frequently offered to toddlers.

"He was 6 months old when I started introducing biscuits and banana to him." (Mother, 36 years, Primary, home-maker)

"My son stopped taking bottle milk at age of seven months. I used to give him pieces of apple and one banana and biscuits in addition to juice, as well as [milk-based desserts]." (Mother, 50 years, intermediate, home-maker)

C. Established eating habits: Introduction of high sugar food items such as jam, chocolate spread, candies, sweets, kaak (a Lebanese sugar cookie), , and sugary drinks (juices, carbonated beverages)

Children of all ages consume huge amounts of sweetened beverages and snacks. It was obvious from the transcripts that children consumed many sweetened juices, either available at home or purchased at the school canteen.

"He drinks juice and in most of the time sweetened juices. Sweetened juices are highly liked by children" (Mother, 35 yrs., illiterate, home-maker)

Likewise, children consumed carbonated beverages in big amounts.

"When he is back from school, he eats whatever I have prepared and drinks [carbonated beverages] with it. He never eats without drinking any of those. They also ask for those beverages when we have barbeques on Sundays." (Mother, 52 years, Intermediate, home-maker)

Consequently, with this increased consumption of juices and carbonated beverages, children favoured milk less and less. These sweetened beverages actually replaced their milk consumption.

"I used to give them money for school, but I don't know what they buy. I think they like [canned sweetened juice] or they prefer more [carbonated beverages]. My daughter drinks juice, a lot of juices and [carbonated beverages] but most of the time she does not prefer milk. They also drink [carbonated beverages] with the breakfast, sometimes they drink juices." (Mother, 28 years, Intermediate, home-maker)

Likewise, children consumed confectioneries, either at home, bought at the school canteen or the nearby grocery shop.

> *"In the afternoon they eat what their father brings them like cake, nuts, chocolate and gums for example. I am so kind hearted so I give them whatever they want."* (Grandmother, 64 years, illiterate, home-maker)
>
> *"He doesn't buy from school. He does from the shop next to our house. He sometimes gets chocolate, chips, and gum"* (Mother, 36 years, Primary, home-maker)

Also, many mothers reported preparing desserts at home for their children, arguing that home-made desserts were healthier than store bought confectioneries.

> *"I gave for my children everything that is beneficial not any harmful things. Instead of giving him a chocolate I make custard. Sometimes I give him sweets like lollipop because children like that."* (Grandmother, 68 years old, Primary, employed)

Moreover, many children refused to take home-made sandwiches to school, but rather buy breakfast from the school canteen instead. *Man'ousheh* (a pizza-like dough with thyme and oil) and pastries were at the top of the list.

> *"He eats a Man'ousheh, pastries... He doesn't bring a sandwich from home; he takes money to buy from school. He buys chocolate, things like that."* (Father, 58 years, Primary, employed)

As for the filling in the home-made sandwiches, jam was very popular.

> *"I would prepare Sandwiches of cheese or jam, my daughter likes to take breakfast but my son no."* (Mother, 28 years, Intermediate, home-maker)

2.4.3.4.2 Introduction of alternatives to milk: sweets cooked with milk, yogurt, cheese and labneh.

Many children discontinued drinking milk after being weaned of the bottle. For this reason mothers would try to compensate for the milk with several other alternatives. Sandwiches with cheese and Labneh (a creamy yoghurt based spread) were very popular among children. They would eat such sandwiches for breakfast, school's snacks, or at dinner. Therefore, mothers considered these dairy sandwiches as an alternative to milk.

> *"My son eats Labneh and cheese every day. For school, he takes a sandwich of Labneh or cheese."* (Mother, 36 years, Primary, home-maker)

"They eat cheese and Labneh and everything, thus no need to drink milk." (Grandmother, 78 years, illiterate, home-maker)

Drinking yogurt substituted for milk in some sort of similar way. Moreover, there were several traditional dishes prepared with cooked yogurt that were thought to compensate for the milk.

"My elder married daughter also doesn't like consuming milk too; therefore, I try to compensate for the nutritional value by providing them with other sources like yogurt. I used to cook using milk and its derivatives like yogurt, I thought that she was getting the needed nutritional value from the food that's why I stopped serving milk and never obliged her to drink it." (Mother, 48 years, Intermediate, home-maker)

Likewise, sweet desserts prepared with cooked rice and milk were considered adequate alternatives to milk. Mothers felt compelled to prepare these desserts for their children to compensate for the nutrients they were missing from milk.

"I do prepare rice with milk, pudding. […] When they were young, I used to prepare Custard and rice with milk. I replace milk with milk-based sweets." (Grandmother, 75 years, illiterate, home-maker)

A few mothers reported introducing desserts prepared with milk as early as one year when her children stopped drinking milk.

> *"My son stopped taking bottle milk at the age of seven months. I used to give him pieces of apple and one banana and biscuits in addition to juice. What shall I do to compensate for milk?. I start prepare desserts with milk such as Mouhalabieh (cooked rice with milk.). This way, my son will not lose the benefits from milk ingredients.* (Mother, 50 years, intermediate, home-maker)

In addition to desserts such as mouhalabieh, many participants stated that they used to compensate for milk with other sweetened options, such as chocolate milkshakes.

> *"She buys chocolate milkshake or juice either from school or from the shop near our house"* (Mother, 48 years, Intermediate, home-maker)

Last but not least, many participants mentioned the addition of cornflakes and sweet crackers to milk in order to increase its acceptability among children.

> *"I still give them to consume milk to this day. However, N now, they drink a cup of milk every morning with cornflakes."* (Mother, 35 years, illiterate, home-maker)

2.4.3.4.3 Permissive parenting style

Choice of food left to children

An unexpected theme that emerged from the discussions is related to the parents' lack of control over their children. It seems that the choice of food was left completely to the children, and parents were not able to oblige any kind of food or drink on their children.

> *"When he was 3, I leave it up to him what to eat or what to drink. When you grow up, you will be very flexible and you don't care anymore, whatever they like to do I will let them, I don't shout or cry I leave to them all freedom. My neighbours said that I have raised a big family and I can still be able to raise children."* (Mother, 50 years, intermediate, home-maker)

2.4.3.5 Theme 5: Taste perception

2.4.3.5.1 Sweet taste

Most participants reported that 'sweet taste' was a major reason behind adding sugar to beverages. They simply added sugar to increase the sweetness of the milk and other drinks to provide a better taste.

> *"I add sugar just for the taste, not because it has some sort of benefits, just for the taste. It is bitter. For it to become more delicious, I would add some sugar to it."* (Mother, 35 years, intermediate, home-maker)

One grandmother compared the taste of breast milk to powdered milk stating that*:*

> *"the child drinks 'sweet' milk from his mother's breast, milk from breastfeeding is sweet. But milk from the goat it would not be sweet. So I need to sweeten it. I'd put a small spoon of sugar so the child would have the appetite to eat it. […] Adding sugar to milk is only about taste and acceptability by the child. For me there was no particular medical reason, it is only about taste. Children do not drink milk without sugar."* (Grandmother, 82 years, illiterate, unemployed)

Moreover, some participants talked about the acquired 'sweet' taste among older children, who would ask for more sugar in their cup of milk.

> *"So at the age of one year and a half, I started to give my son cups of milk without sugar in the morning and in the evening. When a child grows up he starts to distinguish between different tastes so he demands sugar. I put one big spoon of sugar with 3 spoons of milk because the cup is already big."* (Mother, 35 years, Secondary, employed)

2.4.3.5.2 Increased acceptability

The sweet taste was very much related to "increased acceptability" of milk and other beverages by children. Most of the participants complained about their

children not accepting to drink milk without adding sugar: if the milk is sweetened, children will definitely accept to drink it.

> *"I tried to decrease for him the intake of sugar, but he didn't accept, he asked me what have you done and what is this. So I add sugar in order to let him like it, take it and be interested in it. […] Sugar helps the children like milk. Children will not accept it without sugar."* (Mother, 50 years, intermediate, home-maker)

Many participants emphasized the importance of milk consumption and admitted that they would do anything to make their children drink milk, even if it took adding sugar to their bottle or cup of milk. In brief, the benefits of milk prevailed over the harms of adding sugar, and that is what mattered for most mothers.

> *"Well, sugar may be not healthy but the benefits they will gain from milk are much more important. Milk helps in building bones and enhances growth and makes their diet healthy"* (Mother, 36 years, Primary, home-maker)

Adding sugar to increase the acceptability of milk facilitated the transition of infants from breastfeeding to baby formula and the transition of toddlers from baby formula to powdered milk. Participants argued that adding sugar to the baby formula would facilitate that transition and would help the children better accept the baby formula and forget more quickly about breastfeeding.

> *"It's just that every child once you want to wean him off breastfeeding, you have to let him like the bottle. Sometimes he does not like it, he would miss breastfeeding. And he would not take the bottle, even if he was very hungry, so you try to put some sugar in it so that he would like it because babies like sweetness. I'd bring jars of baby-food, of cooked food, and they wouldn't like it. If I would get them something with chocolate or caramel, they would eat it. It has a sweet taste." (Mother, 35 years, Intermediate, home-maker)*

Other participants compared powdered milk to baby formula and came to the conclusion that baby formula already contained sugar; therefore, for a smoother transition from baby formula to powdered milk, sugar needed to be added to the bottle or cup of milk. This way, children could recognize the same sweet taste and thus accept the powdered milk.

> *"She did not accept powder milk without sugar since baby formula contains sugar in it already. I used to give them milk the way they wanted to drink it just to make them drink milk, to strengthen their bones and their bodies. […] without sugar children didn't accept it. I tried to give her milk without sugar but she totally refused it but when I added sugar she simply accepted it."* (Grandmother, 63 years, Intermediate, employed)

2.5 Discussion

The two exploratory phases of this study have clearly demonstrated that sugar is indeed added to the milk of children, in addition to the observed behaviour of high consumption of SSBs including sweetened juices, tea and soft drinks. Moreover, a high consumption of milk and other dairy products at breakfast and dinner was also reported, coinciding with a high consumption of milk with added sugar among children.

The third qualitative phase of the study was unique in providing an in-depth account about the origin of the ASB behaviour among Lebanese children in public schools. Furthermore, it was expanded with details about the views of parents and grandparents concerning this particular behaviour.

The ASB behaviour was common not only to milk, but also to water, juices, tea and other infusions. Adding sugar to formula milk in bottles was not systematic. Several participants stated that they did not add sugar to milk in bottles either because they thought that the milk formula already contained sugar or because it was not written on the formula container that sugar should be added. Also, consistent with what Labiner-Wolfe, Fein and Shealy (2008) reported from literature, 88% of mothers did not receive instructions on formula preparation from a doctor or any other health professional. Receiving no information at all might be as detrimental as receiving wrong information: it was reported that a few doctors did not object to adding sugar or honey to milk for infants. This finding calls for further research to investigate about the role of paediatricians in introducing some nutritional awareness to mothers, especially about the harmful effects of the ASB behaviour. In fact, in a study by Al-Zahrani and Al Raddadi (2009) assessing the nutritional knowledge of

primary health care physicians in Jeddah, Saudi Arabia, 81% of the physicians admitted that their nutritional awareness was poor. Moreover, on average, only 52.1% of the questions were answered correctly by the physicians who completed the questionnaire.

Many parents admitted that the ASB behaviour changed when their children switched from formula to drinking powdered milk in cups as it was allowed to add sugar for toddlers and pre-schoolers, but not for new-borns. Indeed, this finding was in line with the results of 24-hour dietary recalls from children aged between 2 and 19 years old that showed that SSB consumption increased with age. Children aged 2 to 5, 6 to 11, and 12 to 19 years consumed 176, 229, and 356 daily caloric intakes from SSBs respectively (Wang et al., 2008); validating the fact that sugar consumption might be more permissible for older children (Wang et al.,2008)..

Honey, molasses, sweetened cocoa powder and instant cereal were also mentioned as sweeteners added to milk.(Herbold and Scott (2008)), found that 47% of the mothers in Boston who participated in their study added cereal to infant formula, while Fein and Falci (1999) in Nebraska reported that only 22% of the mothers undertook this practice for infants 2, 5, and 7 months of age. Thereafter, data analysed from the Infant Feeding Practices Study II by Grummer-Strawn, Scanlon and Fein (2008) in Atlanta, Georgia reported that at 4 months, 41% of the infants had consumed cereal. The only explanation for this diversity of data can be the geographic location of the data. The more cosmopolitan the area, the higher the percentage of mothers who added cereal to their infant formula; Boston being the most concentrated population had 47% of the mothers who added cereal to infant

formula, followed by Atlanta (41%), and then Nebraska (22%), therefore making sense of the percentages.

The complex interaction among innate, learned and environmental factors greatly affects the development of children's food preferences and their eating patterns (Scaglioni et al., 2008; Ventura & Worobey, 2013). This interplay between genetic and environmental factors determines the major differences among children, and governs their likes and dislikes for specific food items (Ventura & Worobey, 2013). A mixture of innate preferences and the ability to learn new preferences is fundamental, but there is also a substantial similarity in children's preferences of food beyond their different cultures. For instance, fatty and sweet foods are usually preferred by children of many countries, compared to the vegetables that are generally unwelcomed (Skinner, Carruth, Bounds, & Ziegler, 2002).

Food preferences might indeed be deep-rooted in genetically pre-determined predispositions and automatic mechanisms to like sweet and/or salty tastes and dislike bitter and/or sour tastes (Beauchamp, Cowart, Mennella, & Marsh, 1994). Similarly, in this study, preference for sweet taste was one reason behind adding sugar to milk and other drinks, and having a sweet tooth was thought to be passed on by genetics from one generation to another. Moreover, the inherited preference for sweet taste and aversion for sour and bitter tastes was reflected in the findings as parents thought that adding sugar to milk and tea increased the acceptability of such beverages for children.

Beside the theory of genetic self-regulation, specific eating behaviours can be learnt and it is possible to modify food choices by a repeated offer. Taste acquisition for selected foods is a consequence of learning (Birch, 1998). Many participants

talked about ‘the acquired sweet taste among older children. This is totally predictable as the findings of our study showed that sugar was introduced since birth or even before. One mother attributed the sweet tooth of her child to her food choices during pregnancy, where the infant started to get acquainted to the sweet taste in the womb following what she was eating. Undeniably, an infant’s first exposure to flavours begins in utero because whatever the mother eats during pregnancy is transmitted through her amniotic fluid, which in turn shapes the food preferences (Birch, 1999). Indeed, evidence has been accumulating showing that repeated taste exposure can increase acceptance of healthy foods or, on the contrary, an inclination towards unhealthy food choices.

One mechanism of taste development is ‘mere exposure’, which consists of the increased exposure that we might have to a certain food so we tend to like it more; this is how peculiar taste preferences grow in different cultures (Mennella et al., 2014).

Findings have reported that a few mothers expressed their regret about introducing sugar to their children and wished they had tried to offer milk without sugar from the start. In fact, flavour education is another taste development mechanism. When there is a comparison between two foods, one sweetened with sugar and one without; there is always a preference for the first food (Scaglioni et al., 2008).

One of the emerging themes in this study was in relation to the parents’ lack of control over their children’s eating habits. Even though, parents tried to extert control over their child’s choices in eating and drinking, the end result was that choice of food was left to the children. Literature has shown evidence in this regard,

as Savage et al. (2007) indicated that children whose parents exerted excessive control over what, when, and how much their children could eat showed the weakest evidence for consumption regulation. Parents of this type are actually negatively influencing their child's food acceptance patterns (Savage et al., 2007).

In addition, mothers reported that children have the tendency to imitate their parents and therefore it is expected that they add sugar to their milk if they see their parents adding sugar too. This was described in the literature in addition to innate and learned food preferences; a parent's own food preferences have a significant impact on their children's eating habits, as parents are valuable role models demonstrating good or bad eating habits (Savage et al., 2007).

The ASB behaviour has been indeed attributed to inherited traditions from grandparents and learnt habits from parents who themselves added sugar to their own beverages. A parent's dietary intake and food preferences greatly influence their child's eating behaviour. The reported results greatly emphasize the significance of parental role modelling at home, maybe even greater than peer pressure at school. Furthermore, the information obtained from grandparents was very fruitful, although it was subject to recall bias. They shed light on the origins of the adding sugar behaviour and why they added sugar while preparing milk (bottle or cup) or while offering hot beverages such as tea and coffee.

Upon the analysis of 24-hour dietary recalls from children and adolescents in 2 nationally representative population surveys, it was found that 55% to 70% of all SSB calories were consumed at home as compared to 7% to 15% at school. These results put more emphasis on parents' nutritional awareness to curb sugar consumption among children (Wang et al., 2008).

Many participants mentioned that the ASB behaviour was mainly related to the physiological needs of the body, as sugar has many nutritional benefits ranging from provision of energy, curing jaundice, alleviating dizziness to relieving irritability and bad temper in children. Consequently, poor parental nutrition education is affecting their children's eating behaviours. Similarly, in the study by Cluss et al. (2013), low SES and parents with minimal education were shown to have a poorer recognition of a food's nutritional value. This poor recognition was mainly related to misidentification of low nutrition and high caloric content foods, in believing that these food items were healthier than they actually were. Indeed, only 66.7% of participants correctly identified sweets and snacks in their respective food groups. Similarly, Zarnowiecki, Sinn, Petkov and Dollman (2012) reported that children's nutritional knowledge is directly predicted by their parents' nutritional knowledge, thus children of parents with greater nutritional knowledge were more likely to recognize healthy versus unhealthy foods (Zarnowiecki, Sinn, Petkov, & Dollman, 2012).

Moreover, some of the participants mentioned that consuming sugar may relieve the irritability and bad temper of their children. If irritability in children is actually a sign of hunger, it was in fact shown that sugars cause a feeling of fullness and affects the amount of food consumed in the short period following the ingestion of sugars. The effect of sugars on satiety is also found to be greater than the effect of fat (Anderson & Woodend, 2013). Also, in a study on preschool children's emotional eating and parental feeding practices, it was shown that children tend to eat more cookies and chocolate whose mothers frequently used food to regulate their emotions, even in the absence of hunger. Children in the experimental group had

lower mood ratings before being presented with snacks and they actually consumed around 29 Kcal from cookies more than the children whose mothers did not use food for emotion regulation (Blissett et al., 2010).

The early introduction of sweetened food items was evident in this study. While analysing the patterns of food consumption, it was found that most of the mothers introduced solid foods, and specifically sweetened instant cereals, as early as 4 months. In fact, Grummer-Strawn et al. (2008) reported that infants who were fed solid foods at 4 months were more likely to be exposed to fatty or sugary foods at 12 months.

If we analyse the substantial exposure of children in this study to sweetened foods and beverages since birth until early adolescence in light of the 'mere exposure' mechanism cited by Mennella et al. (2014), we can easily understand how this increased preference for sweet taste has developed among this group of participants. According to Cooke (2007a), among the most important determinants of a child's preferences for a given food item is the extent to which a child is familiar with it. Early exposure to different tastes and textures in food increases the readiness of children to embrace new foods (Cooke, 2007b) .

The emerging discussion about the sweetened food items available at home and the choice of food left to children in this study is very much in line with the findings of Campbell et al. (2006). The hypothesis that food availability at home may influence food preferences was contradicted by the fact that children's food preferences might in fact determine which food is brought home. It was also argued that children have the right to choose their food as their tastes are different from those of the adults (Campbell et al., 2006).

2.6 Conclusion

In conclusion, the conventional nutrition awareness that mainly consists of conveying nutritional information has not proven to be very successful in establishing healthy eating habits in Lebanon. Social norms were in fact shown to significantly affect how people eat: the quantities they eat, the quality of their food choices, as well as the development of eating disorders, an increased awareness, or obesity (Burger et al., 2010). Two types of social norms have been identified and believed to govern general decisions and actions: injunctive norms (what people are supposed to do) and descriptive norms (what people actually do). What health awareness specialists basically do is to increase awareness of healthy eating habits, thus focusing on the injunctive norms to eat well. However, more emphasis should possibly be put on what other people actually eat, affecting in this manner the descriptive norms and pushing people to make healthier food choices (Burger et al., 2010; Mollen, Rimal, Ruiter, & Kok, 2013). Nevertheless, more emphasis should be put on the family environment, on the genetic predisposition to like or dislike basic tastes, and how children can reject some food items and learn to like others. Providing parents with the right child-feeding strategies that can have an impact on their children's preferences and food intake could very possibly alleviate the anxiety of the parents and help modify the home food environment in a way that could increase the child's acceptance of a wide range of foods and encourage a healthier diet.

The findings from this chapter have shown that the ASB behaviour is established among families from public schools. Hence, the quantitative study

described in the coming chapter determines the predictors of this behaviour in a larger sample using the tenets of the Theory of Planned Behaviour.

Chapter 3

Using the Theory of Planned Behaviour to Investigate the Predictors of Adding Sugar Behaviour among Mothers of Lebanese Children in Public Schools

3.1 Introduction

The study described in this chapter is a theory based exploration of the ASB behaviour from the perspective of Lebanese mothers. Researchers in the public health field and in the area of behavioural science emphasize the importance of using theories in investigating a particular behaviour and the applicability of these theories in developing interventions at a later stage (Michie et al., 2011). The quantitative arm of the mixed methods approach in this dissertation was designed to explore the factors associated with the ASB behaviour and what influences this behaviour. This study specifically examined the behaviour of adding sugar (teaspoons of table sugar) to beverages such as fresh milk, powdered milk, hot beverages and fresh juices, as these represent the most frequently consumed beverages of children and adolescents (Rugg-Gunn et al., 2004).

The potential determinants of the intake of SSBs as elaborated in the first chapter include many variables as emphasised by numerous authors (Grimm et al., 2004; Hafekost et al., 2011; Roos & Donly, 2002; Xie et al., 2003; Spurrier et al., 2008; Vereecken et al., 2005). Selected variables were included in the tool developed for this study such as education level, employment status of the mother, age of the mother, and age of the child. Socializing children with healthy eating habits and

appropriate dietary behaviour is the role of the primary caregiver, usually being one or more parents (Hewitt & Stephens, 2007). Hence, understanding the mechanism by which the behaviour of parents is influenced may help to support in modifying their behaviour towards healthier drink options for their children. In addition, the exploration of factors explaining the ASB behaviour of parents will set the foundation for an effective behaviour change intervention as illustrated in the Medical Research Council (MRC) framework for complex interventions (Campbell, Fitzpatrick, Haines, & Kinmonth, 2000).

In the context of the exploration of the current behaviour and what are the possible predictors of ASB, the direct measures of the TPB constructs (attitude, subjective norms, perceived behavioural control and intention) were considered.

3.2 Rationale for the Study

All evidence described in the first chapter indicates that the TPB may provide a useful framework for understanding the predictors of ASB behaviour to children's beverages among mothers. In addition, in the previous qualitative study with Lebanese parents and children, it was noted that the parents' ASB behaviour to their children's drinks, in particular to milk, was a common behaviour and practice for many mothers and one that was acquired from early childhood through to adulthood. Most of the participants had a positive attitude toward this behaviour, and among the themes that emerged from the analysis of the qualitative data was the influence of parents as an inherited behaviour and how they control this behaviour. So, by using the TPB, more explanatory power may be added to what was obtained from the previous qualitative exploratory study. It is expected that the work undertaken in this

study will contribute to the body of knowledge on the ASB behaviour, specifically in a country where a high sugar diet is known to exist and there is emerging evidence that people add sugar to beverages as a common practice (see qualitative study). Additionally, it is intended to fill a gap of knowledge in this subject area with regards to the scarcity of theory based exploration of behaviour among this specific Lebanese population. Building on the results in the previous chapter it appears that this behaviour may be a common practice among Lebanese mothers and particularly those of lower socio-economic status. Therefore, it was suggested that questions on automaticity could shed more light in exploring the predictors of the ASB behaviour. A few questions on automaticity were added as an additional and separate section in the questionnaire, but not as part of the TPB focused questions. As far as the researcher knows, there has been no study exploring this behaviour in this context or in developing a culturally sensitive questionnaire. Only a few studies were identified using the TPB and exploring a proximal behaviour to the ASB behaviour which is the intake of sugar sweetened beverages (Kassem et al., 2003; Kassem & Lee, 2004; Zoellner et al., 2012; Tipton, 2014). Hence the main focus of this study is the identification of factors contributing to the ASB by mothers of children in public schools using the tenets of the TPB.

3.3 Aims of the Study

Aim 1: To establish the socio-demographic characteristics that discriminate between mothers who intend to stop/reduce ‘adding sugar’ to their children’s beverages and those who do not, and between parents and caregivers who actually do

add sugar to their children's beverages and those who do not (i.e. which socio-demographic characteristics are associated with intention and the actual behaviour?)

Aim 2: To test the extent to which the theory of planned behaviour (attitude, subjective norms, and perceived behavioural control) can predict the parents' intention to stop/reduce the ASB behaviour to their children's beverages.

Hypothesis 1: In line with the TPB, that attitude, subjective norms and perceived behavioural control would account for a significant proportion of unique variance in participants' intention to stop/reduce the ASB behaviour to their children's beverages, over and above the variance accounted for by the key socio-demographic variables.

Aim 3: To test the extent to which the theory of planned behaviour (intention and perceived behavioural control) can predict the extent to which parents implement the ASB behaviour to their children's beverages.

Hypothesis 2: In line with the TPB, intention and perceived behavioural control would account for a significant proportion of unique variance in participants' self-reported ASB behaviour, over and above the variance accounted for by the key socio-demographic variables.

3.4 Methods

3.4.1 Study design

A cross-sectional paper-based self-completion questionnaire was initially planned to produce quantitative data about ASB behaviour. Other cross-sectional methods such as postal (McColl et al., 2001) or telephone interviews (Bowling, 2009) were not found suitable to answer this research question in the current context.

In Lebanon, the postal system is not a reliable way to communicate as most of the areas and residential locations don't have appropriate or reachable postal addresses. Telephone questionnaire administration is an unreliable means to collect data especially that most of the families from low SES don't have landline phones. In addition, the usage of self-administered questionnaires let participants feel free and honest when filling the questionnaires and expressing their points of view in a direct way without any external influence (Bowling, 2009; Creswell, 2009).

Cross-sectional designs present many advantages such as their ability to measure multiple variables in a more cost effective manner (Creswell, 2009). Using such a design data is collected in a short period of time and is relatively less expensive than other approaches (Creswell, 2009). Furthermore, this approach helps in retrieving data from a wide population and a large number of participants (Groves et al., 2004).

However, like any other design the cross-sectional design also presents disadvantages. Such an approach is not able to identify causes and relationships between findings (Mann, 2003; Levin, 2006). In order to overcome the lack of ability in this design to draw valid conclusions about possible causality between predictors and outcomes, a prospective design was adopted for this study paper after collecting the data cross-sectionally. In addition, the prospective design is in alignment with the tenets of the TPB constructs that predict subsequent behaviours (Fishbein & Ajzen, 2010). Three longitudinal studies reported a variance exceeding 30% (Armitage & Conner, 1999; De Bruijn et al., 2007; Nejad et al., 2004). Information about the sequence of events from a prospective study design can serve as one evidence of causality or cause effect association (effect of intention and perceived behavioural

control on the adding sugar behaviour) thereby enhancing the power of the study results (Armitage & Conner, 2001). The first round of data collection was completed in October, 2013. The second round of data collection ended in March, 2014, 4-5 months after the completion of the first phase.

3.4.2 Participants

Participants were Lebanese mothers of children registered in the classes of Nursery, Kindergarten 1 (KG1), and Kindergarten 2 (KG2) and who were identified through the public schools. These participants were selected because previous findings from a qualitative study suggested that this behaviour occurs more frequently among this group of the community (Abdel Rahman et al., in preparation). It is also expected that parents who have children between the ages of 4 and 7 years still offer milk to their children before going to school.

Inclusion criteria:

Participants with the following characteristics were included in the study:

- Lebanese mothers
- Mothers with formal education (below primary level of education) Mothers who are native speakers of Arabic
- Mothers who add table sugar in order to sweeten their children's beverages

Exclusion criteria:

Participants with any of the following characteristics were excluded from the study:

- Primary caregiver other than the mother; example being a father, grandparents, or older siblings.
- Primary caregiver taking anti-depressants or anxiolytics (Lexotanil, Xanax, Prozac) on a regular or frequent basis. This was to ensure that mothers with mental health difficulties were not unduly burdened as a result of this study.
- Participants who refused to sign the consent sheet

3.4.3 Recruitment

3.4.3.1 Sampling frame

The sampling frame was the last updated listing of all Lebanese public schools which have a pre-elementary section including Nursery, Kindergarten 1 (KG1), and Kindergarten 2 (KG2). There is normally one section of Nursery, (KG1 and KG2) in each public school in Lebanon. The sampling frame was evaluated for completeness, up-to-date information, duplicate listings and missing elements. A multi-stage stratified proportionate random sampling design was employed in the current study. The multi-stage sampling format is useful for widely dispersed populations and where the population is divided into groups or units. In order to overcome the bias resulting from sampling and coverage, the sample strategy ensures the distribution of the questionnaire to a broad population with maximum variety (religion/culture) as elaborated in the section below.

3.4.3.2 Selected regions

There are seven Mouhafazahs in Lebanon. A Mouhafazah is a first-level administrative division of Lebanon with geographic boundaries. The term

Mouhafazah is referred to as a "governorate" or as a "province". Public schools in Lebanon are distributed within Mouhafazahs. The number of public schools per Mouhafazah is determined by the Lebanese Ministry of Education and Higher Education. The public schools included in the study were selected from all of the seven Mouhafazahs, namely: 1) Beirut, 2) Mount Lebanon North, 3) Mount Lebanon South, 4) Bekaa, 5) Northern Lebanon, 6) South Lebanon, and 7) Nabatieh. We included public schools from all Mouhafazahs to secure the inclusion of participants with diverse cultural/religious backgrounds.

3.4.3.3 Sampling techniques

School sample selection: From each Mouhafazah, a number of schools were randomly selected using a simple randomization technique with a probability equal to the Mouhafazah's representation of the entire school population. In total 25 schools were randomly selected, the number of schools selected was proportional to the number of participant from each Mouhafazah (Appendix I)

Sample selection: A representative sample of mothers of preschoolers was recruited. This was an equal and balanced number of mothers of students randomly selected from each of the selected schools using a simple randomization technique. The number of mothers was proportionate to the number of registered students per Mouhafazah. For example, from Beirut 12 mothers (5%) were selected reflecting the 5% of the total number of preschoolers registered in schools located in the Beirut Mouhafazah. Details related to the number of participants and schools selected are presented in Appendix I and the locations of all Mouhafazah are indicated on the Lebanese map (Appendix J).

3.4.3.4 Sample size

The sample size calculation was based on the λ method proposed by Green (1991) for a multiple linear regression (MLR). This method assumed that sample size (N) was a function of 2 parameters, f^2 and λ, where:

- f^2 = Effect size index= $R^2/1-R^2$, where R^2 = coefficient of determination of the MLR model.
- $\lambda = 6.4 + 1.65m - 0.05m^2$, where m= number of explanatory variables in the model.

To calculate N, the formula: $N= \lambda/f^2$

The theory of planned behaviour suggests that behaviour is predicted via the following two models (Rashidian, Miles, Russell, & Russell, 2006).

Model A: *Behavioural intention (BI) = α1 + β (Attitudes) + β (Subjective Norm) + β (Perceived Behavioural Control).*

Model B: *Behaviour = α2 + β(BI) + β(Perceived Behavioural Control).*

To calculate the sample size for Model A, the following assumptions were made:

*A more conservative R^2 (0.1) was assumed than the one reported in the literature (e.g. Kassem et al. (2003), reported an R^2 of 0.64 for intention to drink sugar sweetened beverages).

*m= 10 in order to account for the number of explanatory variables increasing from 3 to 10 to account for the possibility that some constructs may be entered in the model using a variable > 1, and also to account for potential

confounders (e.g. demographic characteristics, etc.). Therefore, N (Model A) = 162 (rounded up from 161.1).

For Model B: Assuming an R^2= 0.1 and m=2, the sample size would be N= 86, and in this model, the behaviour was calculated as a continuous variable.

As a result, the estimated sample size assuming it to be a simple random sample was 162 mothers. Assuming a design effect of 1.2 and to account for cluster sampling and a non-participation rate of 15%, the sample size would be 225 mothers. The sample size for this study was calculated using an alpha of 0.05, and a power of 80%.

3.4.4 Procedure and parent consent

3.4.4.1 Recruitment procedure

The consent of the Lebanese Ministry of Education and Higher Education (MEHE) was obtained as a first step, and in particular the approval of the department of school health programs. This approval was obtained through the Co-Academic programs office at the University of Balamand which liaises between the university and the ministry. The School Health Program is the authoritative body that provides initial consent to contact public schools concerning projects related to health. Thereafter, the MEHE sent a hard copy of the approvals to all public schools that included pre-elementary sections. The letter of approval included all details concerning the background of the researcher, aim and objectives of the study and exactly what was needed from the schools and from the families. The original copy of the approval was kept filed with the School Health Program at the MEHE. In addition, the researcher kept a copy of the approval in the administrative office of the

Faculty of Health Sciences at the University of Balamand for the coming ten years (Appendix K)

The researcher (AAR) arranged an appointment with all school principals of the concerned schools to describe the study and what was required of them. It was well noted that only the contact information of families who agreed to participate would be obtained. The mothers were selected either by the school principal or the health counselor by a simple randomization procedure. A screening tool was developed listing the inclusion/exclusion criteria. The screening procedure was done via the phone and before the first meeting when mothers were asked to sign the consent form.

3.4.4.2 Study procedure

The head of the parent teacher organization in coordination with the primary researcher (AA) called the mothers who were selected randomly and approved to participate. Participants were provided with a copy of the information sheet (Appendix L) and a copy of the consent sheet (Appendix M). The information and consent form were initially developed in English in order to be discussed with the supervisors. The form was translated into Arabic as all consent forms were collected in the native language of the country being the Arabic language. A professional translator, a native speaker of the Arabic language, with professional credentials in English was in charge of translating these documents.

The participants were kindly requested to sign the forms after the researcher explained the details to them and ensured that all procedural steps were understood. The researcher confirmed to the interviewee that his/her participation was

confidential and on a voluntary basis. Furthermore, it was clear for them that they had the right to withdraw from the study at any point in time with no repercussions either to them or to their children. The purpose of the research was clearly stated in the form. It was confirmed to all that there was no risk to those who were involved in the study. Furthermore, the name of the person to be contacted in case of queries was provided at the end of the consent form. All consent forms were collected prior to data collection. It was not anticipated that the research questions would disquiet or upset any of the participants. However, if the study participant requested specific nutritional advice, the researcher referred the interviewee/participant to the Dietary Department at the Saint George Hospital University Medical Centre, one of the most reputable and leading Health Care Centres in Lebanon.

Data was collected using the developed self-administered questionnaire (Appendix N). The questionnaire was distributed to mothers in the presence of the researcher; this process was followed to ensure that all participants understood all questions and were able to explicitly answer these questions. Once the mother started filling the questionnaire, the researcher left the mother alone in order to take her time to fill the questionnaire. All questionnaires were anonymous to avoid breaching confidentiality. Unique participant identifiers were given to all participating mothers prior to data entry, as a list of names, schools and relative codes was developed. The code was composed of five digits, the first one indicates the region (Beirut, South,…) and the second digit was related to the school number and the last three digits were the number allocated for each participant. The coding system permitted tracking the participants for follow up data collection. The participants were kindly requested to return the questionnaire in a sealed envelope. As with the consent forms, all

questionnaires for data collection were conducted in Arabic. There was no person other than the researcher accessing the data except for the researcher's supervisors (Dr. Pauline Adair and Dr. Mark Elliott), and to prevent this anonymity being broken, the work was maintained with only coded data. It is expected that anonymity could reduce the bias of self-reporting in relation to dietary intake.

3.4.5 Development of the questionnaire

This section presents the steps undertaken in developing the tool used in this research work. The translation procedure, validation of the questionnaire and pilot testing are described as well. The questionnaire was designed to determine the predictors of ASB behaviour among children. The instrument used in this study was a quantitative questionnaire adopted from the TPB manual for questionnaire development (Francis et al., 2004). The questions in relation to the behaviour measures were guided by Hedrick, Comber, Estabrooks, Savla and Davy (2010) and modified according to the need of this study. According to Ajzen (2002), there is no standard TPB questionnaire; the targeted population and the particularity of the behaviour need to guide the questionnaire development. The final instrument consisted of four parts in order to produce the most effective format.

The order and flow of questions followed a logical format in order to facilitate the process of questionnaire completion by respondents. According to O'Connor, Yang, and Nicklas (2006), the most important guidelines when developing a questionnaire are that the questions need to be kept as simple as possible, the questions have to be understood in only one way, the researcher should only include relevant questions, and biased questions should be avoided.

3.4.5.1 Structure of the questionnaire

Section A: Demographic Characteristics

This section included six questions. The socio-demographic variables collected related to the education level, profession of the mother, marital status, age and religion of the mother in addition to the family income. The socio-demographic variables (independent variables) were grouped and summarized as follows: Age of the mother (< 30 years/ between 30 & 40 years/ >40 years); Education level (intermediate or below intermediate/ secondary or technical/ university or higher degree); Occupation (employed/ housewife); Marital Status (married/ any other status); Monthly family income (less than $600/ between $600 & 900/ and above $900) being determined according to the official document released by the Lebanese government; Mother's religion (Christian/ Sunni/ Druze/ Shia); Child gender (male/female); Child age (between 3 & 4 years/ between 4 & 5 years/ between 5 & 6 years/ between 6 & 7 years); Number of children (less than 2/ between 3 and 4/ more than 4); Child order (first or second/ third or fourth/ fifth or more than fifth); Perception of the mother in regard to the child's height (below average / average/ above average); Perception of the mother in regard to the child's weight (below average/ average/ above average).

Section B: General information about the child (explanatory variables).

This part included nine questions as explanatory variables adopted from a validating tool by (Goh and Jacob (2011) such as perceived weight and height of the child from the point of view of primary caregivers in addition to the child's age, gender, the number of the child in relation to the total number of children at home,

and details of the primary caregiver that was looking after the child. If the person looking after the child was not the mother, the questionnaire was not analysed.

Section C: Behaviour

This section referenced the ASB to a beverage consumption questionnaire, including 12 questions adopted and guided by the paper of Hedrick et al. (2010).The questions were modified for milk (fresh and powdered), hot beverages (tea and other hot beverages), and fresh juices (juices prepared from fresh fruits without any artificial additives). Before starting the collection of data concerning the behaviour towards drinks, two questions were asked to know if the mother sweetened any child drinks, which drinks were sweetened, and what she added to sweeten the drinks.

The behaviour measure included three questions for each type of beverage: 1) frequency of the beverage intake with added sugar, for instance concerning the frequency of powdered milk *"How often do you offer powdered milk with sugar to your child" show i.e. NIDO* , 2) the quantity of beverage offered to each child *"How much powdered milk with sugar do you offer him each time",* show them the cup, and then 3) the number of teaspoons of sugar added to a beverage each time the drink was offered to the child *"How much sugar do you add for each cup of powdered milk"* show then the teaspoon. (Appendix O)

The ASB behaviour was calculated as the number of teaspoons of added sugar consumed per day per beverage = number of times the beverage offered per day multiplied by how many cups of the beverage was offered per day multiplied by the number of teaspoons of added sugar per cup (Table 3.1).

Table 3.1: Rules followed in converting the nominal scale of the questions related to the behaviour measure to a continuous scale

Calculation of the behaviour measure	Conversion Score
Question: Frequency of sugared beverage intake	
Convert how often do you offer the beverage with sugar to your child:	
If answer 1: 1 time per week	1
If answer 2: 2 to 3 time per week	2.5
If answer 3: 4 to 6 times per week	5
If answer 4: 1 time per day	7
If answer 5: 2+ time per day	14
If answer 6: Don't offer them powered milk with sugar	0
Question: Number of cup of sugared beverages intake	
Convert how many cups offered each time:	
If answer 1: Less than 1 cup	0.5
If answer 2: 1 cup	1
If answer 3: 1 and ½ cup	1.5
If answer 4: 2 cups	2
If answer 5: More than 2 cups	3
Question: Number of teaspoon of sugar added for each cup	
Convert how many tsp. of sugar do you add to each cup:	
If answer 1: Half tsp. per cup	0.5
If answer 2: 1 tsp. per cup	1
If answer 3: 1 and ½ tsp. per cup	1.5
If answer 4: 2 cups	2
If answer 5: 2 and ½ tsp. per cup	2.5

The behaviour was measured as the total number of teaspoons of sugar added to each kind of beverage consumed by the child per day. To obtain a common measurement that could be compared it was necessary to process the data. First the consumption was converted according to Table 3.1 to establish the frequency of each beverage. Then this was divided by 7 to convert from a weekly measurement to the number of times the beverage was offered daily. Thereafter, it was necessary to convert the quantity offered at each sitting again using Table 3.1. Multiplying the number of cups by the frequency of times per day provided the total quantity of beverage consumed per day. At this point the number of teaspoons added to each cup can be determined through the Table 3.1. The last step in the data interpolation was to multiply how many cups of the specific beverage had been consumed per day by

how many teaspoons of sugar had been added to each cup to produce a common measure of the number of teaspoons of sugar added to that beverage consumed per day by the children.

This calculation was repeated for each beverage (powdered milk, fresh milk, hot beverage, and fresh juice) using the same procedure. The final measure of the behaviour variable was calculated using the sum of the scores of the number of teaspoons of added sugar calculated for all beverages.

Section D: The questions in this section were about the construct of the theory of planned behaviour in relation to the ASB behaviour

The questions of this section were based on the theory of planned behaviour (Ajzen, 2002; Francis et al., 2004). What questions need to be included will vary for different behaviours and research populations. In order to address the aims of the study listed above, a subset of direct measures of TPB constructs was selected from the overall model in a final draft of the questionnaire. This section included 25 questions as direct measures of TPB constructs (7 for attitude, 6 for subjective norms, 5 for perceived behavioural control, and 7 for intention).

Attitude: The attitude of mothers toward the ASB behaviour to beverages offered to children was measured using seven questions. Each of the seven questions took the format: "For me, adding sugar to my child's drink is…..". The scales required participants to indicate their attitude towards the ASB behaviour using a 7-point scale with opposing adjectives at either end. Seven pairs of adjectives were used to measure the attitude: useful/useless, harmful/beneficial, worthless/valuable, bad/good enjoyable/unenjoyable, boring/interesting, pleasant/unpleasant (Francis et

al., 2004; Ajzen, 2006). Items with negatively worded endpoints on the right were recoded. Participants responses were scored so that higher scores (closer to 7) indicated a more positive attitude towards 'adding sugar' to children's drinks.

Subjective norms: Subjective norms which reflect the perceived pressure to perform or not perform a behaviour was measured using six items. Two of the six questions took the format: "Most family members/ or most friends who are important to me think I should add sugar to my child's drink"; the other two questions took the format: "Most family members/ or most friends who are important to me expected me to add sugar to my child's drink"; the last two questions took the format; "I feel under social pressure from family members/ from most friends who are important to me to add sugar to my child's drink". All the items used were complete sentences and the answers ranged from (strongly disagree/strongly agree). Responses at the endpoints were not mixed, so a higher score indicated higher social pressure to perform the ASB behaviour to child's drink.

Perceived behavioural control: The perceived behaviour control was measured using 5 questions. Three questions were used to measure the perceived difficulty of participants in performing the behaviour and their confidence in their ability to do it: "I feel able to give my child healthier alternatives to sugar sweetened beverages such as milk instead of sweetened milk", "I am confident that I can limit the number of times per day my child can have sweetened beverages" and "How confident are you that you can stop adding sugar to your child's drink". Participants rated these items on a 7-point scale with opposing wordings at either end (extremely easy/extremely difficult; extremely confident/not at all confident). Two questions were used to assess the controllability of participants in performing the behaviour:

"For me to stop my child drinking sweetened drinks is beyond my control" and "I can control how often my child drinks sweetened beverages". Respondents rated their answers on a 7-point scale using opposing words at either end (strongly disagree/strongly agree). A higher score indicated greater control to stop adding sugar to a child's drinks.

Intention: For the intention to stop/reduce ASB to children's beverages, two questions took the format: "I intend to stop/reduce adding sugar to my children's beverage in the coming three months". Other questions took the format: "I plan to stop/reduce adding sugar to my children's beverage in the coming three months" One of the seven questions took the format: "My goal is to reduce the amount of sugar added to my children's drink in the coming three months". The remaining questions took the format: "I will try to stop/reduce adding sugar to my children's beverage in the coming three months". Two pairs of opposing words were used to measure this construct (strongly disagree/strongly agree). A measure for the intention construct was calculated by summing the seven questions. Here a higher score indicated a greater intention to stop/reduce adding sugar to their children's beverages.

Automaticity: Although it is not main stream to include items measuring automaticity, it was initially decided to incorporate items from this construct to gain a better understanding of the ASB behaviour as it had previously been observed as a common behaviour in the qualitative study. Three items were used to obtain a score for the automaticity measure (Gardner, Sheals, Wardle, & McGowan, 2014). "Giving my child a sweet drink during the day is something I do without thinking", "Adding sugar to my child's drinks is something I do before I realize I'm doing it", and "Making sure that my child does not have any sweetened drinks at bed time is

something I do automatically". Participants were asked to indicate if it is an automatic behaviour using a 7-point scale using two opposing endpoint words (strongly disagree/strongly agree). Presumably, a higher score indicated that participants had a greater habit of 'adding sugar' to their children's beverages.

3.4.5.2 Translation of the questionnaire

A "cross-cultural adaptation" is the term used for the process of evaluating both language and cultural adaptation issues when using a questionnaire in another setting or language (Beaton, Bombardier, Guillemin, & Ferraz, 2000). There are specific steps to take in the translation of a questionnaire depending on the language and cultural differences of the audience (Beaton et al., 2000).

It is recommended that the questionnaire be forward translated into the new language by two translators, one from the field and one "naïve" translator totally unfamiliar with the concept or having no medical background. Then the questionnaire should be back translated by two other translators unfamiliar with the project. In this way major inconsistencies or conceptual error can be discovered and repaired prior to the actual study taking place. Thereafter a small pre-testing trial group needs to be created and evaluated for their answers and reactions to the questions, or where they feel uncomfortable or confused by any of the questions. The main point of this rigour is to make sure that the translation will provide a valid measure of another culture's health before the final testing takes place (Rand, 1994; Beaton et al., 2000; Price et al., 2009).

In reviewing literature on cross-cultural translations, variation in how it should be carried out was observed. For instance, Poirier et al. (2012) who translated

to French believed that back translation does not work, so that step was not taken in their research even though many other researchers have used the back translation method. However, the pre-trial step was instead most critical for them to verify their tool. Price et al. (2009) translated their questionnaire from U.S. English to British English, French, German, and Spanish. They abided by the steps according to Beaton et al. (2000), but chose to only have one translation forward and backward. They reported that it did not compromise their study. As described above, several stages which are recommended to be included in the process of translation are listed by many authors (Beaton et al., 2002; Weeks, Swerissen, & Belfrage, 2007). These steps include: a forward translation of the tool developed as well as a backward translation using the two sources to examine the meaning of words, and ensuring similar interpretations after revisiting the whole procedure. There are many steps and procedures recommended, but in the end what is used varies with the situation and cultural dynamics involved.

For the sake of this project, the author (AAR) decided to follow the WHO guidelines (World Health Organization, 2010) in relation to the process of translation which are similar to those reported in the literature and evidence listed above: "forward translation, expert panel, back translation, pretesting, final version and documentation" as per the WHO-Process of translation and adaptation of instruments (2010). As a first stage in this study, the questionnaire tool was constructed in English and reviewed for effectiveness with the lead supervisor (PA). A research team (WHO collaborative center - University of Salford) with an expert in the field from the MEHE in Beirut carried out a comprehensive review. The questionnaire

was then translated into Arabic as it was the native language of all participants in the survey.

Forward translation: Two qualified persons, one related to the public health field from the Co-academic program, Faculty of Health Sciences-University of Balamand, and one professional in the field of translation were in charge of this process. The primary researcher (AA) scheduled regular meetings with the two translators in order to discuss pending details related to the translation process. The translators avoided word for word translation and aimed at conceptual translation of the content. It was agreed to escape long sentences, jargon, and instead to use common language which could be understood by a common audience not only public health professionals.

Expert panel: Consulting with researchers experienced with TPB was impractical not only for lack of funding but also for lack of human resources in the country. Hence, it was decided that the translated tool would be discussed with people expert in the field of health promotion at the school health department, University of Balamand who had experience in tool development. Their comments were discussed with the primary supervisor (PA) in order to agree on the final version.

Back translation: This method was used in order to compare the two versions (Brislin, 1970). A professional translator from the Faculty of Arts and Social Sciences, University of Balamand, a native speaker in Arabic and a certified translator, was in charge of the back translation process and reviewing the two versions. Then these two Arabic versions were combined using the strengths of each to make the best final version of the questionnaire.

Pre-testing: The questionnaire was given a pre-trial with a group of 7 candidates. After they answered the questionnaire, they were interviewed by the principle researcher (AA) to see how they reacted to the questions and if there was any issue, confusion or discomfort with the questions or wording. The changes included small adjustments to a few words of the questions in the TPB section in particular to the subjective norms construct. The comments and reflections were noted and taken into account in creating the final version of the questionnaire used in this study.

Final version: Necessary measures were taken and appropriate modifications were made to ensure clarity of words and avoid any misunderstood or misleading questions. Particular attention was given to cultural sensitivity and to make sure that the concepts were not lost in translation. It was agreed upon after the review to have the questions presented in the same order and sequence in both versions.

Documentation: All steps followed in the translation process should be traceable and documented. Versions were given serial numbers such as 1.0, 1.1, etc and all comments or suggestions for rewording, comments from experts in the field, and comments from the primary supervisor were documented as well.

3.4.5.3 Psychometric properties

Any newly developed tool should show basic psychometric attributes in order to be statistically acceptable. Addressing validity and reliability will give an idea about the weakness or strength of the measure (Cook & Beckman, 2006).

Reliability: This property intends to test the internal consistency of a measure. Cronbach's $\alpha > 0.7$ was considered acceptable (Cohen, Cohen, West, &

Aiken, 2013). Reliability analysis was done for all TPB constructs; attitude, subjective norms, perceived behavioural control and intention.

Validity is established if the tool successfully measures what it is intended to measure (Robson, 2002) including face, content, criterion and construct validity. It was not feasible to do criterion validity in this study as there was no "gold standard" available in literature to test the items for this property

Face validity: This type of validity is considered among the weakest types of validity. Face validity was addressed by referring to the general appearance of the questionnaire and ensuring that the questions were arranged in a logical sequence. Checking was done for wording, appropriate sequencing, suitability, clarity and avoiding ambiguity. Face validity is important as it helps in ensuring a good response rate.

Content validity: this designates that the content should appear to logically and comprehensively define the different domains included in the questionnaire. This was ensured by the theoretical judgment underpinning the study.

Testing the questionnaire before starting the process of data collection is a fundamental step (Oppenheim, 1992; Boynton & Greenhalgh, 2004). The section below describes the procedure followed for testing the questionnaire in this study.

3.4.5.4 Pilot testing

The process of pilot testing the questionnaire ensures that the research instrument as a whole is clear and functions well. Even if the interviewer is physically present to clarify ambiguity and misunderstanding, pilot testing of a questionnaire is particularly crucial for research based on self-completion

questionnaires. Pilot testing provides information on any weakness in the wording of the instrument; if questions are not clear or not easily understood. In addition, it helps in identifying questions that respondents either tended not to answer or duplicated other questions. This process is also important to recognize questions that make respondents feel uncomfortable or cause them to lose interest at a certain point. It may identify how well the questions flow and whether it is necessary to rearrange, change the sequence of or reword questions. Pilot testing has an impact on the interviewer himself, as it provides added experience and greater confidence in using a specific questionnaire tool. It also familiarizes the researcher with the study environment and the approximate time needed by the participants to fill the questionnaire.

Design

A cross–sectional study of twenty mothers having children in public schools was carried out between May 2013 and June 2013.

Aim

The aim of this pilot research was to ensure face and content validity by examining the acceptability of the questionnaire by mothers in an environment similar to the real study environment.

Participants

Mothers were included if they were Lebanese, native speakers in Arabic and they used table sugar to sweeten their child drinks. Participants needed to be literate

so they could fill the questionnaire unaided and not being influenced by people not involved in the study.

Procedure

A questionnaire needs to be tested until the researcher is fully confident that there is no need for any further modification and that data saturation has been achieved (Boynton & Greenhalgh, 2004). Hence, there are no clear guidelines about the number of participants that need to be included in a pilot study. A purposeful sampling was considered to do the pilot testing (Bowling, 2009). Public schools were included as it was the initial plan for the main study. However, for the purpose of the pilot study, only schools located in greater Beirut were selected. The researcher contacted the school principal and explained the aim of the study. Then, the process of contacting parents started in order to proceed with data collection. Ethical approval from the Ministry of Education and Higher Education was obtained.

Protocol to evaluate the questionnaire

After agreeing on a convenient date and time, the session was carried out on an individual basis on the school premises. The session started by completing the questionnaire and it ended by interviewing participants to obtain their feedback. The researcher sought written agreement from the participants to audio tape the interview. The questions during the interview focused mainly on structure, relevance of items, and clarity of questions, as well as face and content validity. Participants were asked about:

Structure of the questionnaire: If the different sections were clearly presented and if the overall structure was appropriate.

Scoring: If the scoring format was easy to apply.

Layout: If the layout and the font size were appropriate.

Items: If the items included were concise and logical or if they were complex and not easily understood.

Wording: If the words used were easy to understand and clear.

At the end the researcher asked a general question about the value of conducting such a study and if the participants had any additional comments that would make the questionnaire better.

Results

Mothers participating in the pilot study showed similar socio demographic characteristics of the study sample. Mothers were satisfied with the logical flow and clarity of the questions. The question related to glucose intolerance was not clear or understood by most of the mothers. In addition, many participants found difficulties in recalling the height and weight of their children. The researcher observed that most of the participants had the tendency to choose the number 4 category "neither agree nor disagree" for most of the TPB questions.

Amendments

As a result of the pilot procedure, the main changes made to the questionnaire included: Removing the question related to lactose intolerance: "Is your child lactose intolerant? Lactose being the natural sugar in milk and some children experience

stomach cramps, gas and diarrhea when they drink milk as they cannot digest the sugar. The scale was modified from a 5 point to a 7-point scale in order to avoid the ceiling effect. According to Lewis, Grossman, Domoto and Deyo (2000), a ceiling effect occurs when the score of a certain measure is near to the limit of its actual range (Lewis et al., 2000). Moret et al. (2007) aimed in his review to improve the psychometric properties of a previously set scale measuring inpatient satisfaction with medical care in terms of enhancing the response rate among participants and decreasing the ceiling effect. They found that extending the scale from a 4 point scale to a 5 point scale helped in decreasing the ceiling effect in the instrument using 16 questions in relation to the quality of medical information and the relationship with staff and daily routine from the perspective of inpatients regarding medical care (Moret et al., 2007). An example of the scale modification:

Before amendment:

Item	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
Most family members who are important to me think that I should add sugar to my child's drink	1	2	3	4	5

After amendment:

Q1: Most family members who are important to me think that I should add sugar to my child's drink

Strongly Disagree								Strongly agree

In addition, a few questions in relation to TPB constructs were reworded. These changes were discussed with the supervisor and two colleagues who were involved in the translation process. The final version was confirmed to be clear, readable and understood by all participants.

3.4.6 Ethical approval

The approval of the ethics committee at the University of Salford was obtained prior to any data collection (Appendix P). Ethical considerations often shape methodological choices; they are integral to and enrich designing good research. In addition, over the last several decades, there has been an increasing effort to integrate ethics into the teaching and practice of public health, preventive medicine and behaviour change.

3.5 Analysis

Data cleaning, data management and all analyses were performed using SPSS 21.0. Data analyses were performed for participants who had a complete set of data for all related variables. No extreme observations were detected, and no data entry consistencies were perceived. The behaviour construct was subsequently summarized for each participant using the mean of the final score of the measure of ASB behaviour with a higher score indicating an increased consumption of sweetened beverages. The composite score for the TPB constructs (attitude, subjective norms, perceived behavioural control, and intention) were calculated by summing the score of the questions included for each construct. After calculation of all measures related to the TPB constructs, data was imput using the average of each construct where only one or a maximum of two items were missing from these constructs. The internal consistency of these summative scales was therefore determined using Cronbach's α. Next, descriptive statistics were computed (frequency distributions, means and standard deviations) for the socio-demographic variables and TPB measures.

Independent t tests and ANOVA tests were then used to examine the relationships between socio-demographic factors and the outcome measures of interest (intention to stop/reduce ASB and the ASB behaviour). Post hoc analyses were performed whenever the ANOVA test indicated a significant association between independent variables and an outcome of interest.

The descriptive statistic for the variable of behaviour was not normally distributed, so it was transformed as deemed necessary using a natural log function. As stated, all the analyses in this study were based on the transformed variable of behaviour in order to fulfil the normality assumption tested using the Kolmogorov-Smirnov test.

Multicollinearity was examined by checking the tolerance and the variance inflation factor (VIF). None of the independent variables calculated were greater than 0.8 (in absolute value). All independent variables had tolerance values >1.0 and VIF<10, indicating no multicollinearity. The assumption of linearity was also met. Finally, correlations and multivariate linear regressions were performed to elucidate the role of various factors of TPB (attitude, subjective norms, and perceived behavioural control) in predicting behavioural intention and the ASB behaviour. Two multiple regressions were performed: the first regression was concerned with predicting intention to stop/reduce adding sugar to children beverages and the second was concerned with predicting the behaviour of 'adding sugar' which is reported as the number of teaspoons of sugar added to their children's beverages per day. Several steps were used in each multiple linear regression. In Step 1, the socio-demographic factors that were found to be significantly related to intention and behaviour were entered as independent variables. The demographic variables that

had more than two levels (e.g. religion) were dummy coded in order to avoid violating the linearity assumptions of multiple linear regressions. In Step 2, the TPB constructs were added to the analyses. In the first analysis (predicting intention), the measures of attitude, subjective norms and perceived behavioural control were used. In the second analysis (predicting behaviour), the measures of intention, attitude, subjective norms and perceived behavioural control were used. These analyses show the proportion of variance accounted for by intention and behaviour over and above the variables accounted for by the key socio-demographic predictors which are significant relative to the outcome measures (intention or behaviour). Hence, controlling for the effects of the demographic variables at Step 1 of these analyses may provide a more powerful test of the TPB at Step 2.

As described above and for the data collected at Time 2, the steps taken in data analysis were the same as those followed in the cross-sectional design. Independent t tests and ANOVA tests were then used to examine the relationships between socio-demographic factors and the outcome measure (behaviour Time 2). A multivariate linear regression was subsequently performed to test whether the scales comprising the TPB constructs (attitude, perceived behavioural control, subjective norms, and intention) could predict behaviour (Time 2) controlling for significant demographic factors. The descriptive statistics of the variable of behaviour (Time 2) were not normally distributed so it was transformed using a natural log function. All the remaining analyses in this section are based on the transformed variables of behaviour (Time 2) in order to fulfill the normality assumption.

3.6 Results

3.6.1 General descriptive statistics of the study sample

Table 3.2 describes the characteristics of study participants. In total, 237 mothers took part in the study. The data of 184 mothers was analyzed who had completed the measures in all variables including behaviour score was analyzed. The drop from 237 to 184 was due to incomplete questions in relation to the behaviour "Adding sugar to beverages" or to incomplete questions in relation to one of the TPB constructs: attitude, subjective norms, intention and perceived behavioural control. As a result, these participants were considered to have missing data and excluded from the analysis. About half the mothers had an intermediate or below intermediate education (n=98; 53.0%), a third had secondary or technical education (n=56; 31.0%) and only a few had achieved a university education and above (n=30; 16.0%). The majority of mothers were housewives and stated that they were not currently working (n=149; 81%). Almost all respondents were currently married and living with their husbands in the same household (n=180; 97.5%). Slightly less than half of the participants were 30 to 40 years of age (n=83; 45.1%) with a minority being older than 40 years (n=33; 17.9%). The majority of mothers were Christian (n=59; 32.1%), the next largest group was Muslim Shia (n=5, 29.3%), followed by Muslim Sunni (n=49; 26.6%) and finally Druze (n=22, 12.0%). The vast majority of the participating families had between 1 and 4 children; 43.5% (n=80) had 1 child or 2 children and 45.7% (n= 84) had either 3 or 4 children. In just over half of the sample (n=99, 53.8%), the order of the child considered for the study was either first or second. Approximately half of these children were females (n=98, 53.5%). Children were almost equally distributed across the age group 3 to 7 years. This study targeted

people from low socio-economic classes and the results confirmed that only 9.8% (n= 18) had a family income above $900 per month, while 59.1% (n=109) earning less than $600 per month. The remaining families reported having an income between $600 and $900.

Only 1 in 5 primary caregivers reported knowing the height of their child (n=41; 22.3%). In fact, 77.6% (n= 143) stated that they had never measured the height of their child. On the other hand, two thirds of the mothers were able to report their child's weight (n=113; 61.1%). Even though only a few reported their child's height, 63% (n=113) perceived their child being average in height compared to children of the same age. Meanwhile, 74.1% of mothers perceived their child as having an average weight compared to his/her peers (n=137).

The majority of the mothers used table sugar when they wanted to sweeten any drink offered to their children; milk (powdered or fresh), tea and/or fresh juices (89%; n=164) while only 7.6% (n=14) never sweetened any drink for their child, and 3% used exclusively other sweeteners (Table 3.2). In summary, the data shows that participants in this study, mothers of children enrolled in Lebanese public schools, are more likely to be housewives, with lower educational levels, and in households of lower income, and thereby confirming the typical profile of parents with low socio-economic status and children in the Lebanese public schools. In terms of religious affiliation, the data indicates that the sample is representative of the total population of Lebanon, where a third of the Lebanese population are Christian, more than two thirds are Muslim (Sunni and Shia) with a minority belonging to the Druze sect. A vast majority of women in the sample used table sugar to sweeten drinks offered to their children. These characteristics suggest that this is the right sample of

participants with which to conduct our study to get a deeper understanding of the ASB behaviour to drinks and its predictors. It is also the population which could benefit most from any future socio-medical interventions to reduce/stop sugar intake given the documented evidence on the association between high sugar consumption and negative health.

Table 3.2: General descriptive statistics of the study sample N=184

Socio-demographic Characteristics	N	(%)	Total N
Education level			184
Intermediate or below intermediate	98	53.0	
Secondary or technical	56	31.0	
University or higher degree	30	16.0	
Occupation			184
Employed	35	19.0	
Housewives	149	81.0	
Marital Status			
Married	180	97.4	184
Any other different status	6	2.6	
Child Number			184
Two or less	80	43.5	
Between three and four	84	45.7	
More than four	20	10.8	
Child order			184
First or second	99	53.5	
Third or fourth	72	39.5	
Fifth or more than fifth	13	7.0	
Monthly Family income			184
Less than 600$	61	33.0	
Between 600&900$	58	32.0	
Above 900$	18	9.8	
No income	48	26.2	
Age of the mother			184
< 30 years	68	37.0	
Between 30 & 40 years	83	45.1	
>40 years	33	17.9	
Mother religion			184
Christian	59	32.1	
Sunni	49	26.6	
Druze	22	12.0	
Shia	54	29.3	
Perception of the mother in regard to the child's height			184
below average (height)	24	13.0	
Height on average	113	63.0	
Above average (height)	45	24.0	
Perception of the mother in regard to the child's weight			
Below average (weight)	29	15.7	184
Weight on average	137	74.1	
Above average (weight)	15	8.1	

Child gender			184
Male	86	46.5	
Female	99	53.5	
Child age			184
Between 3 & 4 years	45	24.3	
Between 4 & 5 years	66	35.7	
Between 5 & 6 years	47	25.4	
Between 6 & 7 years	27	14.6	
Sweetening beverages			184
Using table sugar	164	89.0	
Using other sweeteners	5	4.0	
Never sweetening beverages	15	7.0	

3.6.2 Explaining the differentials in behavioural intention score

Table 3.3 shows the results of a bivariate analysis examining differentials in socio-demographic characteristics among mothers who reported intending to stop/reduce adding sugar to their children's beverages and those who did not (addressing Aim 1). There were significant differences in intention to stop 'adding sugar' to children's beverages as a function of the mother's education level $F(2, 184) = 17.17$, $p<0.05$, and mother's religion $F(3,184) = 66.2$, $p<0.01$. Post hoc analyses showed that participants who had been educated at university level or above reported significantly higher intention ($p<0.05$) to stop/reduce 'adding sugar' to their children's beverages (Mean= 5.2) than those who had been educated at intermediate level or below (Mean= 4.4). Participants with secondary or technology education were also more likely to state a higher intention to stop 'adding sugar' to drinks offered to children than those with a lower educational attainment ($p=0.05$). There was no noticeable difference in behavioural intention to stop/reduce 'adding sugar' behaviour to drinks between those who reported a university or above level of education and those who reported a secondary or technical level of education ($p=1.13$). Christian mothers had significantly greater intention ($p<0.01$) to stop or reduce 'adding sugar' to their children's beverages (Mean= 5.3) than those who were

Sunni (Mean= 3.8), or Druze (Mean= 4.4), but were rather similar to Shia. Those who were Shia had significantly greater intention ($p<0.01$) to stop or reduce 'adding sugar' (Mean= 4.97) than those who were Sunni (Mean= 3.8), but there was no statistically significant difference between Shia and Druze ($p=0.40$). There were no differences in intention to stop 'adding sugar' to children's beverages as a function of family income, mother's employment status, number of children living in the family, age of the mother, mother's perception in regard to child's weight and height, child order, child gender or age of the child.

Table 3.3: Socio-demographic variables contributing to differentials in intention

Variables	Mean	SD	Sum of squares	Df	F	P
Education			17.17	2	3.33	0.03
Intermediate and below	4.40	1.70				
Secondary or technology	4.90	1.57				
University or above	5.20	1.29				
Employment status			5.89	1	22.5	0.13
Employed	5.07	1.21				
Housewives	4.62	1.69				
Age of the mother			12.51	2	2.41	0.09
<30 yrs.	4.43	1.67				
bt 30 & 40	4.98	1.57				
>40 yrs.	4.55	1.53				
Religion of the mother			66.2	3	9.58	0.00
Christian	5.28	1.28				
Sunni	3.78	1.66				
Druze	4.55	1.78				
Shia	4.97	1.49				
Number of children			0.37	2	0.06	0.90
2 children or less	4.75	1.58				
Between t 3 & 4	4.66	1.71				
More than 4	4.73	1.42				
Child order			4.37	2	0.83	0.43
First or second	4.74	1.63				
Third or fourth	4.57	1.67				
Fifth or above	5.17	1.15				
Family income			17.78	3	2.30	0.07
<600$	4.28	1.73				
bt 600 && 900&	4.99	1.57				
above 900$	4.64	1.32				
Child gender			0.06	1	0.02	0.87
Male	4.90	1.61				
Female	4.72	1.53				
Age of the child			8469	3	0.59	0.62
bt 3 & 4	4.88	1.59				
bt 4 & 5	4.54	1.69				
bt 5 & 6	4.84	1.48				
bt 6& 7	4.55	1.73				
Perception of Child Height			10.5	2	2.00	0.13
Below average	5.20	1.44				
Average	4.53	1.60				
Above average	4.86	1.76				
Perception of child weight			7.63	2	1.46	0.23
Below average	4.25	1.89				
Average weight	4.80	1.52				
Above weight	4.81	1.87				

3.6.3 Explaining the differentials in the ASB behaviour score (Time 1)

Table 3.4 shows the results of a bivariate analysis examining differentials in socio-demographic characteristics among mothers who reported adding sugar to their children's beverages and those who did not (addressing Aim 1). There were significant differences in 'adding sugar' to children's beverages as a function of family income F (3, 1843) =83.05, $p<0.05$, and child gender F (1, 84) =58.7, $p<0.05$ (Table 3.4). Post hoc analyses showed that families earning less than $600 per month were more likely to add sugar ($p<0.05$) to their children beverages (Mean= 2.76), than families reporting an income above $900 (Mean= 0.81). So, families from low income groups added more sugar to beverages than those from higher income groups.

Table 3.4: Socio-demographic variables contributing to differentials in ASB behaviour

Variables	Mean	SD	Sum of squares	Df	F	P
Education			23.33	2	1.45	0.23
Intermediate or below	2.32	3.21				
Secondary or technology	1.62	1.89				
University or above	1.57	2.93				
Employment status			6.2	1	0.77	0.38
Employed	1.63	1.89				
Housewives	2.09	3.01				
Age of the mother			42.37	2	2.68	0.07
<30 yrs.	1.89	2.72				
bt 30 & 40	1.69	2.10				
>40 yrs.	3.01	4.22				
Religion of the mother			38.9	3	1.63	0.18
Christian	1.47	1.86				
Sunni	2.67	3.48				
Druze	1.84	3.43				
Shiite	2.03	2.74				
Number of children			4.29	2	0.26	0.76
2 or less	2.00	2.89				
bt 3 & 4	1.90	2.49				
More than 4	2.42	3.88				
Child Order			11.89	2	0.73	0.48
First or second	1.94	2.73				
Third or fourth	1.917	2.53				
Fifth or above	2.92	4.78				
Family income			83.05.6	3	3.58	0.01
<600$	2.76	3.54				
bt 600 && 900&	1.41	1.68				
above 900$	0.81	0.94				
Gender			58.7	1	7.56	0.00
Male	2.60	3.42				
Female	1.40	2.07				
Age of the child			9.57	3	0.39	0.75
bt 3 & 4	2.24	3.20				
bt 4 & 5	1.70	2.58				
bt 5 & 6	2.09	3.05				
bt 6& 7	2.17	2.43				
Perception of Child Height			16.05	2	0.99	0.37
Below average	1.72	2.75				
Average	2.23	2.84				
Above average	1.57	2.89				
Perception of child weight			22.69	2	1.40	0.24
Below average	2.79	3.27				
Average weight	1.89	2.81				
Above weight	1.55	2.05				

3.6.4 Explaining the differentials in the ASB behaviour score (Time 2)

The number of mothers who were available and accepted to participate in Time 2 was 197. There were no significant differences between any of the socio-

demographic variables (age, religion, education and employment status of the mother, family income, number of children living at home, gender, age and order of the child, and perception of the mother of child weight and height) and the measure of ASB behaviour (Time 2). Therefore, none of the variables would be regressed against the measure of behaviour (Time 2). The results of explaining differentials in the ASB behaviour score (Time 2) are described in the appendix Q.

3.6.5 Reliability analyses

The internal consistency of the measurement scales of attitude, subjective norms, perceived behavioural control, and intention was assessed using Cronbach's alpha (Table 3.5) According to DeVellis (2003) subscales for Cronbach's alpha ≥ 0.7 are considered to be high. Cronbach's alpha was high for most scales: 0.83 for items measuring attitude, 0.86 for items measuring intention, 0.79 for items measuring subjective norm and 0.70 for items measuring perceived behavioural control. However, the reliability of the automaticity construct was not acceptable at 0.28, so these items were removed and this construct was not used for any further analysis in this study.

Table 3.5: ***Reliability analysis***

Variable	N	Cronbach's Alpha
Attitude	7	0.83
For me adding sugar to my child's drinks on daily basis is: useful/useless For me adding sugar to my child's drinks on daily basis is: Harmful/beneficial For me adding sugar to my child's drinks on daily basis is: valuable/worthless For me adding sugar to my child's drinks on daily basis is: bad/good For me adding sugar to my child's drinks on daily basis is: Enjoyable/unenjoyable behaviour For me adding sugar to my child's drinks on daily basis is: Boring/interesting For me adding sugar to my child's drinks on daily basis is: Pleasant/unpleasant		
Subjective Norm	6	0.79
Most family members who are important to me expect me to add sugar to my child's drinks daily: strongly disagree/strongly agree Most family members who are important to me think that I should add sugar to my child's drink daily: strongly disagree/strongly agree I am under social pressure from my family members to add sugar to my child's drinks daily: strongly disagree/strongly agree Most friends who are important to me expected me to add sugar to my child's drinks daily: strongly disagree/strongly agree Most friends who are important to me think that I should add sugar to my child's drinks daily strongly disagree/strongly agree I am under social pressure from my friends who are important to me to add sugar to my child's drinks daily: strongly disagree/strongly agree		
Perceived behaviour control	5	0.70
I feel able to give my child healthier alternatives to sugar sweetened drinks: extremely easy/extremely difficult. I am confident that I can limit the number of time per day my child can have sweetened drinks: extremely confident/not at all confident. For me to stop my child sweetened drinks is beyond my control: strongly disagree/strongly agree. How confident are you that you can stop daily adding sugar to your child's drinks: not confident at all/extremely confident I can control how often my child drinks sweetened drinks daily: strongly disagree/strongly agree.		
Intention	7	0.86
I plan to stop adding sugar to my child's drinks in the coming three months: strongly disagree/strongly agree I will try to reduce the amount of sugar added to my child's drinks in the coming three months: strongly disagree/strongly agree I intend to stop adding sugar to my child's drinks in the coming three months: strongly disagree/strongly agree I intend to reduce the amount of sugar added to my child's drinksin the coming three months: strongly disagree/strongly agree I will try to stop adding sugar to my child's drinksin the coming three months: strongly disagree/strongly agree My goal is to reduce the amount of sugar added to my child's drinks in the coming three months: strongly disagree/strongly agree I plan to reduce the amount of sugar added to my child's drinks in the coming three months: strongly disagree/strongly agree		

3.6.6 Descriptive statistics summarizing the behaviour measure, (Time 1 & Time 2) and the TPB construct

The following table (Table 3.6) shows the mean scores for the ASB behaviour (Time 1 & Time 2) and each construct of the TPB. The mean score of the ASB behaviour measure collected from participants at Time 1 (N=184) was equal to 1.98. Whereas, the mean score of the subsequent ASB behaviour collected at Time 2 (N=198) was equal to 0.99. Concerning the TPB constructs, it was decided to compare the sample means with the scale mid-point of each measure (a 1 to 7-point scale for all measures). These results showed that the sample reported a neutral attitude tending to be slightly negative towards the ASB behaviour as the mean (M=3.20) fell below the midpoint. The sample perceived little social pressure to add sugar to the children's beverages deduced by the mean of subjective norms (M=2.88). In addition, these findings indicated that mothers perceived to a certain extent that they could exert control over the ASB behaviour as illustrated by the mean of perceived behavioural control (M=4.14) which fell above the mean. The intention construct had the highest mean of all other variables of the TPB (M=4.70) demonstrating that the sample of this population perceived a positive intention to stop/reduce ASB to beverages offered to children.

Table 3.6: Descriptive statistics summarizing the TPB constructs, the behaviour (Time 1, N=184) and behaviour (Time 2, N=197).

	Behaviour (time 1) (N=184)		***Behaviour (time 2) (N=197)***	
Constructs	**Mean ± SD**	**n mothers > scale mid- point**	**Mean ± SD**	**n mothers > scale mid- point**
Behaviour	1.99 ± 2.83	NA		
Behaviour(time 2)			0.98± 1.29	
Attitude	3.20 ± 1.42	28.3% (N=52)	3.14 ± 1.33	25.8% (N=51)
Subjective norms	2.88 ± 1.42	24.5% (N=45)	2.78 ± 1.37	23.7% (N=50)
Perceived behavioural control	4.14 ± 1.36	51.6% (N=95)	4.26 ± 1.36	54.5% (N=108)
Intention	4.70 ± 1.62	68.5% (N=126)	4.79 ± 1.47	73.2% (N=145)

3.6.7 Correlations of the theory of planned behaviour variables and behaviour (Time 1)

The correlation matrix of the TPB scales and the ASB behaviour presented in the table below (Table 3.7) shows that intention and perceived behavioural control were both negatively correlated with the ASB behaviour with r= -0.168 ($p<0.05$) and r= -0.317 ($p<0.05$) respectively. Thus providing evidence that participants were less likely to add sugar to their children's beverages if they had a positive intention to stop/reduce adding sugar, and felt they had control over doing so. Adding sugar to beverages behaviour was positively correlated with attitude r=0.181 ($p<0.05$) revealing that mothers who had a positive attitude toward ASB would perform the behaviour. Subjective norms didn't show any correlation with behaviour. Attitude and subjective norms were, however, negatively correlated with intention (r= -0.551, $p<0.01$ for attitude, and r= -0.283, $p<0.01$ for subjective norms). In contrast, perceived behavioural control was positively correlated with intention (r=0.459, $p<0.01$). These findings are consistent with the TPB. Attitude and subjective norms were positively correlated (r=0.351, $p <0.01$), but attitude and perceived behavioural

control were negatively correlated (r=-0.391, p <0.01). Therefore, participants with a positive attitude toward the ASB behaviour perceived less control over doing the behaviour. Furthermore, norms and perceived behavioural control were negatively correlated (r=-0.375, p<0.01).

Table 3.7: Correlations matrix of the Theory of Planned Behaviour, Variables, and Behaviour (Time 1)

Constructs	1	2	3	4	5
1.Behaviour	1	-0.168*	0.181*	0.090	-0.317**
2.Intention		1	-0.551**	-0.306**	0.459**
3.Attitude			1	0.315**	-0.391**
4.Subjective Norms				1	-0.375**
5.Perceived Behavioural control					1

*p< 0.05 ** p<0.01

3.6.8 Correlations of the theory of planned behaviour with behaviour (Time 2)

According to zero order correlation and in line with the TPB, attitude, subjective norms, and perceived behavioural control were significantly associated with intention. Attitude and subjective norms were negatively associated (respectively r= - 0.540, p<0.01 and r= - 0.320, p<0.01) (Table 3.8). Perceived behavioural control (r=0.400, p<0.01) was positively correlated with intention. However, inconsistent with the TPB, perceived behavioural control and intention were not significantly correlated with the subsequent behaviour (Time 2) (Table 3.8). Attitude was the only variable showing correlation with the behaviour (Time 2) (r=0.200, p<0.05).

Table 3.8: Correlation of the Theory of Planned Behaviour, Variables, and Behaviour (Time 2)

Variable	1	2	3	4	5
1.Behaviour (time2)	1	-0.090	0.200*	0.057	-0.120
2.Intention		1	-0.540**	-0.320**	0.400**
3.Attitude			1	0.330**	-0.390**
4.Subjective Norms				1	-0.367**
5.Perceived Behavioural control					1

NA Not applicable *p< 0.05 ** p<0.01

3.6.9 Predictors of intention

Table 3.9 shows the results of a multivariate linear regression addressing study aim (2). In the first step of the regression predicting the intention to stop ASB, the resulting model was significant (F =5.10, p<0.01). The socio-demographic variables (education level and religion of the mother) explained 13% of the observed variation in behavioural intention (F_{change}=5.10, R^2=0.13, p<0.01). This effect was attributed to the respondents' religion (for Sunni β = -0.35, p<0.01; for Druze β = -0.23, p<0.05) and education level (for university β = 0.15, p<0.05). In the second step of the analysis, when attitude, subjective norms and perceived behavioural control were added to the regression model, it was found that the TPB constructs accounted for a significant proportion of the additional variance in behavioural intention, over and above the variance accounted for by the demographic variables, resulting in a significant increment in R^2. (F_{change}=18.39, R^2=0.35, R^2_{change} =0.22 p<0.01). In partial support of the TPB, the standardized regression coefficients (see Step 2 beta weights in Table 3.10) demonstrated that attitude (β =-0.33, p<0.01) and perceived behavioural control (β =0.26, p<0.01) were independent predictors of intention, but this was not true for subjective norms (β =0.00, p=0.99). A unit increase on the attitude scale (that is a positive attitude to adding sugar) was

associated with a significant decrease in the intention to stop adding sugar by 0.33 units, after controlling for socio-demographic factors. Meanwhile, a unit increase in the perceived behavioural control scale (that is the mother's perception of her ability to stop adding sugar to her children beverages) is associated with a significant increase of 0.26 units in behavioural intention to stop adding sugar, after controlling for socio-demographic factors. In this overall model, religion was the only demographic factor that remained a significant predictor of the intention to stop adding sugar (Table 3.9).

Table 3.9: Predictors of intention

Steps and predictors	R^2	R^2change	F change	Step 1β	Step 2 β
1 Education secondary	0.13	0.13	5.10**	0.14	0.01
Education university				0.15*	0.01
Sunni				-0.35**	-0.18*
Druze				-0.23*	-0.16*
Shia				-0.08	-0.06
2 Attitude	0.35	0.22	18.39**		-0.33**
Perceived behavioural control					0.26**
Subjective norms					0.00

*p< 0.05 ** p<0.01

3.6.10 Predictors of ASB behaviour (Time 1)

The key predictors of the ASB behaviour (addressing aim 3) were determined using a multivariate linear regression performed over 2 steps: Step1) by regressing the ASB behaviour on significant demographic variables, and Step 2) by regressing the ASB behaviour on the attitude, subjective norms, perceived behavioural control, and intention constructs controlling for socio-demographic variables (Table 3.10). In the first step, the basic model which included the socio-demographic characteristics was statistically significant (F_{change}=5.31, R^2=0.09, p<0.01) and explained 9% of the variation in ASB behaviour measured. Gender of the child was a significant predictor

of behaviour with mothers being less likely to add sugar to the beverages of their daughters than to their sons (β =-0.21, p<0.05). Family income > $900 was another significant predictor associated with a decrease in the ASB behaviour (β = -0.17, p<0.05). Both factors remained as significant predictors of the ASB behaviour (Table 3.10). In the second step, the model including the TPB constructs was statistically significant as well (F_{change}=5.78, R^2=0.20, p<0.01) and explained an additional 11% (R^2_{change} =0.11) of the variation in the ASB behaviour measured. The mother's perception of her ability to control adding sugar to her child's beverages (perceived behavioural control) stood out as a significant predictor of this behaviour (β =-0.21, p<0.01). Thus, a unit increase in the mother's perception of her ability to control ASB to the children beverages was significantly associated with a 0.21point decrease in log scale of the behaviour measure. The other components of the TPB constructs (attitude, subjective norms and behavioural intention) were not found to predict ASB behaviour when they were entered into the model with other socio-demographic variables. In the final model, the TPB constructs controlling for socio-demographic characteristics explained 20% (R^2=0.20) of the variation in ASB behaviour. (Table 3.10)

Table 3.10: Multivariate analysis determining the predictors of ASB behaviour measured using the log scale

Step and predictors	R^2	R^2**change**	F **change**	**Step 1** β	**Step 2** β
1 Gender	0.09	0.09	5.31	-0.21**	-0.20*
Income bt (600-900)				-0.09	-0.06
Above 900				-0.17*	-0.16*
2 Attitude	0.20	0.11	5.78		0.15
Subjective Norms					0.04
Perceived behavioural control					-0.21*
Intention					1.45

*p< 0.05 ** p<0.01

3.6.11 Predictors of ASB subsequent behaviour (Time 2)

The results showed that when regressing the TPB constructs to the ASB behaviour (Time 2), none of the constructs (attitude, subjective norms, perceived behavioural control or intention) were depicted as an independent significant predictor of the ASB behaviour (Table 3.11). The overall model was significant ($p<0.001$) and explained 9% of the behaviour (Attitude $p=0.45$ ns, Intention $p=0.07$ ns, PBC $p=0.33$ ns, and Subjective norms $p=0.15$ ns). The results obtained are inconsistent with the TPB although the directionality of the relationship between the ASB behaviour and the different scales was preserved.

Table 3.11: Predictors of ASB behaviour (Time 2)

Step and predictors	R^2	R^2change	F change	Step 1 β
Attitude	0.09	0.09	4.58	0.06
Subjective Norms				0.11
Perceived Behavioural Control				-0.08
Intention				-0.15

3.7 Discussion

This dissertation represents an exploration of the theoretical determinants of the ASB behaviour in a Lebanese context with participating mothers of children enrolled in Lebanese public schools. The results of the study are discussed in relation to the tenets of the theory of planned behaviour. The planning of effective intervention strategies necessitates a comprehensive understanding of children's eating habits. The purpose of this study was to: (1) establish which socio-demographic characteristics are associated with intention and the actual behaviour (2) measure the extent to which the TPB can predict a parent's intention to stop/reduce ASB behaviour to children and (3) measure the extent to which the TPB

can predict the extent to which parents implement the ASB behaviour to their children's beverages.

3.7.1 Socio-demographic characteristics associated with intention and the ASB behaviour

When it came to behavioural intention, participating mothers with a greater intention to stop/reduce ASB to their children's beverages had a higher educational level and religious sect of Christian or Shia, when compared to mothers who did not possess that intention. Available evidence supports that a higher parental educational level can favour a lower intake of sugar-containing beverages (Hafekost et al., 2011; Roos, Hirvonen, Mikkilä, Karvonen, & Rimpelä, 2001). The results also revealed that in general, Christian and Shia mothers had a higher intention to stop adding sugar when compared to Sunni and Druze mothers. The effect of religion was also observed in the study of McCabe, Waqa, Dev, Cama and Swinburn (2013) noting the relation between cultural views and adolescent eating practices. The authors demonstrated a central role of religion in shaping meal sizes in that different religions transmit different messages in relation to eating. In this study, cultural values were transmitted by religious influences, as the Christian church equates food with abundance and giving which encouraged a high level of consumption whereas the Muslim religion emphasizes a strict regime controlling the type of foods and eating patterns (McCabe et al., 2013). This requires further analysis to establish a complete understanding of the factors underlying this observation; such factors can include the difference in socio-economic status (SES), educational level and/or cultural belief. As for the ASB behaviour, as the family income decreased (reflecting

lower SES) the addition of sugar increased. These findings are consistent with other research work showing a negative association between the intake of SSBs and socioeconomic status (Mullie, Aerenhouts, & Clarys, 2012; Vereecken et al., 2005). Kvaavik, Lien, Tell and Klepp (2005) showed in their longitudinal study that family income predicted the added sugar intake among adult men. As for the child's gender, mothers added more sugar to the drinks of male children compared to females. These findings are consistent with published literature, since low SES and the child's male gender were associated with higher intake of sugar-containing foods and beverages (Hwalla et al., 2007; Baba, 1998; Xie et al., 2003; Bere, Glomnes, te Velde, & Klepp, 2008; Erkkola et al., 2009).

3.7.2 Prediction of intention using the theory of planned behaviour (attitude, subjective norms, perceived behavioural control)

3.7.2.1 Do attitude, subjective norms and perceived behavioural control predict intention?

The present study revealed a stronger correlation between intention, attitude, and perceived behaviour control respectively (r= -0.551, r= 0.459 and r= -0.306), than those reported by Godin et al. (1996) which reviewed 8 eating behaviours and showed average correlations between intention and attitude, perceived behavioural control and subjective norms respectively (r=0.34, r=0.32 and r=0.16).

The TPB model (including attitude, subjective norms, and perceived behavioural control) was moderately, but still significantly able to predict 22% of the variance in the intention of mothers to add sugar to their children's beverages (whereas a large variance prediction is defined as >25% by Cohen et al. (2003) The

variance of intention in this study is higher than that reported by Ickes and Sharma (2011) where the TPB constructs explained 11.4% of the variance in intention of snack intake among middle school students. It is higher than the 15.6% variance of intention to limit the frequency of infant sugar intake testing the TPB among 162 mothers of 5-7 months old babies (Beale & Manstead, 1991). However, the variance described in this study is similar to the variance in intention (24.2%) explained by attitude and perceived behavioural control among 228 participants exploring their intention to adhere to a gluten free diet (Kothe, Sainsbury, Smith, & Mullan, 2015). It is also close to the findings of Sharifirad et al. (2013) where the TPB explained 25% of the behavioural intention of fast food consumption among Iranian high school students. However, the explained variance of intention in this study is lower than the one explained by the cross-sectional study reported by Zoellner et al. (2012) where the TPB constructs explained 34% variance in intention, and lower than the longitudinal study of Masalu and Astrom (2003) where the TPB explained a 33% variance in intention among 226 Tanzanian students. A similar study by Tipton (2014) investigated the intention of caregivers to serve sugar-sweetened beverages (SSBs) to their 2-5 years old pre-school children. Her results showed that the TPB constructs accounted for about 48% variance in behavioural intention to serve SSBs to these children. Despite similarities between the sample of this thesis and that of Tipton's (2014) study where participants (caregivers) were similar in age (majority <40 years), educational level (majority with lower levels), and SES (majority with low family income), essential methodological differences exist between the Tipton (2014) study and this current one. First, Tipton (2014) studied all SSB servings (though there was no clear definition of SSBs in the published article); thus it is not

clear if the behavioural intention of caregivers in serving homemade sweetened beverages (that is the addition of table sugar to milk, tea, or fresh juices at home) are the same as serving commercial SSBs (including readily available sweetened beverages brought home from the market, such as soft drinks and sodas, commercial fruit juices, and milkshakes). Second, the definition of the intention is different. The intention in Tipton's (2014) study was to serve SSBs to their preschoolers within the next week, while in this study it was defined as the behavioural intention to stop/reduce ASB to the children's beverages. The sample size in the Tipton (2014) study of 165 is a purposive sampling limiting the generalizability of results as the participants were selected from a narrowed population, whereas the sample in the current study is a random sample representing mothers of school aged children in Lebanese public schools from many different areas across the country of Lebanon. Interestingly however, both studies showed an unfavourable attitude towards serving SSBs; as in the Tipton (2014) study, the mean is 8.58 for a scale ranging from 4-20, and in this current study the mean attitude is 3.11 on a scale ranging from 1-7. This also applies to the perceived behavioural control where in both studies the level of perceiving control is resulting in a positive indicator of 3.82 (range 1-5) in the Tipton study, and 4.27 (range 1-7) in this current study. In addition, it seems that in both studies social desirability can play a major role in influencing caregivers to under report the number of times they serve their preschool age children SSBs as evidenced in the Tipton (2014) study and the under reporting of the ASB behaviour in the study of this dissertation.

3.7.2.2 Role of each TPB construct in independently predicting behavioural intention

The results of this study confirm that attitude (positive instrumental and affective attitude towards adding sugar) and perceived behavioural control (control over stopping adding sugar to beverages), but not subjective norms (perceived social pressure from family and friends to add sugar to children's drinks), were independent predictors affecting a mothers' intention (intention to stop adding sugar to children's drinks), respectively in a proportional and inversely proportional manner, in relation to the ASB behaviour which was under examination in this study. Attitude was a stronger predictor than perceived behavioural control. This finding conforms with the available literature such as the meta-analysis results of McEachan et al. (2011), which supports that attitude was the strongest predictor of intention, followed by perceived behavioural control in addition to other studies exploring dietary behaviours reporting similar results (Berg, Jonsson, & Conner, 2000; Kassem et al., 2003; Kassem & Lee, 2004; Zoellner et al., 2012; Basset-Gunter et al., 2013; Kothe et al., 2015). In contrast, the subjective norms construct as stated in literature is usually the weakest predictor of behavioural intention (Ajzen, 1991; McEachan et al., 2011). However, some studies have shown differing results where subjective norms were the strongest predictor of intention as in the research of Branscum and Sharma (2014), exploring two different snacking behaviours among 98 girls participating in a cross-sectional study (Branscum & Sharma, 2014). Bogers et al. (2004) found that perceived behavioural control was the strongest independent predictor explaining 44% of the intention for eating two pieces of fruit and 51% of the intention for eating 200g of vegetables among 159 Dutch women. According to Ickes and Sharma (2011), subjective norms and perceived behavioural control when

combined together explained 11.4% of the variance in behavioural intention among 318 middle school students. When categorized into normal weight and overweight, perceived behavioural control accounted for 19.9% of the variance in intention although the author didn't mention which was the strongest predictor when constructs were combined together (Ickes & Sharma, 2011).

Relative to the attitude construct, similar findings to this research were reported by Tipton (2014) whose results showed that attitude was the most influential predictor of intention. Additionally, in both studies the participants did not show a positive attitude towards the ASB behaviour; in the current paper M=3.11(for a range 1-7) or in the study of Tipton (2014) where there was an unfavourable attitude towards serving SSBs (M=8.58 for a range 4-20). This effect in Tipton's (2014) study was majorly influenced by the behavioural belief that no major disadvantage could affect children when they are served SSBs. Such beliefs however, were not investigated in this current study.

The findings of the current study also showed that perceived behavioural control was an independent predictor of the mothers' intentions to stop adding sugar to their children's beverages. Similar findings were reported by Branscum and Sharma (2014) that perceived behavioural control as the second strongest predictor of intention to eat two different types of snack fruit and lower dense nutrient snacks among boys from a Midwestern public school district (Branscum & Sharma, 2014). Other studies exploring similar behaviours among adolescents showed that perceived behavioural control was the strongest predictor following attitude explaining the variance in intention to drink regular soda (Kassem et al., 2003; Kassem & Lee, 2004) and to limit the intake of sugar sweetened beverages among adults (Zoellner et

al., 2012). Balian (2009) in her thesis exploring the influences of school aged children's milk and soft drink intake, found that perceived behavioural control was an independent predictor of the variance of soda intake among 137 participating children. In Tipton (2014) though opposite to this study's results, the perceived behavioural control was not an independent predictor of intention. The author did not discuss this finding; however, Tipton had a reversed perspective of the perceived behavioural control constructs compared to this study. Tipton defined it as the caregiver's feeling "in control in deciding *if I should serve* my child sugar sweetened drinks each day next week" (Tipton, 2014, p.5), while in this study, mothers were asked questions measuring the perceived behavioural control to limit, stop, or find a healthier alternative to adding sugar to their children's beverages. In addition, Tipton measured the perceived behavioural control using only one item while in this study mothers were asked 5 questions to measure their perceived behavioural control with 70% reliability, making the evaluation of this measure in this study more reliable. The difference in the results of these two research studies could be the difference in culture between the Middle East and other countries, and the motivation for a healthy lifestyle among participating mothers.

Consistent with other studies, subjective norms didn't predict intention to eat healthy (Conner et al., 2002; Blanchard et al., 2009). When it comes to the subjective norms construct, literature shows that it has traditionally been the weakest predictor of intention in 15 out of 19 studies systematically reviewed by Ajzen (1991). In addition, Ajzen's (1991) findings documented a consistency in the ability of attitude to predict intention, while a mixed effect was seen with subjective norms. Similar results were reported by the meta-analysis of Armitage and Conner (2001), showing

that subjective norms was the weakest TPB construct related to intention. The weak influence of subjective norms has been attributed to the low number of items within the measurement tool (Armitage & Conner, 2001). In Tipton (2014), though opposite to the current study results, subjective norms were found to be an independent predictor of intention; still, however, the subjective norms construct was a weaker predictor than attitude (Tipton, 2014). The author used three items to assess the effect of subjective norms on intention, without illustrating the results of the reliability analysis or discussing the findings. Surprisingly subjective norms were not found to be an independent predictor despite the influences of family and friends on the intake of sugar sweetened beverages in the current study. This can probably demonstrate that the parents' ASB behaviour to their children is guided by personal judgement rather than social influence. Another possible explanation of the lack of contribution of subjective norms may be because the questions in relation to this construct were formulated as injunctive norms (i.e. social approval by important others) rather than descriptive norms (i.e. whether important others themselves perform the particular behaviour or not). Ajzen (2002) recommended the use of items tapping on descriptive norms. Moreover, expanding for the inclusion of descriptive norms as a subset of subjective norms as in Berg et al.'s (2000) research demonstrated an improved predictive power of intention to consume different alternatives to milk.

In this study there was some unexplained variance of intention. Adding additional variables as recommended by Ajzen (2011) could further explain the variance in intention. However, such a procedure should be done very carefully after exhaustive academic discussion. According to Ajzen (2011), the commonly identified variables are self-identity and anticipated affect. Controlling for the three

traditional variables of TPB, adding self-identity can explain another 6% of intention, and with a greater control of past behaviour, self-identity can explain another 9% of intention (Rise, Sheeran, & Hukkelberg, 2010). The other possible predictor is the anticipating affect. This new variable refers to the emotional state one anticipates feeling after engaging in the behaviour. According to Sandberg and Conner (2008), the anticipated affect can add 7% more to the variance in intention.

3.7.2.3 Prediction of ASB behaviour

3.7.2.3.1 Do attitude, subjective norms, perceived behavioural control, and intention influence ASB behaviour in mothers of school aged children?

The perceived behavioural control independent predictor of the cross-sectional data

Controlling for child gender and family income, the model significantly explained 20% of the variance of behaviour from data collected in a cross-sectional fashion. The TPB constructs added 11% of the variance in ASB behaviour with perceived behavioural control being the significant unique independent predictor. The explained variance in this study was slightly less than that reported in literature. Evidence has shown that the variance in behavioural intention explained by the TPB model was higher than the explained variance in the actual behaviour (Ajzen, 1991; Armitage & Conner, 2001; McEachan et al., 2011) which is also the case in this study. For example, in the meta-analysis results of McEachan et al. (2011), the TPB explained about 44% of the variance in behavioural intention, but only 19% in behaviour where the perceived behavioural control was considered the most important predictor of adult eating behaviour. These findings are congruent with the suggestion of Ajzen (1991), that a significant relationship exists between behaviour

and perceived behaviour control with the latter being an independent predictor of behaviour. This finding is also similar to the results of Basset-Gunter et al. (2013) where perceived behavioural control was the unique independent predictor of fruit and vegetable intake among men and a unique predictor of fat intake among men and women. Moreover, Kothe et al. (2015) showed that only perceived behaviour control predicted the adherence of a gluten free diet among participants from Australia. The same results were presented elsewhere when a health behaviour related to weight loss was explored among 83 college students, with perceived behavioural control, and not intention, being its stronger predictor (Netemeyer et al., 1991). This result was attributed with the effects of the variables related to perceived behavioural control: participants who had good self-knowledge, well-established plans, high ego strength, and had become overweight at an earlier age in life were able to lose more weight. Also similar are the results of Berg et al. (2000) and Zoellner et al. (2012) where perceived behavioural control added significantly to the variance explained by intention. However, these results are contrary to other research where intention was the unique independent predictor of behaviour (Kassem et al., 2003; Kassem & Lee., 2004; Gummeson, Jonsson, & Conner, 1997).

Prediction of behaviour by intention of the cross-sectional data

Even though the parents' intention to stop the ASB behaviour was being significantly correlated with behaviour, but lower than the intention-behaviour correlation reported in the meta-analysis (r=0.43) (McEachan et al., 2011), the parents' intention to stop the ASB behaviour was not shown to be an independent predictor of behaviour. This finding is not generally consistent with the theory of

TPB in which intention is an independent and major precursor of behaviour and in many studies it was the strongest predictor of behaviour (Ajzen, 1991; Povey et al., 2000; Kassem et al., 2003; Kim et al., 2003; Kassem & Lee, 2004; Balian, 2009). On the other hand, other research concluded that intention, which is the proxy determinant of behaviour, didn't play a role in explaining variance in the behaviour under study, or one of the multiple behaviours which were under exploration (Bogers et al., 2004; Kvaavik et al., 2005; Fila & Smith, 2006; Ickes & Sharma, 2011; Basset-Gunter et al., 2013; Branscum & Sharma, 2014; Kothe et al., 2015).

Utility of the TPB to predict subsequent behaviour

The TPB framework didn't satisfactorily predict the ASB behaviour in this study despite the efforts in overcoming the limitation of the cross-sectional design and subsequently collecting the measure of ASB behaviour. These findings are not usual for the TPB and inconsistent with other similar work. Even though the model was significant and predicted 9% of the behaviour, neither intention nor perceived behavioural control showed to be an independent predictor when the data related to the behaviour was collected after 4 months. The low prediction of behaviour using the TPB has been noted in other studies as Branscum and Sharma (2014) found that intention predicted 6.4% of the variance in fruit and vegetable consumption among boys and 6.0% among girls. In addition, 7.2% of the variance of calorie dense/poor nutrient snacks was predicted for girls. The model was not significant to predict the snack intake among boys and intention was not an independent predictor and didn't play a role. These results, however, are not consistent with the findings reported in other studies using a longitudinal design and where at least either intention or

perceived behavioural control predicted the actual behaviour (Masalu & Astrom 2003; Nejad et al., 2004; Backman, Haddad, Lee, Johnston, & Hodgkin, 2002; De Bruijn et al., 2007).

The lack of an independent contribution of intention to predict the behaviour at Time 1 and the lack of both intention and perceived behavioural control to predict the behaviour at Time 2 could be due to the following two factors as explained below: 1) Duration of follow up, and 2) Question behaviour effect. Hence, future research is encouraged taking into consideration these two factors. Nevertheless, the study itself does show one interesting finding that has potentially important practical implications related to reducing this behaviour. It was clearly observed that the mean of behaviour score collected at Time 1 (M=1.98, SD 2.83) was decreased to (M=0.98, SD=1.28) at Time 2. The repeated measures showed that this decrease was statistically significant ($F=16.89$, $p<0.01$). Hence, this behaviour was not stable over time. Additional analysis was done for mothers who completed the questionnaires in relation to behaviour Time 1 and behaviour Time 2 (N=157). The majority of the mothers (66%) decreased their behaviour by at least 10%. However, none of the four TPB constructs were shown to be independent predictors of behaviour, but the directionality of the relationship between behaviour and the different factors was preserved. This change in behaviour over time can be attributed to many reasons, as explained below:

Duration of follow-up: The time lag between the measurements of TPB constructs and the behaviour at Time 2 was long enough to allow such behaviour to change. The duration of this study follow-up was between 4 and 5 months which was longer than other TPB studies collecting data on a subsequent behaviour where the

period was one to 3 months as detailed in literature (Randall & Wolff, 1994). In fact, when using the TPB model in assessing behaviour, the time period between the data collected the first time in relation to a specific behaviour and the second time imposes an impact of the behaviour stability. McEachan et al. (2011) found in their meta-analysis that 5 weeks is the time of limit within which the measured behaviour is best predicted, and thus the concurrent measurement of the behaviour of ASB with the measurement of the TPB constructs was an appropriate method for accurate prediction of the behaviour. This is explained by the fact that the factors affecting the behaviour, such as the four TPB constructs and in particular intention, would have enough time to change if the duration of follow-up was longer. For example, the intention to stop adding sugar to children's beverages can increase after 5 months from an initial behaviour assessment and thus lead to an attenuated ASB behaviour after this length of time. In addition, Elliott, Thomson, Robertson, Stephenson and Wicks (2013) suggested that a one month gap between data collected at baseline and data collected at follow-up was enough time to introduce a change in behaviour. More specifically, the findings are consistent with the idea that just within the action of giving mothers a questionnaire about adding sugar to children's beverages might be responsible for decreasing the behaviour. Another possible explanation is that this decrease in the mean could be due to the Question–Behaviour Effect as elaborated in the section below.

Question behaviour effect (QBE): The QBE according to Sprott et al. (2006) is real with significant implications for the practice of social influence. In addition, it is a field of research where greater effort is needed and additional evidence needs to be explored. Recently, researchers who have generated data by questions in social

and psychological sciences have shown an interest in exploring the QBE effect more profoundly to further clarify the mere measurement effect. It is a simple straightforward strategy that can help researchers inducing change in health behaviours to improve the population's health with minimum cost (French & Sutton, 2010). The QBE, first described by Sprott el al. (2006), is a tool questioning the participants' behaviour and thereby influencing their future behaviour regardless of the content of the questionnaire. For many years it has been known in psychological research that when a specific behaviour is measured at a certain point in time, this will bias the measurement of subsequent measure (Solomon, 1949). Furthermore, the respondent's subsequent performance of behaviour and their evaluation of this behaviour could be altered by the influence of the questions in a particular initial survey (Dholakia & Morwitz, 2002). Researchers in psychology have been interested in evaluating the effects of asking questions about certain cognitive functions in particular those related to future behaviours, intention, attitudes, beliefs, and socially desirable behaviours (Sherman, 1980). Even though many mechanisms and important moderators are still to be identified in the field of the QBE phenomenon, psychologists have always been interested in questions that elicit emotions and behaviours among participants. Four possible reasons or factors explain why asking general questions could alter subsequent behaviours (McCambridge & Kypri, 2011). The first factor is that measuring general intention can activate further thoughts about engaging in a specific behaviour. The second factor is that the questions about intention have the potential to increase reflection about the attitude toward the behaviour being focused on and the attitude's accessibility. The third explanation could be that the measurement of intention leads to remembering the polarization of

attitude toward the behaviour and the most salient option set. Finally, the fourth explanation could be that answering questions about intention increased their intention accessibility and hence affected the performance of subsequent behaviour. According to Sherman (1980), behaviour performance is affected by filling the questionnaire. The importance in this phenomenon is not only about sending the questionnaire to participants, but in them receiving it, completing it, and thereby impacting their subsequent health behaviour. This issue is very important as it can impact public health interventions which are based on the mere measurement effect.

Beside the question behaviour effect, a number of reasons could exist between intention and the enactment of the ASB behaviour. First, the ASB might not have been adequately measured and thus could result in measurement bias. The measurement of dietary intake is a difficult task compared to other health behaviours such as physical activity which make the TPB not such a robust predictor of such kinds of behaviour (Branscum & Sharma, 2014). Second, the ASB behaviour could be a behaviour driven by impulses rather than intention which is shaped by taste more than by a desire for a better health outcome. This behaviour could be inconsistent from day to day, and the intention unstable. The concept of intention instability requires reflection on the environmental cues influencing the predictive power of the intention (Fila & Smith, 2006).

When highlighting the efficacy of the theory of planned behaviour to predict behaviours, two major factors can affect this equation: the behaviour type and the age of the population included in the study (McEachan et al., 2011). From this perspective, the intention-behaviour relationship is also greatly affected by the type of behaviour being studied. For example, the results of the meta-analysis of Randall

and Wolff (1994) classifying behaviours stated that the nature of the behaviour being studied can explain more than 19% of the variance in the strength of the intention-behaviour relationship. Thus the nature of the behaviour can greatly affect the efficacy of the theory to predict that behaviour, and question its use as a tool in developing effective interventions (McEachan et al., 2011). As for the age of the participating sample, one should note that most available studies focused on adults and adolescents, but rarely on children. In that perspective, data shows that the TPB supports with greater effect the prediction of behaviour in adults compared to adolescents (26.7% versus 9.6%, respectively) (McEachan et al., 2011). An interesting finding is that the most prominent predictor of dietary behaviour differs between adults and adolescents; it is reported to be perceived behavioural control among adults and behavioural intention among adolescents (McEachan et al., 2011). This is congruous with the findings of this researcher since adult behaviour of adding sugar to their children's beverages was one focus of the study. The predictors of behavioural intention also differ between adults and adolescents; coherent with this research study results, attitude appears to be the strongest among adults while subjective norms dominate behavioural intention among adolescents (McEachan et al, 2011). This may reflect both the less reasoned nature of adolescent dietary behaviour, and perhaps a lower degree of control over their behaviour. On the other hand, Zoellner et al. (2012) targeted low SES participants and assessed the behaviour of their SSB consumption. All the theory constructs significantly predicted the behaviour in the following in descending order: behavioural intention, attitude, perceived behavioural control, and subjective norms. However, it remains questionable whether or not adults would give SSBs to their children the same way

they consume them themselves, and due to this thinking, it is questionable if the results of Zoellner's (2012) study on behaviour can be projected to the current study.

Ajzen (1991) and Armitage and Conner (2001) argue that when the studied behaviour is volitional (or under full cognitive control), intention should be able to completely predict that behaviour, and perceived behavioural control should not have an impact on the intention-behaviour relationship. However, when the behaviour under study was not completely volitional (such as in the case of a habit), it was the perceived behavioural control that majorly controlled the intention-behaviour relationship. From that perspective, and based on the findings of this study showing that perceived behavioural control was the predictor of both intention and behaviour, while intention was not found to be a predictor of behaviour, this can lead to the deduction that the parents' ASB behaviour was actually a common behaviour that is not subject to full volitional control. This can lead to the inclusion of a potential explanation that this behaviour could be habitual. Habit concept has been included in many studies and in particular dietary behaviours and explains the intention-gap (De Bruijn, 2007; Gardner et al., 2014). Verplanken and Orbell (2003: p.1317) stated that habit is defined as 'the automatic elicitation of behaviour upon encountering a specific cue in the content of an activated goal'. However, other qualifiers are considered to determine if the habit determines the behaviour sufficiently such as the environment in which the behaviour is performed and how well the behaviour has been learned and the degree of control over the behaviour (Hall & Fong, 2007; Ouellette & Wood, 1998).

3.8 Conclusion

When the health behaviour concerns the parents' addition of sugar to their children's beverages, perceived behavioural control and attitude were independent predictors of behavioural intention and only perceived behavioural control was an independent predictor of behaviour. The TPB was able to only moderately predict intention (22%) and minimally the behaviour (11%). On the other hand, when the TPB–behaviour relationship was examined using a measure of subsequent behaviour (taken 4 months after the TPB measure) no relationships were detected. Thus, there is some evidence that the TPB (specifically perceived behavioural control) can predict behaviour, and individuals with low perceived behavioural control and strong habits would be more likely as actual performers of the ASB behaviour regardless of their intention level. However, this argument is not solid since it comes from an analysis in which a measure of behaviour that was only contemporaneous to the TPB measures was included. More research and follow up studies are encouraged guided by the findings of this study and recommendations to identify predictors of the ASB behaviour. It should be noted though, that there is evidence that giving parents and caregivers a questionnaire about exploring the determinants and predictors of the ASB behaviour might be responsible for decreasing this behaviour among participants. In addition, further research is needed to provide a controlled test of a potential intervention strategy to reduce the ASB behaviour. For example, a study of ASB behaviour between a group of participants that has received a questionnaire and a group of participants that has not could provide worthy insights. The study limitations and further future work are described in chapter Five.

The findings from chapters 2 and 3 showed that the ASB behaviour exists established among families from public schools in Lebanon. The following chapter identified effective interventions that may inform needed preventive interventions in Lebanon to curb the ASB behaviour that has been associated with chronic diseases.

In the next chapter, a systematic review is presented. The aim of Chapter 4 is to identify the most effective behavioural interventions aimed to reduce the intake of sugar sweetened beverages among children and adolescents.

Chapter 4

Effectiveness of Behavioural Interventions to Reduce the Intake of Sugar Sweetened Beverages among Children and Adolescents: A Systematic Review

4.1 Background

Evidence-based practice is primarily founded in systematic reviews and meta-analyses which are considered high-level overviews of primary literature searches. Systematic reviews provide an exhaustive summary of current literature through a methodical process of identifying, selecting, appraising, and synthesizing a complete capture of research evidence relevant to a specific research question (Higgins & Green, 2011). Systematic reviews that include meta-analyses compare and merge statistical data reported in multiple quantitative research studies (Littell, Corcoran, & Pillai, 2008). These studies address a unique research question using comparable units of analyses to produce a pooled effect of variance (Littell et al., 2008). A meta-analysis is only feasible when (1) all the studies address the same question, (2) more than one study has estimated an effect, (3) the characteristics of the studies are sufficiently similar, and (4) the outcomes of the studies employ comparable measurement (Higgins & Green, 2011). Usually, quantitative data from randomized control trials (RCTs) and quasi-experimental studies meeting these four conditions are used in a meta-analysis. Otherwise, a narrative synthesis is sufficient to explain research findings and inform evidence-based findings (Egger & Smith, 1997).

4.1.1 Description of the condition

To promote optimal health among children and adolescents, public health researchers and practitioners strive to establish strategies and interventions aimed at improving dietary intake and promoting lifestyle behaviours that are conducive to health living. Unhealthy dietary and lifestyle habits, if established during the early stages of life may extend into adulthood, and become ingrained and very difficult to change at a later date (Flodmark, Lissau, Moreno, Pietrobelli, & Widhalm, 2004). Evidence shows that unhealthy dietary habits can lead to obesity and numerous metabolic disorders and diseases, including diabetes and cardiovascular disease. Obesity can affect the physical and psychological health of growing children and adolescents, in addition to its direct implication on the quality of their lives and their perceived low self-esteem (Mäkinen et al., 2015)

Given the importance and complexity of ensuring that children and adolescents consume an adequate dietary intake, a wide range of strategies have been applied to address each of the dietary behaviours of this critical age group. These strategies include interventions that promote an increased intake of water, milk, fruits and vegetables, and a lower consumption of foods rich in salt, sugar, and saturated fats as well as trans-fats. Specifically, interventions aimed at reducing the consumption of sugar sweetened beverages (SSBs) which include soft drinks, carbonated beverages, and sweetened milk (Pereira, 2006). The consumption of SSBs is a focused area of concern for intervention with the following overview and background.

Consumption of SSBs and adverse health outcomes

As described in the first chapter, addressing the intake of SSBs among adolescents is a public health concern in most societies where the children's intake of milk decreases and their intake of SSBs increase as they grow in age (Ferferbaum et al., 2012). Popkin (2010) analyzed the food balance prepared by the U.S. Department of Agriculture (USDA) comparing the data collected in 1977-1978 by the Nation Wide Food Consumption Survey (NFCS, 1977) with the data collected in 2005-2006 by the National Health and Nutrition Examination Surveys. The data showed an increase from 97.4 Kcal per capita in 1977 to 153.7 Kcal per capita in 2006 among children aged 2-18 years. In addition, Harrington (2008) reported in her paper that around 65-85% of adolescents in the U.S. consumed at least one can of soft drinks per day as of 2008.In Mexico, the intake of SSBs almost doubled from 1999 till 2006 among pre-school children and school-aged children (Barquera et al., 2010). The author compared the data from the Mexican Nutrition Survey (MNS) collected in 1999 and data collected from the Mexican Health and Nutrition Survey (MHNS) in 2006. This comparison of data showed that the intake of SSBs among preschool children (1-4 years) increased from 161 Kcal in 1999 to 310 Kcal in 2006, and it increased from 185 Kcal in 1999 to 323 Kcal in 2006 among school-aged children (5-11 years). According to (Barquera et al., 2010), the liquid consumption among the preschool aged children was 794 ml per capita with the largest proportion from whole milk whereas the consumption among school aged children was 1254 ml per capita with the largest proportion coming from SSBs. The consumption of sugar sweetened beverages in Mexico is among the highest in the world with 60.6% of school-aged children consuming SSBs daily. The situation in the UK, however, is

different from the U.S. or Mexico, where the trend in the consumption of sugar sweetened beverages did not change markedly over the 5 years from 1997 till 2002 (Ng, Ni Mhurchu, Jebb, & Popkin, 2012). Ng et al. (2012), explained that the British government developed the Rolling Program -The National Diet and Nutrition Survey for children aged 1.5 years and older collecting data on the dietary intake among different age groups. While comparing recent data (2008-2009) with the data collected in 1992 by the National Diet Nutrition and Dental Survey for children aged 1.5- 4.5 years, the proportion of children consuming SSBs fell by a significant amount with the consumption declining from 238KJ per capita per day to 134Kj per capita per day. However, in contrast, comparing the 2008-2009 data with the data collected in 1997 by the National Diet and Nutrition Survey for young people 4-18 years, the results showed that the consumption of sugar sweetened beverages remained the highest among the age group 3-18 years with 14% of their energy coming from the intake of these beverages, the amount of Kj per capita per day increased from 498Kj to 548 Kj (Ng et al., 2012).

Similar trends of increase have also been observed in other countries and regions of the world, including the Middle East and North African Region (MENA). The consumption of SSBs in this region has been increasing significantly over the last 10 years in parallel with an increase in the intake of refined and added sugars among populations of the region (Al-Hazzaa & Musaiger, 2011b). During this same period the Arabian Gulf countries – Bahrain, Kuwait, Qatar, Oman, Saudi Arabia, and the United Arab Emirates (UAE) – have experienced a rapid transition from a traditional semi-urbanized life to a modern and fully-urbanized society starting in the 1960's (Ng et al., 2012). Though the overall dietary energy consumption has been

increasing worldwide at an average of 19% from 1964 to 1999, the change has had a varied impact in different regions, with the Eastern Mediterranean region increasing 38.4% from 1964/1966 to 1997/1999, with further increase projected by 2030. These figures are surpassed only by the regions of Eastern and Southern Asia at 63% and 43.8% respectively (Musaiger, Takruri, Hassan, & Abu-Tarboush, 2012).

Specifically, calories from beverages appear to be one of the major contributors to total calories, providing 8% of total calories for adult Emirati women, with an even stronger impact of 14% for male Emirati children. Sugared sodas and fruit drinks account for the majority (40-71%) of liquid beverages consumed in the UAE, with sugary drinks constituting 60% to 70% of the total calories consumed by Emirati children and adolescents in their beverage intake (Ng et al., 2012). While sales of sugar-sweetened beverages have been relatively static or declining in many high-income countries in recent years, they are typically increasing at 3% per annum globally, with much of the increase in low-and middle-income countries in Asia and Latin America. For example, in 2013, India and Brazil reported annual increases of 7% and 6% respectively (Lobstein, 2014). The Middle East region lacks a published percentage of sales; however, Lobstein (2014) conducted an analysis of children in 16 countries of various socio-economic levels. Adolescents in Kuwait (13-15 years of age) had the highest percentage of SSB consumption (75% for boys, and 74% for girls) compared to other countries in the region (Lobstein, 2014). As reported earlier in this dissertation, a Global School-based Student Health Survey (GSHS, 2011) in Lebanon indicated that carbonated beverage consumption was highest among students in grades 7 to 9, with 33% of students drinking carbonated soft drinks two or more times per day (GSHS, 2011). In addition to cultural custom of adding large

quantities of sugar to tea, coffee and milk, the consumption of carbonated beverages creates a situation in need of greater understanding and exploration. Appropriate steps are crucial for slowing down, and hopefully reversing this health crisis, to pattern the momentum of what is happening in high-income countries. The intake of SSBs should be limited mainly due to their impact on health. The upsurge in the intake of sugars, with the global increase in the intake of SSBs in particular, has been seen as being partially responsible for an increase in oral health problems, obesity, and early onset of chronic diseases, such as diabetes, cardiovascular disease and metabolic syndrome among children and adolescents (Curhan & Forman, 2010). With regard to the link between SSB consumption and obesity, several explanations have been proposed. One of which involves the rationale that liquid forms of energy may be less satiating than solid food, resulting in the consumption of more calories (Bachman, Baranowski, & Nicklas, 2006) SSB consumption is also associated with other health problems including dental decay and oral health challenges (Levy, Friend, & Wang, 2011). Harris, Nicoll, Adair, and Pine (2004), strove to identify the most significant factors associated with dental caries in young children in their systematic review. They found that sugary bed time drinks and carbonated drinks were identified among the most prominent dietary behaviours contributing to dental caries among young children (six years of age or younger). Furthermore, Park, Lin, Onufrak, and Li (2015) performed a longitudinal analysis of data for 1274 U.S. children collected as part of the Infant Feeding Practice Study (IFPS II) between 2005-2007 with a 6 year Follow Up Study (Y6FU) in 2012. Mothers were followed from the last month of pregnancy for 12 months and 11 questionnaires were sent to collect data from mothers on a monthly basis. After 6 years, 48% of the original

children remained in the study for follow up with 6.8% of these children being offered SSBs more than 3 times per week, compared to 6.4% offered SSBs between 1-3 times per week SSB, and 4.7% offered SSBs less than 1 time per week. Interestingly children who consumed SSBs frequently at age 10-12 months had the increased odds of 83% to develop dental caries later in their lifetime (Park et al., 2015). Kosova, Auinger, and Bremer (2013), in their cross-sectional analysis of children's dietary data, also found a clear correlation between excessive SSB consumption and the alteration of lipid profiles and increased markers for inflammation as well as adiposity. They related SSBs with a growing occurrence of metabolic and cardiovascular disease in the paediatric population (Kosova et al., 2013).

In conclusion, SSBs are adversely affecting the health of our next generation in the ways that we know of now such as caries, obesity, diabetes, metabolic syndrome and cardiovascular disease. With further studies, the list of the effects of SSBs on the body in childhood leading into their adult life could continue to expand. Due to this fact many schools in Great Britain and France as well as a large number of schools in the U.S. including Los Angeles, Philadelphia and Miami have banned or significantly restricted the intake of SSBs on the school premises (Vartanian, Schwartz, & Brownell, 2007).

Characteristics of successful behavioural interventions

Behavioural interventions based on theory and supported by evidence are more effective, especially when identifying a certain specific target behaviour and deciding the content of the intervention (Adair et al., 2004; Bartholomew & Mullen,

2011; S. Michie, Abraham, Whittington, & McAteer, 2009). Moreover, recently in the field of health behaviour change, the wisdom of using theories as a foundation to implement well-designed and effective interventions has become more popular and recognized as significantly contributing to the success of the intervention (Noar & Zimmerman, 2005). According to Bartholomew and Mullen (2011), there are five main roles when using theory in designing interventions. The first role of using theory is for ascertaining personal and environmental determinants leading to the intended behaviour change, the second function is to develop a logical model of change by stating who and what the intervention will aim to change, the third role is to select and apply strategies that are feasible and applicable to the group targeted in the intervention, the fourth role consists in developing questions measuring the outcomes, and the fifth and last role of using theory is to be able to describe the intervention and synthesize evidence in terminology relatable to other studies to build on previous research (Bartholomew & Mullen, 2011).

Furthermore, interventions should provide enough details in order to enable replication (Michie & Abraham, 2004). It is also important to consider the interaction between the environment, social context and personality and how these factors also influence behaviour (de Bruijn, Kremers, de Vries, van Mechelen, & Brug, 2007). Understanding the theoretical framework underlying behaviour is necessary in designing an appropriate intervention addressing each of its components and accordingly ensures the success and comprehensiveness of the intervention.

Focusing on the promotion of a healthy lifestyle from early childhood with parental involvement will likely have a great impact on the health of the group in particular and the greater population in general (Michie et al., 2009). It has been

found that parental control over food choices, parental perceptions about the importance of healthy nutrition for child health, and the child and adolescent barriers of food preference or related social norms are significant in the type of diet consumed in adolescence (Pearson, Ball, & Crawford, 2012). Understanding these mechanisms is crucial for the development of a successful intervention program (Pearson et al., 2012). Change is a process that unfolds over time and progresses through various stages. No matter how many theoretical models for changing behaviour have been developed, translating them into something that actually works is challenging. Improving knowledge or changing attitudes can be carried out, but the actual change of a behaviour and its sustainability are much more difficult (Tolvanen et al., 2009).

Randomized Control Trials (RCTs) have been found to be an excellent platform for studying the causal processes underlying behavioural interventions. RCTs strengthen the evidence base for intervention design as used by the Improved Clinical Effectiveness through Behaviour Research Group (ICEBeRG, 2006). Michie, Johnston, Francis, Hardeman, and Eccles (2008) found that five of the nine positive intervention effects obtained from RCTs successfully aimed at promoting healthy eating. Both Beech and James (Beech et al., 2003; James, Thomas, Cavan, & Kerr, 2004) agree that RCTs represent the most convincing research design, providing the strongest evidence examining the relationship between SSB consumption and body weight among children aged 7-18 years. The use of these concepts with the intention of improving adolescent health and the decrease of SSBs can provide the education and information for developing new habits, thereby attempting to manage the consumption of SSBs. Support provided by parents,

teachers and peers can facilitate the development of these new habits in different socio-environmental settings (Beech et al., 2003). In addition, the application of behavioural change techniques (BCT's) can help in achieving the delivery of the intervention (Michie et al., 2009)

4.1.2 Rationale for this review

Literature has repeatedly shown evidence that the intake of SSBs is associated with many chronic diseases (as described previously). The burden of these diseases on the family, and in particular those from low socio-economic classes, has made it crucial to provide families and the community with tools to reduce the intake of SSBs among children and maintain a healthy diet over the long term.

This systematic review of the literature aims to provide an understanding of the components and mechanisms of successful interventions that have produced lasting behavioural change concerning the intake of SSBs among the target population.

4.2 Objectives

The objectives of this review are to (i) explore educational and behavioural interventions that have been implemented to reduce the intake of SSBs among children and adolescents (4-16 year olds) across different settings (school and non-school), (ii) explore the characteristics of the interventions included in the review, and (iii) assess the effect of these interventions on the dietary sugar sweetened beverages consumption behaviours of children and adolescents and the related health

outcomes (i.e. obesity, dental caries, diabetes, metabolic syndrome and increased level of triglycerides and cholesterol).

4.3 Methods

4.3.1 Criteria for considering studies for this review

4.3.1.1 Types of studies

Only RCTs were included in this review. Studies based on other study designs such as non RCTs or quasi-experimental designs were not eligible.

4.3.1.2 Types of participants

Inclusion criteria for participants: Children and adolescents, between 4 and 16 years of age. Participants in these studies could be recruited from a school, home, or community setting.

Exclusion criteria for participants: Children outside the designated age range (younger than 4 years old or older than 16 years old). Studies describing interventions targeting primary caregivers in order to change their behaviour rather than their children's behaviour were further excluded.

4.3.1.3 Types of interventions

Intervention groups:

The criteria for eligible interventions are listed below:

- Behavioural interventions (e.g. education, skills and /or behaviour change) taking place in a school, home, community or any other setting convenient for the delivery of the intervention. The included interventions could comprise educational components and/or health instruction, such as lesson

plans and activities targeting a change in the knowledge, attitude, and/or behaviour of children and adolescents with regard to their intake of SSBs.

- Interventions targeting the reduction of SSB consumption as their main purpose, or as one of the elements of a multi-component intervention.
- Interventions that were with or without follow-up after the completion of the intervention. Interventions that were delivered by teachers at schools, by health promoters, health educators, health researchers or professionals from the field and addressed to children in the school setting, parents in the home setting, or any other setting to change their child's behaviour.

Interventions were excluded if:

- The intake of SSBs or any other kind of sweetened drinks was not targeted.
- Behavioural components (education and/or skills and/or behaviour change) were not elements of the intervention.
- If the intervention introduced a change at the population level or focused on policy guidelines including changes in availability and the price of foods, such as increasing the tax on certain beverages, or prohibiting the access to SSBs among other environmental-level interventions.

Control groups:

Any comparator was considered including no intervention or the conventional or standard approach.

4.3.1.4 Outcome measures and other variables

The primary outcome was the reduction in SSB consumption patterns after the delivery of the intervention, measured as a decrease in the intake of soft drinks, sweetened juices or any other sweetened drinks defined in the included study. This outcome was quantified using the difference in consumption of these beverages pre- and post- intervention and at follow-up.

Secondary outcomes included clinical or health outcomes leading to an improvement in the child's health status. These outcomes included but were not limited to:

- Reduction in weight and/or obesity status
- Changes in anthropometrics measures (e.g., body mass index (BMI) in kilograms per meter squared (kg/m^2).
- Reduction in oral health maintenance, and/or reduction in caries increment measured by the difference in decayed, missing and filled teeth (dmft/DMFT)
- Reduction in the risk of cardiovascular diseases (CVD)
- Reduction in the risk of developing diabetes mellitus type II (DM2)
- Reduction in other chronic diseases including hypertension, dyslipidemia, and orthopedic problems among others

Other relevant clinical outcomes were also extracted whenever available and reported based on the specific measurements in the included studies, such as reduction in glucose or cholesterol levels.

Both reviewers, Abir Abdel Rahman (A.A.) and Lamis Jomaa (L.J.), extracted the duration of interventions and the follow up period when primary and

secondary outcomes were measured in addition to other pertinent information for each of the included studies.

4.3.2 Search strategy for identification of relevant studies

The search strategy was designed to be comprehensive and thorough to identify all studies relevant to the research question. In order to increase the search specificity, keywords and terms to be used in the search strategy were identified through an initial search of PubMed and EMBASE followed by an analysis of text words included in the titles, abstracts retrieved and the index terms used to describe the articles. We started by determining the PICOS (**P**opulation of interest, **I**ntervention delivered, **C**ontrol group, **O**utcomes measured and **S**tudy design) (Cook & West, 2012). We also determined the related specific vocabulary. The search strategy for MEDLINE and EMBASE were the initial methods and all other strategies for other databases were revised and updated accordingly. The search strategy was based on a combination of three concepts: the participants, the consumption of SSBs, and the method of intervention (Table 4.1).

Table 4.1: Search strategy

Search terms	
1	Child* OR adolescent* OR student* OR teenager* OR youth* OR teen* OR "school aged child*"
2	"carbonated beverage*" OR "soft drink*" OR " Soda pop" OR "sugary drink*" OR "carbonated drink* OR "fizzy drink*"OR "sweetened drink*" OR " fruit drink*" OR " fruit juice*" OR "sweetened juice*" OR "sweetened beverage*" OR " sugar sweetened beverage*" OR "sugar-sweetened beverage*"OR beverage* OR Juice
3	behaviour*intervention* OR behaviour*intervention* OR behaviour*modification* OR behaviour*modification*OR behaviour*change* OR behaviour* change* OR intervention*OR health education
Search	Combine #1 AND #2 AND #3

4.3.2.1 Electronic searches

The electronic search was started on September 30, 2013 which included the following databases:

- ASSIA: Applied Social Sciences Index and Abstracts.
- CINHAL Cumulative Index of Nursing and Allied Health Literature (accessed via EBSCO).
- Cochrane Central Register of Controlled Trials (CENTRAL in The Cochrane Library)
- EMBASE: Excerpta Medica Database (accessed via OVID)
- MEDLINE: Medical Research literature (accessed via OVID)
- MEDLINE: Medical Research literature (accessed via Pubmed)
- PsycINFO (accessed via OVID)
- Web of Science

The full detailed search strategies of all databases are presented in Appendix R. Google scholar was searched as well in order to obtain additional publications. All retrieved citations were downloaded and managed using EndNote. This software helped as well to remove duplications from the database.

Table 4.2: Citations obtained from electronic searches from each database

Database	***Years searched***	***Number of documents obtained***	***Date searched***
PubMed	1947 to date	1314	October, 2013
EMBASE	1947 to date	1803	October, 2013
Medline	1947 to date	1419	October, 2013
PsycINFO	1967 to date	511	November, 2013
Web of Science	1900 to date	691	November, 2013
Cochrane Library	1988 to date	2931	November, 2013
CINHAL	1960 to date	867	December, 2013
ASSIA	1987 to date	1417	December, 2013
Total		***10953***	

4.3.2.2 Searching other resources

The researcher conducted hand searches of relevant journals to further identify any pertinent article that might have been potentially missed. The following journals were included in the hand search process.

- *Journal of Nutrition Education and Behaviour*
- *Journal of the Academy Nutrition*
- *Public Health Nutrition*
- *Journal of Nutrition*

In addition, the reference lists of all articles included in the final stage of the review were checked to locate further relevant titles.

4.3.3 Data collection and analysis

4.3.3.1 Selection of studies

The process of article selection was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Liberati et al., 2009) and is detailed in the flow diagram described in Figure 4.1. All citations identified were screened for relevance based on titles and abstracts. The first reviewer Abir Abdel Rahman (A.A.) and her supervisor, Lamis Jomaa (L.J.), serving as a second local reviewer, independently screened the titles and abstracts of retrieved articles for potential eligibility (Appendix S). When the screening of the titles and abstracts was not enough to bring evidence for inclusion of concerned papers, the full text of the article was retrieved in order to make a final judgment about the inclusion of the final report. Full texts of the references judged as potentially eligible by at least one of the reviewers were obtained for full-text

screening. The two reviewers then independently screened the full text of the article for eligibility using a standardized form with explicit inclusion and exclusion criteria. The two reviewers resolved any disagreements concerning the inclusion of articles by discussion or by consulting the primary supervisor, Pauline Adair (PA).

4.3.3.2 Data extraction and management

The Cochrane guidelines and format for data abstraction were used to enter data using Review Manager software for data management, excluding items from the Cochrane format that were not relevant to the scope of this review. The reviewer (A.A. and L.J.) independently extracted the data from each study into two separate RevMan files. After entering the data separately, the two reviewers discussed the entered data to see if there were discrepancies in reporting, before merging the information into one RevMan file. The process of data collection emphasized the following components:

- Methods: the study design, setting, unit of randomization, unit of analysis and funding obtained were listed. In addition, the tools used to measure the various outcomes were reported whenever available. The registration identifier was listed in the note section if the study was registered.
- Participants: the inclusion and exclusion criteria were highlighted, age at baseline, gender of participants, number of participants randomized and number of participants evaluated were all reported.
- Interventions: the aim of the intervention, the educational and behavioural components of the intervention, and details of how it was administered were all extracted. The duration of the intervention and the duration of follow-up

were also summarized. This section included a description of the control group (e.g. no intervention, waiting list, alternative intervention, or active control). Furthermore, any behavioural and educational components used in the intervention and/or constructs from theories of behavioural change used while developing the protocol and implementing the intervention were clearly described.

- Outcomes: Data related to primary and secondary outcomes was extracted as listed in section 4.3.1.4.
- Other notes: The statistical method, the source of funding if applicable in addition to the setting where the intervention took place were all included in this section.

4.3.3.3 Assessment for risk of bias for included studies

The risk of bias was assessed at the study level using the Cochrane risk of bias tool as described in chapter 8 of the Cochrane handbook for Systematic Review of Interventions (Higgins & Green, 2011; Littell et al., 2008). A summary of the risk of bias for each of the included studies was entered to the Review Manager Software (RevMan). The author (AA) and the local supervisor (LJ) independently assessed the methodological quality of each of the included studies and compared their risk of bias evaluations per study. Any pending disagreements were resolved by discussion with the primary supervisor (PA).

The criteria followed relative to the risk of bias assessment were:

- Random sequence generation (selection bias).
- Allocation concealment (selection bias).

- Blinding of participant and personnel (performance bias).
- Blinding of outcome assessment (detection bias)
- Incomplete outcome data (attrition bias)
- Selective reporting and whether the study was free of selective outcome reporting (reporting bias)

The data concerning the risk assessment of bias was entered into a specific table in the Review Manager where the first part described what had been reported in the article and the second part included a judgment concerning the risk of bias. The three options that were available to make the judgment were "low risk" of bias, "high risk" of bias, or "unclear risk" of bias. The studies were pooled into different groups according to the delivery of the intervention levels.

4.3.3.4 Subgroup analysis and investigation of heterogeneity

Heterogeneity was measured using the I^2 statistic. The I^2 statistic was interpreted according to the guide provided in section 9.5 of the Cochrane Handbook for Systematic Reviews of Interventions (Higgins & Green, 2001). The significance of heterogeneity measure was assessed by the associated p-value. Sources of heterogeneity were explored if the I^2 statistic exceeded 25%. Subgroup analyses were conducted to explore the reason for heterogeneity and the influence of the latter on the effect estimate. Subgroup analyses involved stratifying studies included in the meta-analysis into subgroups, so as to make comparisons between them. This was of particular interest so as to compare the effect of behavioural interventions conducted in a school-based setting versus those outside of school settings, as well as whether to include home and community-based behavioural interventions.

4.3.3.5 Assessment of reporting and publication bias

Selective reporting was assessed by trying to identify within-study reporting bias. In case the study protocol or trial registered in a certain trial registry was available, then outcomes of the protocol and published study manuscript could be compared. If not, then outcomes listed in the methods section of the study manuscript were compared with the outcome listed in the results section. Publication bias was further assessed by creating an inverted funnel plot in the Review Manager file for the primary outcome in relation to the intake of SSBs.

4.3.3.6 Data synthesis

The agreement between reviewers was assessed for study inclusion both during the title, abstract screening, and the full text screening stages using the Kappa statistic. The guidelines proposed by Landis and Koch (1977) were considered to interpret the agreement: Kappa values of 0 to 0.20 represent slight agreement, 0.21 to 0.40 fair agreement, 0.41 to 0.60 moderate agreement, 0.61 to 0.80 substantial agreement, and greater than 0.80 almost perfect agreement (Landis & Koch, 1977).

A meta-analysis was performed where mean differences in the consumption of SSBs were pooled using a random-effect model. Following the Cochrane Handbook recommendations, the unit of outcome data was converted to a standardized scale before pooling measures. For the change in SSB intake, to standardize the measurement, the unit of ml/day was reported. In case the equivalence in terms of ml/day was not reported, the nutrient analysis software was used for converting equations and units, (Nutritionist Pro Axxya Systems, 2014):

- one gram of sugar sweetened fluid is equivalent to 1 milliliter (ml).

- one glass of sugar sweetened fluid is equivalent to 240 ml.

For the conversion to BMI, reviewers referred to BMI z-scores instead of crude BMI measurements. BMI-z scores are standardized quantities adjusted for the child's age and sex, calculated based on the distribution of a reference population using WHO growth charts, based on reference populations of children from six countries representing the six continents (http://www.cdc.gov/growthcharts/clinical_charts.htm). Some of the limitations of calculating z-scores for BMIs are that they are harder to explain to the public and at times not very user-friendly in clinical settings when communicating with patients and clients. For this reason percentiles are more frequently reported in clinical settings; however standardized z-scores are reported more commonly in research studies and allow for comparisons to be made among different populations of children recruited across various trials worldwide (Wang & Chen, 2012).

4.4 Results

4.4.1 Description of studies

The section below describes key aspects of included studies. Descriptions of included studies will be summarized in the section 4.4.1.2. Further details in relation to the reasons for excluding the remaining studies will be summarized in the section 4.4.1.3.

4.4.1.1 Results of the search

The study selection process is described in Figure 4.1. A total of 10,953 records were identified through the electronic search of databases. Thereafter, 854

additional records were identified through other sources; 21 were identified through hand searches, and 833 through Google Scholar. After removal of duplicates from the total number (11,807) of identified records, 6,863 underwent a first round of screening based on title and abstract by the author Abir Abdel Rahman (AAR), and supervisor Lamis Jomaa (LJ). Of those, 6,790 were discarded as irrelevant to the review. When the authors were not able to judge the relevance of a paper, the full text was retrieved to reach a final decision to this end. Once the initial screening had been completed, the full texts of the 73 potentially relevant records were screened. Out of those, 58 were deemed as not having the necessary distinctly relevant elements of the intervention, and 15 trials were included in the review (*17 studies/articles, as 2 authors published two papers from one intervention*). The agreement between the author (AAR) and the supervisor (LJ) was substantially congruent, assessed at kappa 0.72. The inverted funnel plot for the primary outcome of reduction in SSB intake was not informative due to the low number of included studies in the meta-analysis (Figure 4.2).

Figure 4.1: PRISMA 2009 Flow Diagrams

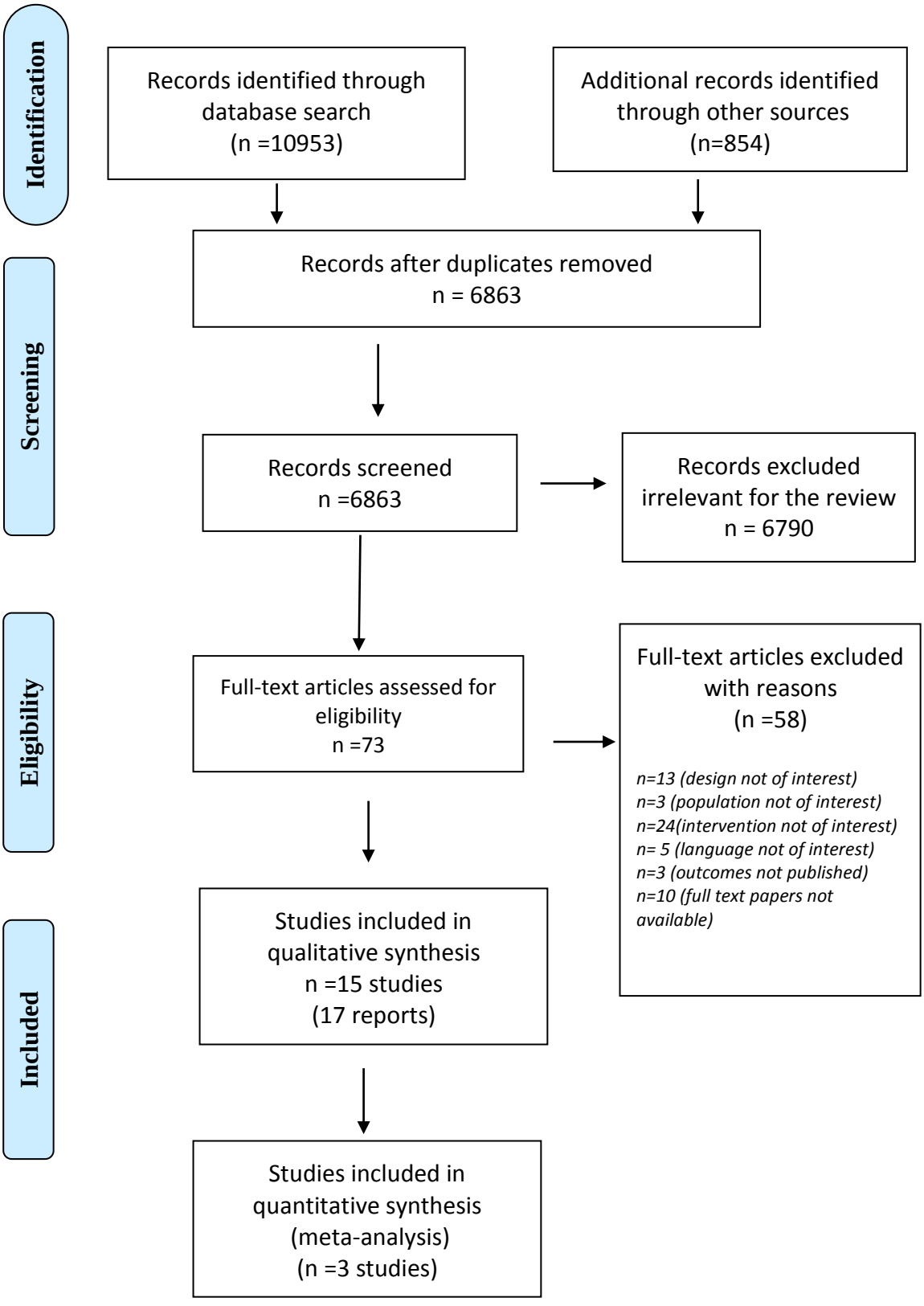
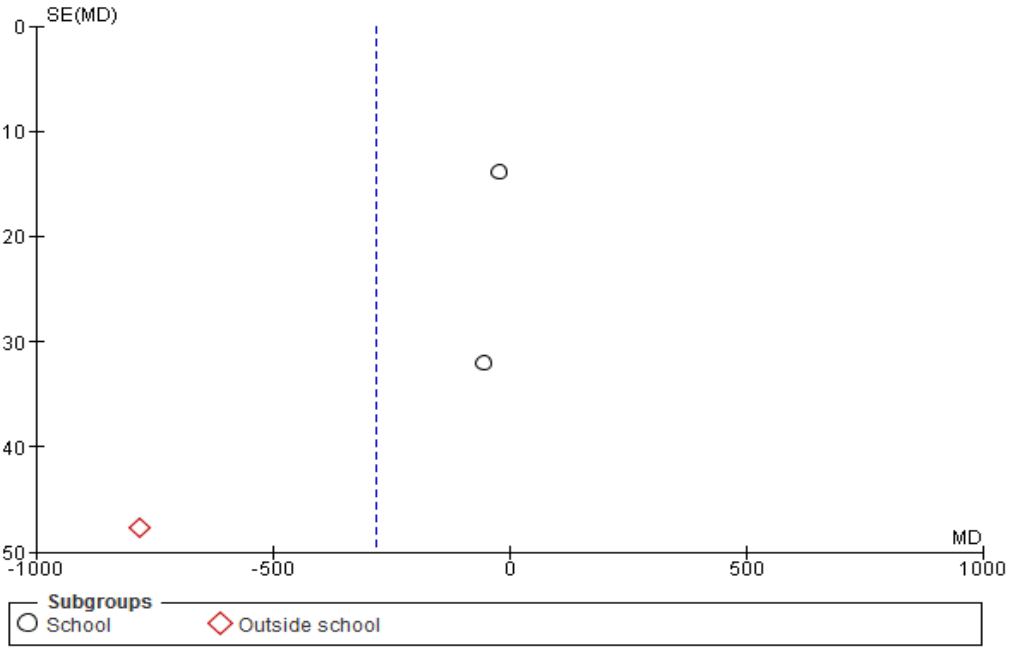


Figure 4.2: Inverted funnel plot for studies of behavioural interventions for children and adolescents to reduce their SSB intake.



4.4.1.2 Included studies

The table 4.3 summarizes the characteristics of the included studies (Appendix T)

4.4.1.2.1 Characteristics of the trial design

From the identified 15 interventions, 11 studies were school-based interventions (Bayer et al., 2009b; M. Bjelland et al., 2011; Cunha, de Souza, Pereira, & Sichieri, 2013; Ezendam, Brug, & Oenema, 2012; Haerens et al., 2007; James et al., 2004; Muckelbauer et al., 2009; Rosário et al., 2013; Sichieri, Paula Trotte, de Souza, & Veiga, 2009; Siega-Riz et al., 2011; Singh, Chin A Paw, Brug, & van Mechelen, 2009)and four interventions were based outside the school setting (Albala

et al., 2008; Beech et al., 2003; Rosenkranz, Behrens, & Dzewaltowski, 2010; van Grieken et al., 2013).

Nine of the interventions were cluster RCTS (Bayer et al., 2009; Ezendam et al., 2012; Haerens et al., 2007; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009; Sichieri et al., 2009; Siega-Riz et al., 2011; Singh et al., 2009; van Grieken et al., 2014; van Grieken et al., 2013). Two papers of the same study were published by James et al. (James et al., 2004; James et al., 2007) and van Grieken et al. (van Grieken et al., 2014; van Grieken et al., 2013).The design of three of the studies were RCTs (Albala et al., 2008; Bjelland et al., 2011; Rosário et al., 2013); the design of the Beech et al. (2003) intervention was an RCT with 3 arms, and the design for Cunha et al. (2013) was a paired RCT.

In total, eight studies were randomized at the level of the school (Bayer et al., 2009; Bjelland et al., 2011; Ezendam et al., 2012; Haerens et al., 2007; Muckelbauer et al., 2009; Rosário et al., 2013; Siega-Riz et al., 2011; Singh et al., 2009). In addition, three studies were randomized at the level of classes within the school (Cunha et al., 2013; James et al., 2004; James et al., 2007; Sichieri et al., 2009), while the Rosenkranz et al. (2010) study was randomized at the level of a scout troop and the van Grieken et al. (2014) and van Grieken et al. (2013) studies were randomized at the level of a youth health care center.

Among the retrieved studies, four studies were conducted in the U.S.A (Albala et al., 2008; Beech et al., 2003; Rosenkranz et al., 2010; Siega-Riz et al., 2011), two studies in Brazil (Cunha et al., 2013; Sichieri et al., 2009) , two were carried out in Germany (Bayer et al., 2009; Muckelbauer et al., 2009), two in the Netherlands (Ezendam et al., 2012; van Grieken et al., 2014; van Grieken et al.,

2013), and the remaining studies were conducted in different countries in Europe, including England, Belgium, Amsterdam, and Norway (Bjelland et al., 2011; Haerens et al., 2007; James et al., 2004; James et al., 2007; Rosário et al., 2013; Singh et al., 2009).

All of the studies stated a source of funding except for the interventions described by Ezendam et al. (2012) and Mucklebauer et al. (2009). Seven studies were registered in clinical-trials.gov (Albala et al., 2008; Bayer et al., 2009; Cunha et al., 2013; Muckelbauer et al., 2009; Rosário et al., 2013; Rosenkranz et al., 2010; Siega-Riz et al., 2011) and the two other studies used in three articles were registered in ISRCTN (Ezendam et al., 2012; van Grieken et al., 2014; van Grieken et al., 2013).

In total, 18,320 children participated in the fifteen studies (mean = 1221 children). Of these, 10,287 received the behavioural or educational component of the intervention and 8033 were included as a control group. The sample size in the control group ranged from 18 participants (Beech et al., 2003) to 1944 participants (Siega-Riz et al., 2011). As for the intervention group, the sample size ranged from 42 participants (Beech et al., 2003) to 2232 participants (Haerens et al., 2007). The two interventions by Beech et al. (2003) and Haerens et al. (2007) reported the number of participants as three groups, intervention with parents, intervention alone, and control groups. The reporting clearly differentiated between boys and girls in the following papers (Bjelland et al., 2011; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009; Singh et al., 2009). For the other studies, the number of participants was stated as the total number included in the intervention or total number in the control group.

4.4.1.2.2 Characteristics of the participants

Participants in the various studies ranged in age between 4 and 16 years old. Studies had different age groups of children at baseline overlapping the various childhood preadolescent/ adolescent categories making it difficult to divide the studies into distinct groups based on the children's age at baseline.

Preschoolers (aged between 4-6 years)

Two studies included in the review were conducted with preschoolers aged 4 – 6 years old (Bayer et al., 2009; van Grieken et al., 2014; van Grieken et al., 2013). These studies were included as children between 4 and 6 years old were the focus of the trials and fell within the age range of this research's target population. The study implemented by Bayer et al. (2009) described an intervention program titled "TigerKids" delivered in Kindergartens. The other study was conducted with preschoolers aged 5 years old and was titled "Be Active, Eat Right (van Grieken et al., 2013; van Grieken et al., 2014), though the latter only included overweight children.

Early to Late Childhood (Children aged between 6 - 12 years old)

Many of the included studies were conducted on children within their late childhood/early adolescent developmental period. Six studies discussed in seven papers were conducted with children aged between 7 and 11 years of age (Albala et al., 2008; Beech et al., 2003; Bjelland et al., 2011; Cunha et al., 2013; James et al., 2004; James et al., 2007; Siega-Riz et al., 2011). All the children included in the intervention reported by Beech et al. (2003) were girls, whereas the sample of Albala

consisted of 53% boys, and included only children who drank two servings of SSBs or more, or had a BMI of more than the 85th percentile (Albala et al., 2008), whereas 48.6% were boys in the study described by Bjelland et al. (2011), and 50.3% were boys in the study of James et al. (2004). Siega-Riz et al. (2011) included schools who had more than 50% African/American, Hispanic/Latino, or American/Indian population and only those schools that had greater than a 50% eligiblity for federally reimbursable meals or meals at a reduced-cost.

Three studies were conducted among children aged 8 to 12 years (Muckelbauer et al., 2009; Rosenkranz et al., 2010; Sichieri et al., 2009) and one study included children aged between 6 and 12 years (Rosário et al., 2013). Rosenkranz et al. (2010) included only girls in their study and stated that troops which were not primarily composed of Girl Scout Juniors and/or did not meet regularly during the study period were excluded. Muckelbauer et al. (2009) included 50% boys in his study across 32 elementary schools in two German cities.

Adolescence age group (12 -16 years old children)

Two interventions included participants in this age group (Haerens et al., 2007; Singh et al., 2009). Haerens et al. (2007) delivered a school-based intervention to 7th and 8th graders from a random sample of 15 schools offering technical or vocational training primarily aimed to promote healthy eating. The age of the children at baseline was not reported; however, the mean age of the children participating in the study was 13 years old, reflecting the early adolescent period and including 63.4% boys. This intervention was unique from all other included studies as it included a comparison between two intervention groups and a control group,

where the first intervention group received parent-tailored intervention together with the school-based child-targeted intervention, the second intervention group included only the child-targeted component without parental involvement, and then both groups were compared to a control group that did not receive either interventions. Children received computer tailored intervention focusing on fat and fruit intake, whereas the environmental component of the intervention addressed the availability and accessibility of soft drinks within schools and tried to promote the drinking of water as opposed to soft drinks by providing water for free or at a reduced price compared to the alternatives with added sugar.

4.4.1.2.3 Characteristics of the intervention

School-based educational programs

The intervention conducted by James and colleagues entitled "Ditch the Fizz" was primarily focused on discouraging the consumption of soft drinks among children and replacing this behaviour with a healthier one (James et al., 2004; James et al., 2007). This intervention was part of "CHOPPS", the Christchurch Obesity Prevention Programme in Schools in southwest England. The study was conducted over one academic year and all enrolled children in each classroom (cluster) were randomized into the intervention group. The latter received four sessions of one hour duration each and included specific messages about the impact of sweetened carbonated colas on tooth decay. Each class was given a tooth immersed in a sweetened carbonated cola to assess its effect on dental health. The importance of drinking water was also emphasized. The children tasted fruits to learn about the sweetness of natural products. Teachers assisted in the sessions and were encouraged

to reiterate the message in lessons during regular classes. The last session of the intervention focused on using the arts, music, and other interactive activities to teach students how to improve their health (including dental health) through reducing their sugar consumption. Each class was given a copy of song lyrics (Ditch the Fizz) and challenged to produce a song or a rap with a healthy message. The author stated that the prevalence of obesity among the children included in the intervention was detrmined in the pilot study two years before the implementation of the intervention (James Thomas, &, Kerr, 2002). However, the author didn't mention if the program of the intervention had been piloted before implementation. The reporting of outcome measures was after 6 and 12 months. The follow up study after 3 years (James et al., 2007) reported only one outcome (BMI). The data on drinks relied on self-reporting which could be subject to under-reporting (French, 2004) and as well it was collected for three days only which is considered a short duration of time. Moreover, only 36% of participating students returned the data on drink consumption after the follow up period.

The intervention conducted by Ezendam et al. (2012), was a 10 week program, composed of eight modules about weight management with each module lasting 15 minutes. FATaint PHAT was a web-based computer tailored intervention. The intervention was not piloted prior to implementation. The author emphasized reducing the intake of high energy snacks and the reduction of SSBs in addition to other components such as reducing sedentary behaviours, increasing physical activity and the increased intake of fruits and vegetables. The teachers were instructed to spend 15 minutes each week to explain the use of the web interface. The outcomes were measured 4 and 12 months after delivering the intervention. The main

limitations of this study lied in the use of self-reporting, in the lack of assessment of the pubertal status of children at the beginning of the study which affected the quality of anthropometric measures, and in the difference in characteristics between the intervention and control groups.

Sichieri et al. (2009) conducted a 7-month educational intervention on children recruited from 22 public schools in Brazil. The educational program provided specific simple messages that promoted water instead of SSB consumption through classroom activities, banners were hung on walls promoting water consumption, and there was a distribution of water bottles to both students and their teachers. The intervention was tailored to the age of the children as it included fun interactive games that encouraged students to draw and sing songs highlighting the importance of water and its benefits for the body. According to the authors, the messages highlighted in the intervention were previously tested for comprehension by two small groups of children of the same age and socio-economic background as the children who participated in this study. Furthermore, the beliefs and behaviours of the children were assessed through focus groups and then implemented in the development of the printed materials given to the participants. The major limitation in this study was data collection which relied on 24- hour recall at baseline and 24-hour recall after the intervention. The author tried to validate the data collected at baseline by administering another beverage frequency questionnaire.

The intervention reported by Singh et al. (2009), was an 8 month program which included an educational component comprised of eleven classes on healthy food and physical education. The intervention also included physical education classes. The elements related to healthy food focused on the consumption of sugar-

rich beverages and high-energy snacks. The behaviours targeting energy output/expenditure included physical activity and screen-viewing behaviour. The authors didn't report any piloting of the intervention and parents were not involved in the implementation of the intervention. The outcomes were measured immediately after the end of the intervention. The effect of the intervention was maintained for the first 12 months, but dissipated by 20 months. The research assistants were not blinded during the implementation which constituted a major limitation in the study in addition to the report of outcomes and the non-random selection of schools.

School-based educational programs with parental involvement

The research described by Bayer et al. (2009) was a behavioural intervention program focusing on modifying the habits of food and drink consumption among preschool children. The educational materials used in the study were tailored for kindergarten teachers which included modules for day-to-day activities and CDs with songs to be used at the Day Care. The study also included newsletters and 'Tipp Cards' targeting parents, along with simple health-related messages to be implemented with their children such as the energy content of fruits, vegetables and energy snacks. In addition, Bayer et al. (2009) implemented role modeling behaviour with the preschool children in the day-to-day activities as well as songs and informational material for the parents in an effort to extend the behaviour modeling into the home. The environmental component included the availability of only healthy food items at school for snack times. This intervention extended over an 18 month period while the control group maintained the regular program.

The PAP-PAS (parents, students and teachers for healthy eating) intervention was described by Cunha et al. (2013). This study aimed to encourage students to change their eating habits and food consumption patterns over a period of 9 months through one hour sessions delivered monthly in the classroom carried out by trained nutritionists employing games, theater sketches, movies, and puppet shows, as well as creating writing and drawing contests. In addition, the school nutritional sessions included activities, educational material, and strategies for reinforcement by the teachers. Furthermore, parents and teachers received the same positive information on the intake of water, fruits, rice and beans. There was a particular emphasis on reducing SSBs and cookies. Cunha et al. (2013) attempted to provide children with a supportive environment. The environmental component focused on the availability of controlled meals at home motivated by the disbursement of educational material by sending booklets and recipes to parents in order to encourage them to reduce the purchase of sodas and increase the availability of fruits. Small gifts were sent to parents at home as incentives. The measures were taken at baseline, after 3 months, 6 months, and at the end of the academic term. It is worth noting that the two groups were not well matched at baseline with a higher percentage of overweight, obesity, and children who drank SSBs in the control group.

Rosario et al. (2013) used a teacher training program in Portugal to communicate knowledge about the consumption of low nutrient, energy dense (LNED) foods and beverages through activities for the children with parental/family involvement for healthy meals at home. The information was delivered by training teachers about various health-related topics delivered through 12 sessions (3 hours each). The sessions promoted healthy eating behaviours. Key concepts in food,

nutrition and dietary guidelines (the Portuguese Food Wheel) were provided. The concept of hydration and the importance of water were emphasized. Nutritious recipes and strategies to get children and their families involved in healthy eating were also highlighted. The intervention lasted 6 months. The major goal in the study was to reduce the consumption of low nutrition energy dense (LNED) foods and beverages among the participating children. The author didn't report any piloting of the intervention before implementation. The data were collected using a 24- hour dietary recall right before and right after the intervention. One of the limitations of the study was that the schools selected could have differed from other schools as there was no budget to investigate the characteristics of non- participating schools.

School-based educational programs with environmental change

The study conducted by Bjelland et al. (2011), known as the HEIA study, included an intervention program over a period of 16 months with a mixture of individual, group and environmental leveled strategies and activities targeting the reduction in intake of SSBs and screen time among children. The messages were reiterated through student booklets and posters. The intervention included numerous lessons and educational materials most of which were tailored to the children participating in the study, and others targeting the parents and the school physical education teachers to provide the children with a supportive environment. The environmental component included fruit and vegetable breaks and physical activity equipment for recess activities. This multicomponent intervention explored if the intake of SSBs was influenced by gender and if the educational level of the parents influenced their involvement. The messages were reiterated through student booklets

and posters. The author didn't report any pilot study before the implementation, but the study of the protocol was published elsewhere. The outcomes were measured after 8 months as a midway assessment. Contact with the author via mail confirmed that the final assessment of the last measurements was not yet published in any formal paper.

Haerens et al. (2007) used an educational intervention with environmental components. The implementation of the intervention took place mainly on the school premises, but also at home because it targeted children and their parents. The latter were reached through school newsletters and informational brochures. Additionally, a CD including the adult computer-tailored intervention segment for fat intake was given to all parents to use and complete at home. This school-based intervention programme was developed to promote healthy food choices and physical activity engagement in order to prevent the increasing prevalence of overweight children in the Netherlands. The food intervention focused on three behavioural changes that were supported by environmental changes: increasing fruit consumption to at least 2 pieces a day, reducing soft drink consumption while increasing water consumption, and reducing the intake of fatty foods. The environmental component of the intervention aimed to change the availability and accessibility of soft drinks at schools. The intervention tried to promote the drinking of water as opposed to soft drinks by offering it free with drinking fountains, or at a lower price than soft drinks in shops or vending machines which were available at the schools.

The study reported by Mucklebauer et al. (2009) took place in two German cities. It included educational and environmental components. The children of interest were primary school aged children. It promoted the consumption of water in

socially deprived areas of the two cities. As part of the curriculum, educational sessions were delivered by teachers about the importance of the consumption of water and the effect of the consumption of soft drinks or sweetened juices on their health. It included as well the provision of water bottles and water fountains. Utilizing water bottles during the intervention was a motivational factor for children to change their behaviour. In addition, the measurement of water flow during the intervention indicated that the children's overall intake of water increased. The study materials which were developed for the intervention, the data collection, and the procedure followed to implement the intervention were piloted. Of all the studies included, this study was among the first to add the cost of the intervention; the cost of each fountain installed at the schools was 2500 € and the estimated cost per child per year was 13 €. The cost of giving the educational sessions was not included as the lectures were embedded in the curriculum and given by the regular school teachers. Parents were not involved in the intervention.

Siega-Riz et al. (2011) conducted a study across various states in the United States. This intervention was conducted over two academic years being 5 semesters. It consisted of behavioural and environmental components aimed at examining the effects of an integrated multicomponent intervention in moderating the risk factors of type II Diabetes Mellitus among public middle school students. The environmental component focused on eliminating all beverages with added sugar from the school premises. The intervention consisted of four integrated components: lessons on nutrition, physical education, behaviour modification, and socially marketed communications (Siega-Riz et al. (2011). The nutritional intervention implemented changes in the quantity and nutritional quality of food and beverages offered in the

school environment. The physical education component provided lesson plans and accompanying equipment to increase both the participation and number of minutes spent in moderate to vigorous physical activity. The behavioural component included classroom activities in order to increase knowledge and awareness, as well as strengthen decision-making skills particularly vulnerable to social influence for adolescents in middle school. Parents were involved by sending informational newsletters and take-home packages of materials that provided information and strategies to support and reinforce the targeted youth in accomplishing the desired behavioural goals. The major limitations of the intervention were that the duration of the implementation may have been too short to affect or reveal external factors of behavioural influence, the delay in changing the school policy to modify the food environment during the time-frame of the study, and questionable effectiveness of the FFQ to capture all changes in behaviour.

Community/Home -based programs

Four trials in this review were home-based. Albala and colleagues (2008) focused on an environmental intervention to establish the grounds for behavioural change among children in Chili. This 16-week intervention focused on discouraging the consumption of SSBs by children, replacing their drinking behaviours with the consumption of milk in a home-based intervention. A nutritionist visited the homes providing instruction on consuming the delivered beverages, and removing SSBs from the home. Flavored milk beverages were delivered weekly as increasing the consumption of milk was a major factor in the intervention. All members of the household were encouraged to support the targeted subject by not drinking SSBs.

The diet of the target audience was assessed by a food-frequency questionnaire at the beginning and end of the study. The author didn't, however report any pilot work prior to the final stage of implementation. The major limitation in this study was the small sample size of students and the relatively short time allocated for this intervention. An additional limitation was the reliance on self-reporting of dietary assessment as has been common among many of the other interventions described.

The 12 week GEMS pilot study reported by Beech et al. (2003) in Memphis, Tennessee, was a three-armed targeted intervention for pre-adolescent African-American girls; the first arm included girls, the second targeted the parents, and the third was for the control group. It was a 90-minute intervention over a 12-week period with weekly interventions which started with a 15 minute introduction, a welcoming and discussion, and ended with a 15 minute "Taking it Home" segment for healthy eating and physical activity to be continued at home. The major goals of this study were to; increase awareness in relation to the consumption of healthy foods and beverages - "Munchin it", and increase physical activity among children in the specific age group - "Movin it". One element of the active intervention was to increase the consumption of water and decrease the consumption of SSBs. The themes obtained from the qualitative study were used in order to develop the intervention and materials for the parent–targeted component. The parents were targeted with "Eating and Activity Skills for Youth (EASY)" in parallel over the same 12 weeks including physical activity (EASY Moves), nutrition education (EASY Tips), and a segment for food preparation and nutritional games (EASY Fun). Additionally, culturally relevant material related to the weekly topic was distributed.

Rosenkranz et al. (2010) used a group RCT with a nested cohort design for Girl Scouts titled “Healthier Troops in a SNAP (Scouting Nutrition & Activity Program)” in Manhattan, Kansas. The troops were the unit of randomization. The intervention consisted of three main components: an interactive educational curriculum delivered by troop leaders, troop meeting policies implemented by troop leaders, and badge assignments completed at home by the Scouts with parental assistance. The educational curriculum consisted of eight modules delivered over the course of four months. The major goals for behaviour change in the intervention included frequent family meals (FM), parent-child shared physical activity, elimination of TV viewing during mealtime, drinking water instead of SSBs at mealtime, encouraging the consumption of fruits and vegetables at family meals, and practicing good manners during family meals as well as helping parents prepare them and cleaning up afterwards. These concepts were delivered during weekly or biweekly meetings of one or two hours. The effectiveness of these efforts was observed during meetings, but the maintenance of this behaviour modification in the home setting was not successful though there was some data of parental involvement. However, this intervention was successful in the environment of the weekly meetings with controlled food availability. This work had been previously piloted by Ebbeling and colleagues (2006) before the implementation of this intervention. Funding was the main limitation in this study which resulted in recruiting a small sample size and the short duration for the intervention.

In the study by van Grieken et al. (2013) they used the parents as a conduit for behaviour modification within the home environment since the targeted age group was 5 years old. This study was based on the education of the parents to

effecta lifestyle change for their children. It was a behavioural intervention program focusing on a theoretical model exercising habit formation. This was carried out at nine child health care centers. The health care professionals used motivational interviewing techniques to increase awareness, motivate parents and support behavioural change. Participants were exposed to a regular preventive health check and would be invited for up to three additional counseling sessions during which they received personal advice about a healthy lifestyle and were motivated for and assisted in behavioural change. The three lifestyle counseling sessions were offered to parents at intervals of 1, 3 and 6 months after the regular preventive health session. It is worthy to note that one of the behaviours targeted in this intervention was limiting the consumption of sweetened beverages to not more than 2 glasses per day (including soft drinks, fruit juices, sports/energy drinks, sweetened milk/yoghurt drinks or tea with sugar). Four lifestyle related activities were monitored: outside play, daily breakfast, control of SSBs, and limiting exposure time to television thus targeting the goal behaviours of having breakfast and being physically active, while limiting exposure time to TV and computer games. Handouts and diaries were used to monitor the behaviour. Data was collected at baseline and after 2 years, at which time parents were asked to complete a questionnaire as well. This work was not piloted before the enactment of the intervention. The major limitation was the possible contamination of the control group as the health care professionals didn't entirely abide by the set protocol and provided the control group with the regular tailored care in order to prevent obesity, which could result in little to no effect between the two groups. Another limitation was the fact that not all parents attended the additional sessions that were scheduled.

4.4.1.3 Excluded studies

Based on communication with other possible authors, three studies were excluded because their authors confirmed that the results were not yet published. In addition, for studies in foreign languages, given that this review was part of a doctoral dissertation that was not funded, the process of professional translation for studies that were identified to be of relevance yet written in languages other than English could not be supported. Thus, five studies were excluded because they were not available in English; two were written in Persian, one was only available in Chinese, one was only available in German, and one was only available in Spanish. All possible attempts were made to obtain the papers of all identified relevant studies, of which ten were available only as poster or abstract. The majority of the remaining studies were excluded either because the design of the study was not sufficiently relevant or the intervention didn't include a specific component in relation to the intake of SSBs. The characteristics of all excluded studies are summarized in Appendix U.

4.4.2 Risk of bias in included studies

The Cochrane collaboration's risk of bias was used to conduct the quality assessment. This tool assessed each included study on seven domains: sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessors, incomplete outcome data, selective outcome reporting, and other bias (Appendix V). The majority of the studies scored low risk in the domains related to selection bias (random sequence generation), attrition bias, reporting bias and other bias. Half of the studies scored low in the domain related to performance

bias (blinding of participants and personnel). The majority of the studies scored unclear risk in relation to the domain of allocation concealment. Furthermore, 25% of the studies scored high risk in relation to the detection bias (blinding of outcome assessment) while 20% scored low risk. Figure 4.3 below shows a summary of the risk of bias assessment performed.

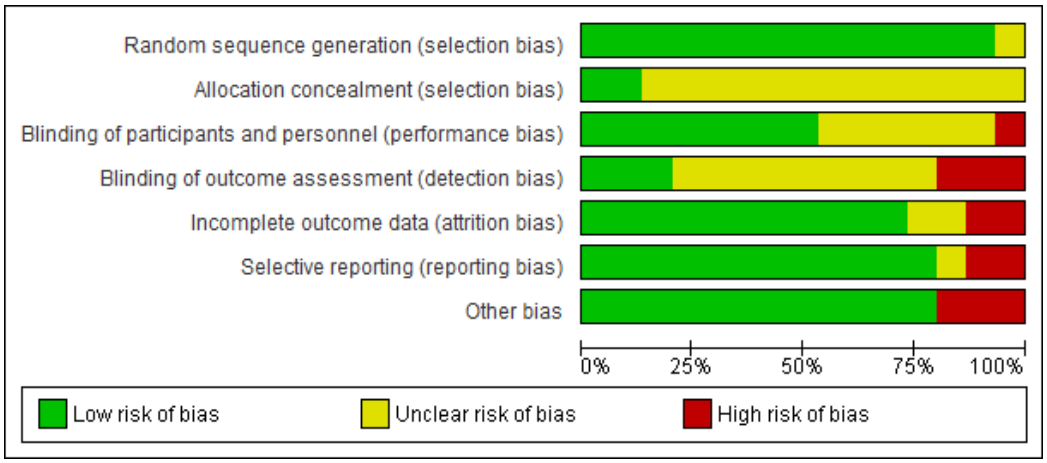


Figure 4.3*:* Risk of bias graph: judgments about each risk of bias item across all included studies

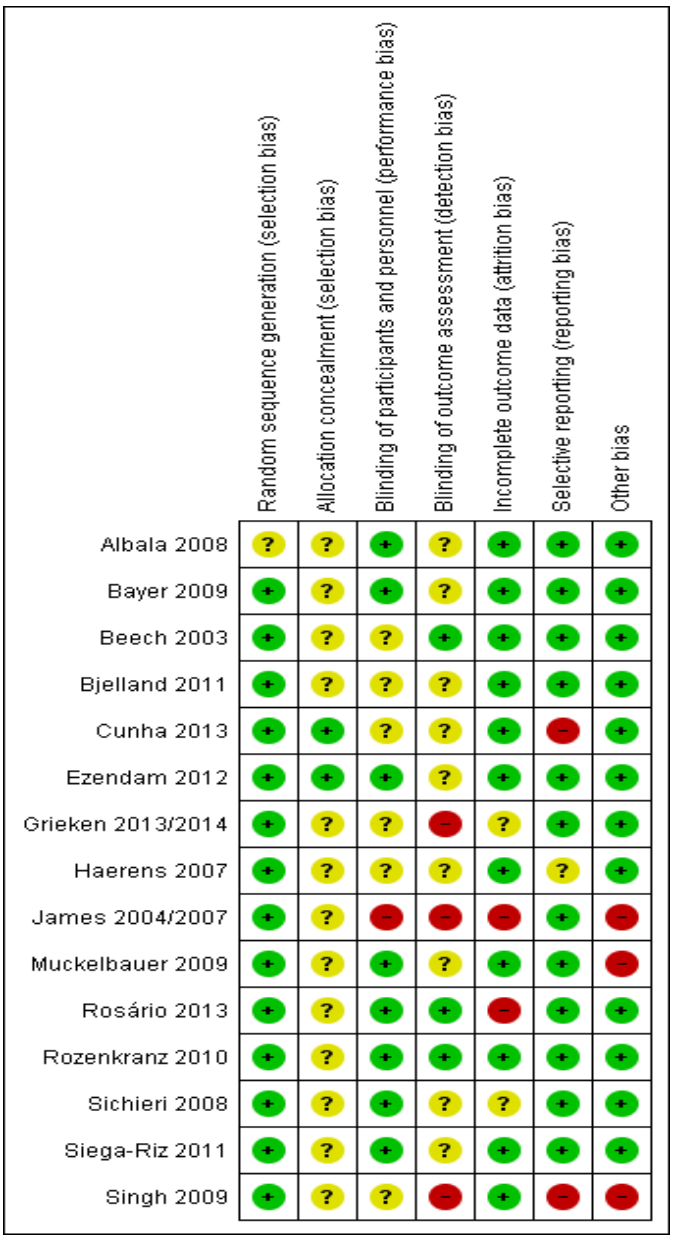


Figure 4.4*:* Risk of bias summary: review authors' judgments about each risk of bias item for each included study (intervention delivered in school setting or community/home setting).

4.4.2.1 Allocation

4.4.2.1.1 Random sequence generation

In one of the included studies (Albala et al., 2008), it was not clear how the randomization was conducted and therefore this study was judged as having an unclear risk of bias. The risk of bias was judged as low in the remaining studies

(Bayer et al., 2009; Beech et al., 2003; Bjelland et al., 2011; Cunha et al., 2013; Ezendam et al., 2012; Haerens et al., 2007; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009; Rosário et al., 2013; Rosenkranz et al., 2010; Sichieri et al., 2009; Siega-Riz et al., 2011; Singh et al., 2009; van Grieken et al., 2014; van Grieken et al., 2013). Across the above listed studies, the method of randomization was clearly stated. For instance, it was stated as a random number table, a simple drawing, a stratified randomized scheme, a computer generated set of random numbers, or a computerized randomization using an interactive voice-response telephone directory. As for the paper of Rosenkranz et al. (2010), the randomization was derived according to the number generated for the scout troop where the randomization occurred by the author within the strata.

4.4.2.1.2 Allocation concealment

The allocation to intervention or control was not discussed in the following studies, and the authors didn't identify their means of concealment, so these studies were judged as having an unclear risk of bias (Albala et al., 2008; Bayer et al., 2009; Beech et al., 2003; Bjelland et al., 2011; Haerens et al., 2007; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009; Rosário et al., 2013; Rosenkranz et al., 2010; Sichieri et al., 2009; Siega-Riz et al., 2011; Singh et al., 2009; van Grieken et al., 2014; van Grieken et al., 2013). The randomization in Cunha et al. (2013) was carried out using opaque envelopes in the presence of three investigators, each pair in the ranking sequence was randomly drafted with one class being assigned to the experimental group and one class to the control group, so this study was judged to have a low risk of bias. The study reported by Ezendam et al. (2012) was also judged

as having a low risk of bias as the author clearly described how the concealment occurred.

4.4.2.2 Blinding

4.4.2.2.1 Participants and personnel

It is very difficult and problematic to blind participants and people in charge of delivering the intervention. This problem has been stated in other reviews such as the Cochrane Review by Waters el al. (2011) where the authors acknowledged the blinding problem in behavioural and educational interventions.

Seven studies were judged to be of low risk for performance bias as blinding of the personnel is not possible in behavioural interventions, therefore staff bias can only be minimized. In these studies, schools took measures to make sure that participants were blinded to the allocation. It was clearly stated that to minimize the bias only the study staff who delivered the intervention appeared at the intervention school and they were separated from other study staff members who administered data collection procedures for both intervention and control groups (Albala et al., 2008; Bayer et al., 2009; Ezendam et al., 2012; Muckelbauer et al., 2009; Rosário et al., 2013; Sichieri et al., 2009; Siega-Riz et al., 2011). In the paper reported by Rosenkranz et al. (2010), the author clearly stated that at the commencement of the study research assistants were blinded to the status of each troop. This study was therefore judged as having a low risk of bias.

In six studies, the blinding of participants and personnel was not clearly indicated or reported and it could therefore be assumed that the participants in these studies were not blinded to their group allocation after giving consent (Beech et al.,

2003; Bjelland et al., 2011; Cunha et al., 2013; Haerens et al., 2007; Singh et al., 2009; van Grieken et al., 2014; van Grieken et al., 2013).

In one study, it was clearly stated that contamination could have occurred as randomization was across classes and not across schools, and the dissemination of messages could happen outside the classroom where the transfer of knowledge could take place. In addition, there was only one investigator who delivered the program to all classes including the lessons and educational material sessions. This study was judged as having a high risk of bias (James et al., 2004; James et al., 2007).

4.4.2.2.2 Outcome assessors

Three studies were judged as having a low detection bias (Beech et al., 2003;Rosário et al., 2013; Rosenkranz et al., 2010). Here children and outcome assessors were blinded to group assignment as sufficient information was provided to assume blinding. In the following studies (Albala et al., 2008; Bayer et al., 2009; Bjelland et al., 2011; Cunha et al., 2013; Ezendam et al., 2012; Haerens et al., 2007; Muckelbauer et al., 2009; Sichieri et al., 2009; Siega-Riz et al., 2011) no input regarding the blinding of outcome assessors was detailed. Hence, they were judged as having an unclear risk of bias.

The two trials of James et al. (2004) and Singh et al. (2009) were judged as having a high risk of bias because the researcher was the person who delivered the intervention, and at the same time the assessor or the research assistant was also involved in the organization of the measurements and was not blinded to the group assignment. The trial conducted in the 2 reports produced by van Grieken et al. (2014) and van Grieken et al. (2013) demonstrated a high risk of bias as the author

was responsible for data collection, data analyses, study coordination and reporting of outcomes.

4.4.2.2.3 Incomplete outcome data

The majority of the studies in this review were judged to be of low risk of attrition bias. Eleven out of the fifteen trials were classified as having a low risk of bias in relation to the incomplete outcome data domain (Albala et al., 2008; Bayer et al., 2009; Beech et al., 2003; Bjelland et al., 2011; Cunha et al., 2013; Ezendam et al., 2012; Haerens et al., 2007; Muckelbauer et al., 2009; Rosário et al., 2013; Siega-Riz et al., 2011; Singh et al., 2009). The rate of participants who dropped out from these studies was low, and in these studies few participants were lost for follow up during the midway assessment or the final assessment. The attrition rate observed in these studies was judged as unlikely to impact the outcome after the delivery of the intervention. In addition, many of these studies reported that the characteristics of participants who were lost didn't differ from those who stayed. In addition, reasons for the participants' withdrawal were listed explicitly in the trials such as no follow up on a participant due to sickness, medical appointments, or sometimes the student moved to a different school or class. In another paper, participants refused to participate for unknown reasons, but this was applicable to only a very small percentage of people and the rates were reported. In one study, it was clearly stated that the retention rate was 95%, as well as the high retention rate in the papers of Beech et al. (2003) and Rosenkranz et al. (2010).

There were only two studies, used in three papers, that were judged as having an unclear risk of bias (Sichieri et al., 2009; van Grieken et al., 2014; van Grieken et

al., 2013). In these studies, insufficient information was given to determine the attrition rate. The studies reported only that a non-response analysis was undertaken, including ethnicity, education level, and household composition. Two studies used in three papers (James et al., 2004; James et al., 2007; Rosário et al., 2013) were judged as having a high risk of bias concerning attrition. In these studies, the author stated that a high proportion of participants were lost in follow up which may have resulted in response bias and/or results description.

4.4.2.2.4 Selective reporting

Twelve out of fifteen of the included studies used in fourteen articles were judged as having low risk for the domain of selective reporting (Albala et al., 2008; Bayer et al., 2009; Beech et al., 2003; Bjelland et al., 2011; Ezendam et al., 2012; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009; Rosário et al., 2013; Rosenkranz et al., 2010; Sichieri et al., 2009; Siega-Riz et al., 2011; van Grieken et al., 2014; van Grieken et al., 2013). All primary and secondary outcomes as indicated in the study protocol were reported in the results section. In a few studies, there was a need to contact the author in order to get the exact protocol or to be able to access the protocol published elsewhere. For instance, the protocols for the study done by Bjelland et al. (2011) and the study done by Siega-Riz et al. (2011) were obtained in order to determine the details of the intervention and the pre-specified outcomes (Drews et al., 2009; Lien et al., 2010). In the study of van Grieken et al. (2013), the results were published in a separate article, but they were in alignment with the primary and secondary outcomes that were reported in the protocol (Veldhuis et al., 2009). The risk of bias in the study reported by Haerens et al. (2007) was judged as

unclear as the outcomes presented in the article were in alignment with the objectives of the study, but the effects of the intervention on adiposity indices and children's physical activity levels were indicated to have been submitted elsewhere.

The studies described by Cunha et al. (2013) and Singh et al. (2009), were judged to have a high risk of reporting bias because one or more outcomes of interest were reported incompletely, or the results at different time intervals were not fully reported. Moreover, in the Singh et al. (2009) paper, the primary and secondary outcomes changed. For example, in Singh et al. (2009) paper, the primary outcome reported was related to the mediators of energy related behaviours while in the protocol of the original study, the primary outcome was body composition and anthropometric measurement (Singh et al., 2006). The mediators of the behaviours were not measured despite the fact that they were described in length and analyzed in the protocol (Singh et al., 2009).

4.4.2.2.5 Other potential sources of bias

The majority of the studies were classified as low risk of bias in relation to any other sources (Albala et al., 2008; Bayer et al., 2009; Beech et al., 2003; Bjelland et al., 2011; Cunha et al., 2013; Ezendam et al., 2012; Haerens et al., 2007; Rosário et al., 2013; Rosenkranz et al., 2010; Sichieri et al., 2009; Siega-Riz et al., 2011; van Grieken et al., 2014; van Grieken et al., 2013). Although the above studies were classified as having a low risk of bias, three papers were judged as actually having a high risk of source bias. In the paper reported by James et al. (2004) and its extension in James et al. (2007), the risk of contamination could have occurred as the randomization took place according to classes and not schools. Thus, the transfer of

knowledge may have taken place outside the classroom. The author tried to minimize this by the randomized cluster design. In addition, the use of a diary in order to collect the data over only three days, and the validity of self-reporting could be questioned for underreporting. The same concern applies to the study described by Singh et al. (2009); there was a possibility of social desirability bias in addition to the fact that over and underreporting biases may have influenced the measurements of energy balance related behaviours. The study of Muckelbauer et al. (2009) was also judged as high risk as well because the selected schools were randomized in two different cities in Germany which can create the bias that the two schools might not share the same characteristics at baseline.

4.4.3 Effects of interventions

4.4.3.1 Primary outcomes

4.4.3.1.1 Reduction in SSB intake

A total of 15 trials assessed the difference in consumption of SSBs pre- and post- intervention using different measures (Albala et al., 2008; Bayer et al., 2009; Beech et al., 2003; Bjelland et al., 2011; Cunha et al., 2013; Ezendam et al., 2012; Haerens et al., 2007; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009; Rosário et al., 2013; Rosenkranz et al., 2010; Sichieri et al., 2009; Siega-Riz et al., 2011; Singh et al., 2009; van Grieken et al., 2014; van Grieken et al., 2013).

The statistics sought for the meta-analysis were: mean of change in SSB intake in ml/day for each arm, the corresponding standard deviation of each mean, and the total number of participants per arm. The variety in the reporting of the effect of interventions precluded any attempt of including all trials in the meta-analysis.

Only three trials provided homogeneous measures of statistical data that could be combined in a meta-analysis (Albala et al., 2008; Muckelbauer et al., 2009; Sichieri et al., 2009).

The remaining 12 trials were not included due to: statistical data reported as a dichotomous outcome (Bayer et al., 2009a; van Grieken et al., 2014; van Grieken et al., 2013) ; statistical data separately reported for weekends and weekdays (Bjelland et al., 2011); statistical data provided pre-intervention and post-intervention only, thus calculating the standard deviation of the change between the two data points was not possible without the raw data (Ezendam et al., 2012; Haerens et al., 2007; Rosário et al., 2013; Rosenkranz et al., 2010); statistical data reported in terms of median, standard deviation, and interquartile range, thus calculating the mean difference was not possible without the raw data (Siega-Riz et al., 2011); statistical data reported for girls and boys separately, hence calculating the pooled standard deviation of the two groups was not possible without the raw data (Singh et al., 2009); values of change within each group were not reported (Beech et al., 2003; Cunha et al., 2013); and the statistical data group was reported in terms of clusters (James et al., 2004). The authors of these studies were contacted; however none provided sufficient pertinent data to be included in the meta-analysis.

The meta-analysis of the three trials (Albala et al., 2008; Mucklebauer et al., 2009; Sichieri et al., 2008) included 3004 participants. The unit of analysis used was milliliters (ml) per day. Albala et al. (2008), reported SSB consumption in terms of grams per day, Muckelbauer et al. (2009) in terms of glasses per day, and Sichieri et al. (2009) in terms of ml per day. Based on the nutrient analysis software (Nutritionist Pro Axxya Systems, 2014), one gram of sugar sweetened fluid is

equivalent to 1 ml; accordingly, the unit reported by Albala et al. (2008) was converted to ml. Muckelbauer et al. (2009) reported that each glass of SSB was equivalent to 200 ml; thus we converted the unit reported by Muckelbauer et al. (2009) to ml. The results of the meta-analysis suggested that behavioural and educational interventions as compared to no intervention are associated with a trend toward a reduction in SSB intake (MD -283.54; 95% CI –642.65 to -75.57; p-value = 0.12) (Figure 4.5). However, the percentage of the variability in effective estimates that was due to true heterogeneity rather than sampling error (chance) was very high (I^2 = 99%). This noise might be the cause of variability in the trial conducted by Albala et al. (2008). The population included in this trial was composed of obese and overweight children and the intervention was performed outside the school setting, unlike the other two trials (Mucklebauer et al., 2009; Sichieri et al., 2009) where the interventions were conducted within the school setting among children with normal weight. Hence, excluding Albala et al. (2008) the findings showed that receiving behavioural and educational intervention in school replicated the results obtained in the entire population, however, with a much greater significance and a significantly lower heterogeneity (MD -26.53; 95% CI –53.72 to 0.66; p-value = 0.06 and I^2 = 6%).

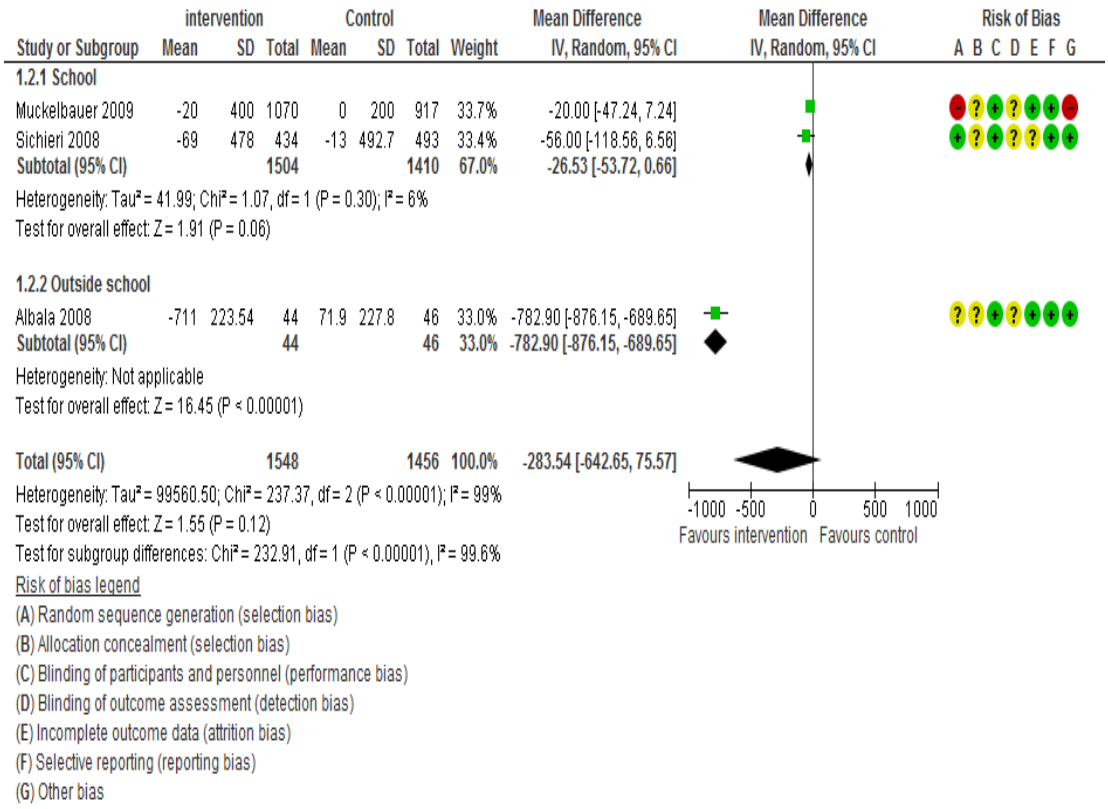


Figure 4.5*:* Forest plot showing the reduction in SSB intake in the intervention and control group (no intervention) in children in schools (1.1.1), outside schools (1.1.2) and overall. A random effect model method was employed to calculate the mean difference (MD) with 95% confidence intervals (CI).

While pooling the results of most trials was not feasible, their findings were aligned with what the meta-analysis described: Bayer et al. (2009) found that 60.4% of the intervention group and 47.7% of the control group reported low consumption of highly caloric drinks and the change in behaviour was significant with a p-value of <0.0001. Bjelland et al. (2011) showed that unlike the boys, the intake of SSBs was lower by 2.1 dl/day on average among girls in the intervention group versus the control group with a p-value of 0.04. Singh et al. (2009), showed that SSB intake was significantly lowered among boys and girls 8 months post-intervention (boys: −287 ml/day with its associated 95% CI −527 to −47; girls: −249 ml/day with its associated 95% CI −400 to −98) and at the 12-month follow-up (boys: −233 ml/day

with its associated 95% CI −371 to −95; girls: −271 ml/day with its associated 95% CI −390 to −153), but this did not continue to the 20 month follow-up (Singh et al., 2009). Beech et al. (2003) found that girls who received the intervention reduced their consumption of sweetened beverages by 34% as compared to the control group. Cunha et al. (2013) found that there was a positive change relative to the intervention goals for the consumption of sugar-sweetened beverages. Similarly, James et al. (2004) concluded that the consumption of carbonated drinks over three days decreased by 0.6 glasses in the intervention group, but increased by 0.2 glasses in the control group. Ezendam et al. (2012) showed that the intervention was associated with lower odds of drinking more than 400 ml of sugar sweetened beverages per day with an OR of 0.054 and corresponding 95% CI of 0.34 to 0.88.

On the other hand, behavioural interventions did not modify the SSB consumption patterns of children in three trials (Haerens et al., 2007; Rosario et al., 2013; Siega-Riz et al., 2011). Furthermore, among trials conducted outside the school setting, results showed that children in the intervention arm were not significantly different than those in the control arm with respect to the study outcomes (Rosenkranz et al., 2010; van Grieken et al., 2014; van Grieken et al., 2013).

4.4.3.2 Secondary outcomes

4.4.3.2.1 Reduction in prevalence of obesity and overweight

None of the included trials assessed the secondary outcomes of interest related to health status except for two that measured the change in obesity and overweight status (James et al., 2004; James et al., 2007; Sichieri et al., 2009). These

trials reported change in obesity in terms of prevalence rather than change in BMI among obese or overweight participants. Thus, it was impractical to pool data from these trials due to the fact that they only reported the prevalence measure. James et al. (2004) found that the percentage of overweight and obese children increased in the control group by 7.5%, compared with a decrease in the intervention group by 0.2%, with a mean difference of 7.7%, (95% CI 2.2% to 13.1%). As for Sichieri et al. (2009) in both the intervention and control groups, the prevalence of obesity increased from about 4 to 4.5% (Sichieri et al., 2009).

4.4.3.2.2 Reduction in Body Mass Index: BMI

Body Mass Index (BMI) was explored in 11 trials within this review (Albala et al., 2008; Beech et al., 2003; Cunha et al., 2013; Ezendam et al., 2012; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009; Rosário et al., 2013; Rosenkranz et al., 2010; Sichieri et al., 2009; Singh et al., 2009; van Grieken et al., 2014; van Grieken et al., 2013). The statistics sought in the meta-analysis of BMI z-scores were the mean of change in BMI z-score per arm, the corresponding standard deviation of each mean, and the total number of participants per arm. Within these parameters only three trials provided statistical data that could be included in the current meta-analysis (Albala et al., 2008; James et al., 2007; Muckelbauer et al., 2009). The statistical data reported by the other trials were found ineligible for the following reasons: Beech et al., (2003) did not report values of change per arm. Cunha et al., (2013); van Grieken et al., (2013); and van Grieken et al., (2014) reported the effect of reduction in BMI in terms of β of regression. But, James et al. (2007) used clusters of schools as the unit of analysis of reduction in BMI instead of

students. Ezendam et al. (2012), Rosario et al. (2013), and Rosenkranz et al. (2010), reported statistical data pre-intervention and post-intervention only, thus calculating the standard deviation of the change between the data was not possible without the raw data. Singh et al. (2009), reported statistical data for girls and boys separately, thus calculating the pooled standard deviation of the two groups was not possible without the raw data, and Sichieri et al. (2009), provided values of change in BMI but not BMI z-score so the calculation of z-scores was not possible given that the standard deviation could not be converted in the absence of the raw individual data.

The meta-analysis of three trials (Albala et al., 2008; James et al., 2007; Mucklebauer et al., 2009) included 3474 participants. The findings of the meta-analysis suggested that behavioural and educational interventions had no significant effect on the reduction in adjusted BMI compared to no intervention (MD -0.01; 95% CI –0.05 to 0.03; p-value = 0.08) (Figure 4.6). The percentage of the variability in effect estimates due to statistical heterogeneity rather than sampling error (chance) was moderate to high (I^2 = 60%). To explore the reason behind the observed heterogeneity, a subgroup analysis stratifying trials based on the setting of the intervention was conducted. The subgroup analysis based on participants receiving behavioural and educational interventions in schools also showed no effect on change in BMI z-scores (MD -0.04; 95% -0.05 to 0.06). The test for the subgroup difference was found to be low or insignificant. The percentage of the variability in effect estimates from the different subgroups that was due to genuine subgroup differences rather than sampling error (chance) was low to moderate (I^2 = 18.3%) and insignificant (p value= 0.27) indicating that the setting of the intervention did not modify the effect of the intervention on the outcomes of interest.

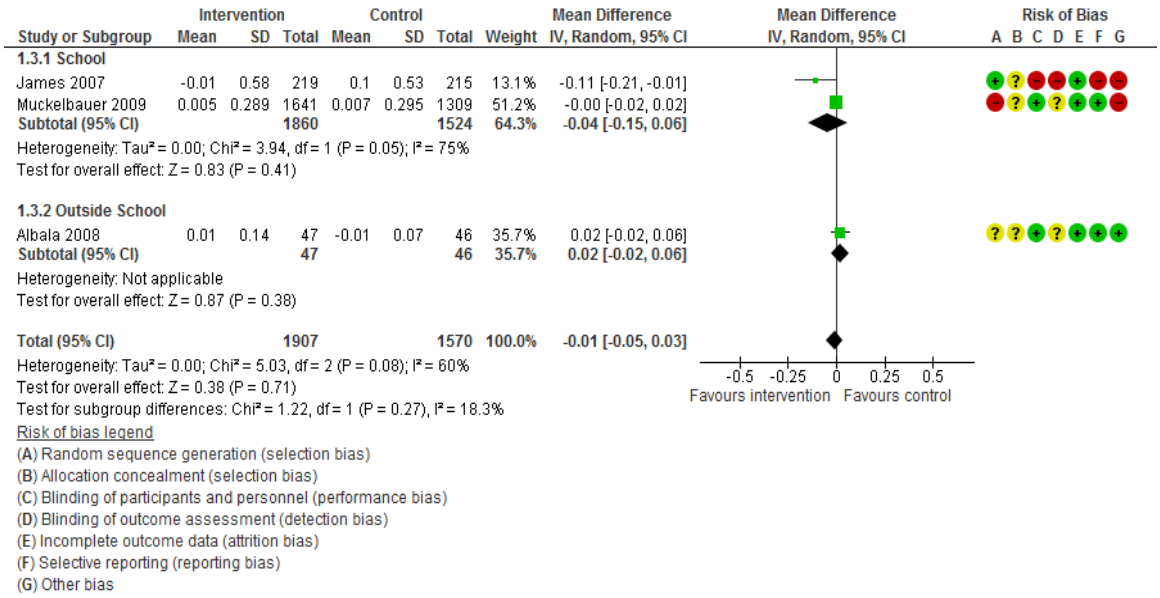


Figure 4.6*:* Forest plot showing the reduction in BMI in the interventions relative to control group (no intervention), in children in schools (1.2.1), outside schools (1.2.2), and overall. A random effect model method was employed to calculate the mean difference (MD) with 95% confidence intervals (CI).

The remaining trials, though not included in the meta-analysis, showed similar results. Ezendam et al. (2012) showed no significant change in BMI for children in the intervention group 2 years post-intervention (MD 21.08). Similarly, the findings of Beech et al. (2003) did not confirm a significant effect of the intervention on BMI with an adjusted mean difference of 0; however, results showed that girls demonstrated a trend toward reduced BMI. Cunha et al. (2013), showed that the reduction in BMI was not significantly different between the two groups (β = 0.003; p-value = 0.75). The regression model conducted by van Grieken et al. (2013) showed that children allocated to the intervention had a smaller increase in BMI at follow-up as compared to children allocated to the control group (estimated adjusted MD 20.67 with standard error of 0.30). James et al. (2004), found that after 12 months there was no significant difference in BMI between the intervention and control groups (MD 0.13, 95% CI − 0.08 to 0.34). Rosario et al. (2013), found that

the mean of BMI at baseline and post intervention did not significantly differ across both the intervention and control groups (p-value= 0.062 and p-value =0.966, respectively). Rosenkranz et al. (2010), found that the effect of the intervention on BMI among girls and their parents was not significantly different from that of the control group (p-value = 0.544). Similarly, Sichieri et al. (2009) found a non-significant overall reduction in BMI among the two groups (p-value 0.33), despite a greater reduction in BMI among female students who were overweight at baseline. Furthermore, Singh et al. (2009) found no difference in BMI reduction between groups after 8, 12, and 24 months (MD −0.1, 95%CI −0.2 to 0.1; MD −0.03, 95%CI −0.2 to 0.3; MD 0.2, 95%CI −0.1 to 0.5).

4.5 Discussion

This systematic review aimed to identify characteristics of interventions that were most effective in changing the intake of SSBs among young children and adolescents aged 4 to 16 years old. The primary outcome considered for the purpose of this review was the change in quantity of SSB intake among children and youth. The secondary outcome included clinical or health-related results such as a reduction in the prevalence of obesity, diabetes, cardiovascular diseases, or other proxy indicators, including reported change in body composition measures (BMI, lean mass and fat mass) or biomarkers (lipid profile, blood glucose measures). According to this review, educational and behavioural interventions developed to prevent childhood obesity that tackled SSB consumption were successful in significantly reducing the focused SSB consumption, particularly among studies with a short term follow-up period. However, based on the available evidence, there was insufficient

data to support the positive effect of these interventions in reducing the prevalence of overweight and obesity as well as other physical measures such as a change in body fat, particularly BMI, among children and adolescents**.**

A number of systematic reviews have been conducted or are currently being undertaken to explore the effects of SSB consumption on excessive weight gain and other clinical outcomes among adults and children (Malik, Schulze, & Hu, 2006; Malik et al., 2013; Hamel et al., 2014) Moreover, numerous studies have examined the effectiveness of interventions tailored to prevent obesity among children and adolescents through addressing diet, including SSB consumption, and physical activity in various settings (Campbell et al., 2000; Brown & Summerbell, 2009; Sharma, 2011; Wang et al., 2013). However, after an exhaustive search, it was observed that only one recent review conducted by Avery, Bostock and McCullough (2014) has been published exploring the effectiveness of interventions that specifically aim at reducing SSB consumption. While Avery et al. (2014) reviewed the literature to identify interventions that could help reduce the consumption of SSBs in children, their review included only a change in body fat as a clinical outcome and did not use statistical methods to pool the results across studies. To the knowledge of this researcher, the review by Avery et al. (2014) is the first to conduct a meta-analysis of studies to assess the effectiveness of educational and behavioural interventions specifically targeting SSB consumption.

After conducting a rigourous screening and review process, a total of 15 trials have been included in this systematic review. Trials varied in terms of location (country), setting (school, home, or community based), duration, follow up period, targeted population age range, educational and behavioural strategy used

(educational, environmental, or a combination of both), and unit of measurement reported. Only three trials (Albala et al., 2008; Muckelbauer et al., 2009; Sichieri et al., 2009) reported homogenous measures of statistical data for the primary outcome of interest of SSB consumption, and were combined in a meta-analysis to identify if the consumption of SSBs differed significantly pre- and post-intervention. The meta-analysis of data from the three trials showed a reduction in SSB intake favoring the intervention; however, the difference was not statistically significant, and may be explained by a high percentage of variability in effect estimates that was due to statistical heterogeneity (I^2= 99%). Furthermore, subgroup analyses were conducted based on the setting of the intervention to identify if differences existed between the school-based versus outside-of-school educational and behavioural interventions in reducing the primary outcome of interest; i.e. SSB consumption. Two of the three trials included in the meta-analysis were conducted in a school-based setting (Muckelbauer et al., 2009; Sichieiri et al., 2009) and when analyzed together showed a reduction in the SSB intake of children post intervention that approached statistical significance compared to their control groups. A meta-analysis could not be conducted for the one trial conducted in a non-school setting by Albala et al. (2008), yet results of that study showed a significant reduction in SSB intake favoring the intervention. The difference in significance of results between the two school-based interventions and the one conducted in a setting outside of the school (Albala et al., 2008) may be attributed to the specific setting where the trials were conducted. However, it is worth noting that the target groups addressed in these interventions were also noticeably different. The Albala et al. (2008) trial, targeted overweight and obese children with relatively high SSB consumption rates at baseline compared to

the two school-based trials. In addition, the two school-based interventions included in the meta-analysis promoted the replacement of SSBs with water through the installation of water fountains and distribution of water bottles for the children in the intervention groups while promoting water consumption through educational sessions. The Albala et al. (2008) trial focused on replacement of SSB consumption with milk through the provision of flavored milk for the children within their home settings. Thus, the replacement of SSBs with milk versus water was another difference that can be reported among the three trials that were pooled together initially within the meta-analysis.

Results from all remaining 12 trials were not pooled into one meta-analysis given the variance of reporting intervention effects, however most of these trials reported significant changes in the primary outcome of interest (consumption of SSBs) similar to those reported by the pooled data from Albala et al. (2008), Muckelbauer et al. (2009), and Sichieiri et al. (2009). This was particularly true for interventions that had short-term follow-up durations ranging from 3 to 12 months (Albala et al., 2008; Beech et al., 2003; Bayer et al., 2009; Bjelland et al., 2011; Cunha et al., 2013; James et al., 2004/2007; Sichieri et al., 2008; Singh et al., 2009; Ezendam et al., 2012). It is worth noting that a positive change in the reduction of SSB intake was no longer sustained when student participants were followed up for longer periods of time in some of these trials (> 20 and 24 months) (Singh et al., 2009; Ezendam et al., 2012). School-based interventions with short term follow-up may have demonstrate significant effects in the short run; however, reviewers argue that these results do not provide useful information regarding the sustainability of interventions and their long term effects (Avery et al., 2014; Cooper et al., 2013).

Avery et al. (2014) reported the need for maintenance sessions to remind children to retain any change in SSB consumption over time, whereas Cooper et al. (2013) recommended that school-based programs be integrated into school curricula and that the school teachers be trained on the different strategies needed to change dietary and oral health behaviours to ensure the sustainability of these programs.

To further examine the characteristics of interventions used in the trials and the different approaches used to change the behaviour of children and youth towards SSB consumption, trials conducted at the school-based level will be discussed separately from those conducted at the home or community-based level. Furthermore, the different intervention strategies and techniques used to implement educational versus a combination of educational and environmental interventions within these settings will be discussed in light of the existing literature.

Out of the 15 trials included in this review, a total of 11 trials were school-based, 7 of which included educational approaches to change the SSB consumption behaviour among other nutrition and physical activity-related behaviours of the targeted children and adolescents (Bayer et al., 2009; Cunha et al., 2013; Ezendam et al., 2012; James et al., 2004; James et al., 2007; Rosário et al., 2013; Sichieri et al., 2009; Singh et al., 2009). The remaining four school-based trials included both educational and environmental components (Bjelland et al., 2011; Haerens et al., 2007; Siega-Riz et al., 2011; Muckelbauer et al., 2009).

With regard to non-school based trial settings, one included an educational intervention only (van Grieken et al., 2014; van Grieken et al., 2013) and three other trials included both educational and environmental interventions (Albala et al., 2008; Beech et al., 2003; Rosenkranz et al., 2010).

4.5.1 School based interventions

Schools provide unique settings for conducting educational and behavioural interventions as they are optimal for children to acquire health-related knowledge and learn how to integrate healthier dietary habits into their daily routine (Pine et al., 2004). Schools can also promote healthy eating behaviours through integrating nutrition education within behaviourally, developmentally, and culturally-appropriate classroom curricula. Furthermore, schools can provide children and adolescents with opportunities for being physically active during physical education classes, recess, afterschool programs, and other competitive or organized sports venues as it is within the school environment where social norms are observed, knowledge is acquired, and attitudes and behaviours are modeled and changed. Children and adolescents spend an average of 8 hours a day five days a week at school and are offered a variety of foods and beverages through various venues within the school such as the cafeteria, vending machines, and fundraising activities among other events. Furthermore, children can interact with their teachers and peers within the school environment, who may serve as role models of healthy behaviours, and the children are provided with various learning opportunities, all of which make the school a unique setting to deliver educational interventions aimed at improving the dietary and lifestyle behaviours of children.

4.5.1.1 School-based Educational Interventions

In this review, seven trials that included interventions with educational components integrated within the school curriculum or delivered via additional educational sessions and strategies were found to be independently effective in reducing the consumption of SSBs among school-aged children and youth (Bayer et

al., 2009; Cunha et al., 2013; Ezendam et al., 2012; James et al., 2004; James et al., 2007; Rosário et al., 2013; Sichieri et al., 2009; Singh et al., 2009).

It is worth noting that only two of the seven school-based educational interventions were focused on the reduction of SSB consumption as the primary intervention component and main goal of the educational intervention (James et al., 2004; Sichieri et al., 2009). The five remaining interventions (Bayer et al., 2009; Cunha et al., 2013; Ezendam et al., 2012; Rosário et al., 2013; Singh et al., 2009) focused on the general healthy dietary habits of children and included messages regarding physical activity to help maintain a healthy body weight with the reduced consumption of SSBs being one of the lessons covered within a multi-component intervention.

Interestingly, in both studies (James et al., 2004; Sichieri et al., 2009) with SSB consumption being the primary focus and outcome of the study, researchers did not rely on a specific theoretical framework for changing the children's behaviours. Yet, interactive activities were conducted combining music and art to promote water consumption as a healthy replacement to SSBs. Furthermore, both studies focused on providing only specific simple messages that promoted water consumption instead of SSBs, thus targeting a particular behaviour rather than numerous dietary and lifestyle behaviours. The focus on one component may explain the significant reduction in SSB consumption among the targeted student populations; however, there is insufficient evidence to evaluate whether single component interventions are more effective than multiple-component interventions.

The remaining 5 school-based trials (Bayer et al., 2009; Singh et al., 2009; Ezendam et al., 2012; Rosario et al., 2013; Cunha et al., 2013) included in our review

had a common purpose that was to prevent and reduce the prevalence of overweight and obesity among school-aged children and adolescents with a change in SSB intake being a secondary outcome. For example, the 'TigerKids' educational intervention conducted by Bayer and colleagues (2009) in Germany among young children (4- 6 years old) was designed to assess the effects of a low cost behavioural prevention program in a preschool setting to reduce risk factors for obesity (Bayer et al., 2009). Similarly, the DOiT intervention focused on behaviours related to energy in and energy out among young Dutch adolescents (12–14 years old) to determine the success of a multicomponent health promotion intervention influencing body composition and dietary and physical activity behaviours among participating adolescents over the short and long term. The consumption of SSBs and other high-energy snacks were targeted as components within the DOiT school-based intervention and the study was successful in reducing the consumption of SSBs among boys and girls in the intervention group compared to the control group students at 8 months and 12 months, but not at 20 months post-intervention (Singh et al., 2009). The FATaintPAHT computer-tailored intervention conducted by Ezendam et al. (2012) in the Netherlands among young adolescents 12–13 years old and the school-based intervention conducted by Cunha and colleagues (2013) in Brazil among similarly aged young adolescents (mean age of 11 years) were focused on preventing excessive weight gain. Both of these interventions were successful in reducing SSB consumption among the intervention groups at 4 and 9 months respectively. However, the significant difference in consumption between the intervention and control groups with respect to SSBs was lost 24 months after the delivery of the intervention in the FATaintPAHT program.

Despite the fact that SSB consumption was only one of several educational components within these five school-based educational interventions (Bayer et al., 2009; Cunha et al., 2013; Ezendam et al., 2012; Rosario et al., 2013; Singh et al., 2009), rather than being the primary educational focus, researchers reported a significant reduction in SSB consumption among targeted children compared to control groups. The success of these interventions may be attributed to the use of theories of behavioural change (Bayer et al., 2009; Cunha et al., 2013; Ezendam et al., 2012; Rosario et al., 2013; Singh et al., 2009). The theoretical frameworks and concepts most commonly used were based on the social cognitive theory and theory of planned behaviour; whereas the remaining school-based educational trials (James et al., 2004; Sichieri et al., 2009) were atheoretical. Commonly used constructs within the theory-based educational interventions included: increasing the self-efficacy of children and youth, developing the knowledge and skills needed to change targeted behaviours (behavioural capacity), role modeling of healthy behaviours (observational learning), and changing the perspective of the study participants towards the behaviour. The benefits of using theoretical frameworks and constructs in the design of educational and behavioural interventions targeting dietary and lifestyle behaviours have been well-established in scientific literature. These benefits are numerous and include the ability of program planners to specify methods for changing behaviours, identify the timing and duration needed for interventions to be effective, and explore the combination of strategies that can best lead to the desired outcomes (Sharma, 2011). Theories can assist researchers and program evaluators in identifying what components of an intervention succeed in

changing mediating variables, which in return can change the intended behaviour (Baban & Craciun, 2007).

Furthermore, and despite the use of theories of behavioural change in most of the school-based educational interventions included in this review, only the DOiT intervention (Singh et al., 2009) assessed the impact of a planned intervention relative to the mediators of change when addressing the targeted behaviour. The mediators of change generally include components of these theories such as the impact of the intervention on perceived behavioural control, intention, and self-efficacy. Exploring mediators of change that constitute the main pillars and constructs of behavioural change theory is integral to identifying which constructs are most effective in changing specific behaviours. In this review, it was observed that Singh et al. (2009) assessed how the DOiT program affected energy balance-related behaviours including dietary intake and SSB consumption indirectly through mediator variables. These mediators included attitude, subjective norms, perceived behavioural control and habit strength, which are constructs of the theory of planned behaviour and habit theory. Researchers observed that attitude and habit strength were significant mediators of the DOiT-intervention's effect for the consumption of sugar-containing beverages among boys, but not girls. As a follow up to this study, researchers explored the mediating and moderating factors underlying the DOiT intervention effects through a nationwide 'natural' dissemination of the study, yet they did not find any mediating effects for any of the hypothesized behavioural mediators (van Nassau, 2014).

Studies that assess how educational interventions affect mediators of change, which in turn may influence the intended behavioural change, are relatively limited.

Sharma (2011) reported a similar weakness in her review of school-based interventions conducted between the years of 2000 and 2009 that were designed to prevent childhood and adolescent obesity. She noted that only a few interventions reported explicit changes in behavioural constructs when these theories were followed over time. The review recommended that robust instruments be developed and used to measure changes in constructs from theories adopted by interventions in an attempt to identify which components or constructs of theories work best to explain the reasons behind the success and failure of these interventions.

4.5.1.2 School-based interventions with parental involvement

Four of the school-based educational trials in our review had parental involvement as a component of the intervention (Bayer et al., 2009; Bjelland et al., 2011; Cunha et al., 2013; Haerens et al., 2007). Three of these trials reported a significant reduction in SSB consumption among children of both genders (Bayer et al., 2009; Cunha et al., 2013; Haerens et al., 2007), whereas one trial proved to be effective among girls only, with no significant changes among boys (Bjelland et al., 2011).

Involving families and parents in school-based interventions targeting the dietary behaviours of children has been proven to be effective, particularly among preschoolers and young children (Sharma, 2011; Kelishadi & Azizi-Soleiman, 2014). Parents play an important role in the level of physical activity and dietary intake of their children through providing adequate and healthy foods at home, encouraging children to consume adequate amounts and types of foods, modeling of healthy behaviour, and encouraging them to be physically active while at home or at school.

The common strategies implemented among trials included in our review for involving parents were the distribution of educational materials in the form of booklets, tip cards and fact sheets as materials developed to focus on healthy eating and active lifestyle behaviours to continue the reinforcement of the messages that children are exposed to at school within their home settings. For example, the 'TigerKids' behaviour intervention program included the distribution of newsletters and ''TippCards'' to parents of preschoolers (4-6 years old) with simple messages on the energy content of fruits and vegetables versus energy dense snacks offered to children and how to integrate regular physical activity in the daily routine of the children and family. Similarly, Cunha and colleagues (2013) sent messages to parents and families in the form of booklets and recipes encouraging them to reduce the purchase of sodas and increase the purchase of fruits among other healthy eating habits as part of their school-based intervention targeting 5th graders. Researchers in the HEIA study by Bjelland et one group al. (2011), distributed fact sheets for parents to help promote two main behaviours: reduction of SSB consumption and reduction of screen time by school-aged children.

Only two trials, one by Bjelland et al. (2011) in the HEIA study and the other by Haerens et al. (2007), involved parents beyond the mere distribution of supportive educational materials whereby they included them in the evaluation process and sought their assistance in assessing the satisfaction of the children with the various components of the interventions. Results from the HEIA study allowed researchers to learn that parents of girls were more aware of the project compared to parents of boys, which could have been the result of more parental support for the girls. This could partially explain why the consumption of SSBs was significantly lower among

girls in the intervention group, but not for boys in comparison to the control group. Based on results from the HEIA study, researchers highlighted the important role that parents should play as models for healthy behaviour for their children. Furthermore, Haerens et al. (2007) included an adult computer-tailored intervention for fat intake that was provided to the parents of participating children to use and complete at home similar to the computer-tailored intervention that their children received at school. Researchers hypothesized that the involvement of parents would increase the effectiveness of the intervention; however, no positive intervention effects on soft drink consumption were reported for both intervention groups (the group of children undergoing the intervention alone without parental involvement and the other group, who with their parents received a computer-tailored intervention). The only significant difference between groups was reported among girls with regard to fat intake, which can be explained by the fact that the computer-tailored intervention was focused on fat intake and did not include a personalized tailored feedback for soft drinks or water consumption (Haerens et al., 2007).

Results from studies included in this review are insufficient to determine the effectiveness of parental involvement in reducing the SSB consumption of children. Trials that can help test the hypothesis of whether parental involvement can increase the effectiveness of school-based trials in changing specific dietary behaviours of children, such as reducing SSB consumption, are needed. Recently, Wang et al. (2013) conducted a review to compare the effectiveness of childhood obesity prevention programs with various outcomes including the intake of SSBs (as an intermediate obesity-related clinical outcome) and the change in prevalence of obesity and body composition measures (BMI, waist circumference, percent body

fat, skinfold thickness). Reviewers highlighted that school-based diet interventions with a home component had a moderate strength of effectiveness, yet their strength of effectiveness increased when diet and physical activity were combined in school-based interventions with a home component. Another systematic review conducted to assess the impact of the parents' role modeling of healthy eating and physical activity on the weight status of their middle school-aged African American children found the evidence to be low to moderate. This can be attributed to the low number of studies that focus on specific ethnic minorities and groups within this age group in a specific cultural context (Webber & Loescher, 2013).

School-based Educational and Environmental Interventions

Schools are considered a unique setting to reach out to a large group of children and offer students opportunities to receive nutrition education combined with an environment that is conducive to healthy eating and active living (CDC, 2011; IOM, 2012). Four school-based trials within this review encompassed both educational and environmental strategies to address the eating habits of children and youth, including SSB consumption (Bjelland et al., 2011; Siega-Riz et al., 2011; Muckelbauer et al., 2009; Haerens et al., 2007).

Educational and behavioural strategies in these four trials were very similar to those reported by the seven school-based educational interventions discussed earlier. They included the development and implementation of nutrition education lessons conducted within classroom settings and the use of supportive educational materials including posters, booklets, or interactive web-based educational modules. However, Haerens et al. (2007), Muckelbauer et al. (2009), and Siega-Riz et al. (2011),

extended their interventions beyond nutrition education and changed the availability and accessibility of soft drinks at school as well as promoting water as a healthier alternative. Haerens et al. (2007) offered water at reduced or no cost compared to the price of soft drinks, and Muckelbauer et al. (2009) provided water fountains and water bottles for free to all students in participating intervention schools. Furthermore, the HEALTHY nutrition intervention conducted by Siega-Riz et al. (2011) included changes in the quantity and nutritional quality of food and beverages offered through the school environment, including the elimination of all added sugar beverages from cafeteria meals, vending machines, fundraisers, classroom parties, and other venues within the school. However, none of these discussed studies reported significant changes in the intake of SSBs among children in the intervention groups. The only school-based trial with a combination of educational and environmental interventions that showed a significant positive effect in reducing SSB intake among school-aged children, particularly girls, was the HEIA trial (Bjelland et al., 2011). The latter was conducted in Norwegian schools and included numerous individual, group, and environmental level strategies and activities targeting the reduction of the intake of SSBs and screen time among children in the school system (Bjelland et al., 2011). Furthermore, this intervention included a parental involvement component, as discussed earlier. Thus, we cannot determine if the positive effects of the Bjelland et al. (2011) intervention were due to the focus on SSBs as one of the two primary components of the trial, or if the environmental component of the intervention may have helped in achieving these results.

Environmental interventions promoted in these four trials are in line with the scientific literature and the current policies and programs conducted in various

settings around the world in an attempt to prevent, if not reverse, the problem of childhood obesity. In the past few years, numerous nation-wide policies and school-based initiatives have been developed and implemented within schools in the U.S., Canada, Australia, Europe, and other developed countries (Nathan et al., 2014). These policies have focused on environmental changes in addition to the classic educational strategies to address the 'obesogenic environment' within schools (Story et al., 2012; Taber, Chriqui, Powell, & Chaloupka, 2012; Van den Berg et al., 2013). One of the main environmental changes has been limiting the availability of low nutrient, energy-dense (LNED) foods and beverages, including SSBs, on the school premises. This was secured through various strategies, such as increasing the price of SSBs when sold in school cafeterias, limiting the availability of SSBs and other LNEDs in vending machines, and providing water fountains for free water (Levy et al., 2011). Furthermore, in the U.S. local wellness policies (LWPs) were mandated by federal law (the Child Nutrition and WIC Re authorization Act of 2004) that requires all schools participating in the federally-funded School Breakfast Program (SBP) and National School Lunch Program (NSLP) to develop guidelines for all foods and beverages sold or offered outside the school meal programs. SSBs together with similar LNEDs are named as competitive foods and beverages as they compete with healthier SBs and NSLs programs that meet the USDA dietary guidelines and are considered of higher dietary quality (RWJF Research Review, 2012).

Wellness policies and nutrition guidelines were required to be implemented by participating schools to ensure that children would consume healthy foods and beverages while on the school premises, as well as receive age-appropriate nutrition and physical education. Furthermore, these policies aimed to expose school children

to a healthy school environment that is conducive for healthy living. Although local wellness policies (LWPs) have been developed to address the availability of competitive foods and beverages in schools among other school-level environmental changes, the implementation and reinforcement of these policies has varied across schools. Researchers note that "simply having a school district wellness policy does not equate with having a strong policy" (Terry-McElrath, O'Malley, & Johnston, 2015). Furthermore, according to a national cross-sectional study conducted in the U.S., the availability and access of soft drinks (defined as 'soda SSBs') through vending machines decreased significantly for both middle and high school students between 2007 and 2009, after the LWPs were implemented nationally. However, access to non-soda SSBs, including sports drinks and fruit drinks that are not 100% fruit juice, did not decrease within these schools.

Over the past few years, researchers have argued whether limiting the availability of soda is sufficient to reduce the consumption of energy dense SSBs among children, if other non-soda SSBs are still available within schools, and if specific nutritional guidelines for all competitive foods and venues are not implemented as part of the schools' wellness policies (Terry-McElrath et al., 2015). This argument is further supported by Sichieri and colleagues (2009), who reported that the reduction in SSB intake in a school-based intervention was combined with an increase in powdered-fruit flavored juice drinks that were higher in sugar content than regular sodas. Thus, evidence suggests that efforts aiming at decreasing energy intake through liquids should focus on all sugar-sweetened beverages, and not just sodas. Furthermore, these studies highlight the need for more than policy-level and

environmental-level changes to achieve the desired behavioural change among children and youth.

Environmental interventions alone without educational intervention at the level of schools may be inadequate to change the attitude and preference of children and youth towards the various forms of SSBs and might be insufficient to get the buy-in of students, who are the main target group of such programs. Thus, future studies need to compare the effectiveness of school-based interventions that include either educational or environmental components versus those that include a combination of both components focused on changing SSB consumption among other obesity-related dietary outcomes to help evaluate the strength of effectiveness of these interventions.

4.5.2 Outside the school setting (home or community-based) interventions

Policies and guidelines limiting SSB consumption are commonly reported within school settings as discussed earlier. Yet recently, researchers and program practitioners have been focusing on developing policies to improve eating and drinking behaviours of children and youth in out-of-school settings, including before-school, after-school, and summer programs. These policies and programs aim to offer water and limit SSBs in an attempt to prevent obesity (Sliwa et al., 2014). Family-based intervention programs are considered among the most successful strategies to prevent and treat childhood obesity (Kelishadi & Azizi-Soleiman, 2014). Furthermore, they are considered even more useful for minority children who are at an increased risk of obesity.

In this review, four trials were conducted in an out-of-school setting: two were home/family-based (Albala et al., 2008; van Grieken et al., 2013), one was community-based (Rosenkranz et al., 2010) and the fourth was a mixed community and family-based intervention (Beech et al., 2003). Only one trial used an educational approach (Beech et al., 2003), while the remaining three trials included a combination of educational and environmental components (Albala et al., 2008; van Grieken et al., 2013; van Grieken et al., 2014; Rosenkranz et al., 2010). Pooling of results among the four community/home-based interventions into one meta-analysis was not possible due to differences in reporting of the effects of interventions. However, results from two of the four community-based trials independently showed a significant reduction in SSB intake favoring the intervention (Albala et al., 2008; Beech et al., 2003), whereas the other two showed no significant effect.

Albala et al. (2008), conducted a family-based intervention that focused on limiting SSB consumption and promoting milk as a healthier alternative among overweight or obese children by encouraging parents to remove SSBs from the home and providing flavored milk to all participating children within their home-setting. Researchers were able to observe significant intervention effects on the consumption behaviour of children despite the short duration of the study (4 months). A similar positive effect was also reported by Beech et al. (2003), in the GEMS Memphis study. This trial was conducted in neighborhood community centers and schools after the regular school day and included two family-based interventions (both a child targeted and parent targeted intervention) as compared to a control group. Researchers reported a significant decrease in the consumption of SSBs among the parent-targeted intervention compared to the child-targeted intervention.

No significant difference between intervention children and control children was detected by the van Grieken et al. (2013) study with respect to SSB consumption. Nonetheless, researchers of the latter study reported a higher percentage of children in both groups who were drinking less than 2 glasses per day of SSBs post-intervention. The limited effect of this intervention can be explained by numerous implementation challenges faced by the researchers including the lack of adherence by some of the Youth Health Care team (YHC) professionals to the obesity prevention protocol of the study where they relied on their own clinical judgment rather than the standardized international cut-off values to evaluate the body composition measurements of children collected as part of the study. In addition, YHC professionals were not always able to invite parents of overweight children for follow up sessions, which led to a high dropout rate, and may have limited the ability to observe significant effects of the intervention. Possible contamination of the intervention protocol among the control groups may have also limited the effect of the intervention, as indicated by the study researchers. Similarly, Rosenkranz et al. (2010) did not observe any significant effects of the intervention on the intake of SSBs among girls. Some authors argued that their trial did not investigate the impact of the intervention on mediating variables, such as skills, attitudes, intention, and self-efficacy. Possible changes in mediating variables may have occurred during the intervention, yet these changes could not be detected, limiting the ability at this time to assess possible reasons why the intervention did not achieve its desired outcomes.

It is worthy to note that the three community-based trials in this review that included educational components were based on theories of behavioural change.

Beech et al. (2003) conducted educational and behavioural strategies that were based on constructs within the Social Cognitive Theory (SCT) and their pilot-study included the assessment of various behavioural constructs and domains for parents/caregivers and children, including dietary and physical activity-related preferences, positive outcome expectations, self-efficacy, and self-concept. Similarly, the Rosenkranz et al. (2010) intervention was also based on the Social Cognitive Theory, mainly through role modeling by peer leaders and parents, skill building (behavioural capacity), enhanced self-efficacy, and reinforcement of behaviour (van Grieken et al., 2013), on the other hand used a mix of frameworks including a "stages of change" model, motivational interviewing techniques, and the habit formation theory.

However, none of the out-of-school trials within our review that used the theories of behavioural change explored the impact of the interventions on the mediators of change. Thus, it is believed that findings from these studies highlight the need to assess mediators of change, and not just behavioural change itself to improve our understanding of the reasoning behind the success or failure of these interventions and the components that make them more effective.

4.5.3 Secondary outcome measures

When exploring the secondary outcomes of interest in this review, only two trials were identified to measure the change in prevalence of overweight and obesity among children (James et al., 2004; Sichieri et al., 2009). Although James et al. (2004) found that the percentage of overweight and obese children increased in the control group compared with a decrease in the intervention group at 12 months, thus

favoring the intervention, the difference was no longer significant at 36 months post-intervention (James et al., 2004; James et al., 2007). This trial was also considered to be unclear and assessed as having a high risk of bias for a number of parameters, including selection, performance, detection, and attrition biases. Sichieri et al. (2009) on the other hand, reported an increase in the prevalence of overweight and obesity among adolescents in both the intervention and control groups at 12 months; however, no significant difference in the prevalence of overweight or obesity between both groups was documented. These results may not be surprising, given that both studies focused on a single message that included cutting down on soda consumption, which may have been insufficient to limit excessive weight gain. Obesity is a complex and multifactorial problem, and other dietary and lifestyle behaviours besides the consumption of SSBs may have contributed to the excessive weight gain among children in both the intervention and control groups. Another explanation may be attributed to possible compensatory behaviours that are adopted by children when sodas are replaced by other sugar-loaded, energy-dense beverages, including sports drinks and flavored juices. The consumption of sugar-rich beverages and LNED foods, as a replacement to soda consumption, may offset the reduced caloric intake leading to further excessive weight gain (Sichieri et al., 2009).

Data from nationally representative cross-sectional studies of students and school administrators in the U.S. public middle shools and high schools conducted annually from the 2007-2008 through 2011-2012 school years showed that the absence of SSBs in schools is associated with significantly lower overweight and obesity rates among non-white high school students and Hispanic middle school students (Terry-McElrath et al., 2015). The only trial within this review that reported

the successful effect of an educational intervention on the prevalence of overweight and obesity among children from families of a low socio-economic level was conducted in Brazil by Sichieri et al. (2009). Although researchers reported a significant decrease in the daily consumption of carbonated drinks in the intervention group compared to the control group in that trial, the change in behaviour was not followed by an overall significant reduction in BMI, except among girls who were overweight at baseline. The association between limited income, food insecurity and obesity among children and adolescents has been well-reported in literature. This highlights the need for more interventions that focus primarily on low-income, ethnically diverse children and families to explore the best strategies needed for the primary prevention of obesity in developed and developing countries with a high burden of non-communicable diseases (NCDs).

In this review, 11 trials (Albala et al., 2008; Beech et al., 2003; Cunha et al., 2013; Ezendam et al., 2012; van Grieken et al., 2013; van Grieken et al. 2014; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009; Rosario et al., 2013; Rosenkranz et al., 2010; Sichieri et al. 2009; Singh et al., 2009) reported changes in BMI for the intervention group versus the control group. Only three of the 11 trials provided statistical data that could be included in our meta-analysis (Albala et al., 2008; James et al., 2004; James et al., 2007; Muckelbauer et al., 2009) though they showed no statistical difference between intervention and control groups regarding reduction in BMI. Furthermore, no specific pattern or significant difference was observed in this review with respect to the effect of interventions on changes in BMI when subgroup analysis was conducted between school-based settings versus out-of-school settings.

Results from individual trials assessed in this review that were conducted in school-based or community/home-based settings similarly showed non-significant changes in BMI, as an indicator of body fat and overweight, regardless of the educational and environmental strategies used in these interventions. The only trials that reported significant reductions in BMI between the intervention and control groups were Sichieri et al. (2009) and James et al. (2004/2007). The mixed results in this review are similar to those reported by other reviews focusing on childhood obesity prevention trial programs. According to published literature, school-based interventions have considerable impact on the health behaviour of children and adolescents, yet results are inconsistent with respect to the effect of these interventions on the children's body weight, BMI status, and other anthropometric measurements (Brown & Summerbell, 2009; Kelishadi & Azizi-Soleiman, 2014). Furthermore, numerous studies have been published to date showing the positive effect of family-based interventions on anthropometric measurements, mainly a change in BMI, among children and adolescents. However, these studies vary in their design and have several limitations including small sample size, high dropout rate, lack of follow up, and potential selection bias where generally only motivated families accept to be enrolled and followed up in these studies (Kelishadi & Azizi-Soleiman, 2014). Thus, to further test the effectiveness of behavioural school-based interventions targeting SSB consumption, large studies with long-term follow up periods and more rigorous methodologies that focus on the randomization of schools and limiting sources of bias, including blinding of participants, personnel, and outcome assessors to the intervention and control assignments are needed.

Only two of the total 15 trials that met the review's inclusion criteria reported change in body composition parameters different than BMI, including change in body fat and in skinfold measurement (Albala et al., 2008; Singh et al., 2009). According to Albala et al. (2008), the change in beverage consumption didn't significantly affect fat mass but increased the accretion of lean mass reflected by linear growth among boys but not girls, whereas the study conducted by Singh and colleagues showed that waist circumference (an indicator of central obesity) was significantly lower among boys in the intervention group compared to the control group at 8 months, but not at 20 months of follow up. Furthermore, the latter study reported a lower sum of skinfold thickness measurement (as an indicator of body fat) among girls at 8 and 20 months follow up post-intervention. None of the included studies in this review reported on other health outcomes including dental health or any change in risk of developing obesity or other chronic diseases. Future reviews will hopefully address these outcomes as important questions to identify what are the best strategies and programs needed to reduce the risk of developing chronic diseases and dental diseases among children and adolescents.

4.5.4 Quality of the evidence

Cochrane Collaboration's risk of bias was used to assess the quality of studies included in this review, taking into consideration the sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessors, incomplete outcome data, and selective outcome reporting aspects for each of the reviewed studies. Overall, the quality of the evidence from the 15 included trials in this review were assessed by two separate reviewers as moderate, given the 'low

risk' of selection, attrition, reporting biases, and unclear risk commonly reported regarding the allocation concealment, blinding of personnel, and outcome assessors. A more detailed justification supporting the reviewers' judgments on each of the risks of bias is explained in the results section and included in the Risk of Bias summary table (Appendix 4.5).

4.5.5 Justification summary regarding risk of bias of included studies

Although the majority of the studies (14 out of 15 trials) had a low risk in the domain related to selection bias, particularly with respect to 'random sequence generation', only two trials (Cunha et al., 2013; Ezendam et al., 2012) out of 15 had a low risk of bias for the allocation concealment dimension when considering selection bias. In addition, half of the trials had a low risk of performance bias, particularly the 'blinding of participants and personnel', only 1 trial (James et al., 2004; James et al., 2007) had a high risk of bias, and the remaining trials had a relatively uncertain risk. It is worth noting that the blinding of the personnel in most behavioural interventions is not feasible and staff bias can only be minimized by researchers (Friedberg, Lipsitz, & Natarajan, 2010). This was done by half of the trials through separating the study staff who were administering the interventions from those who were collecting data in both intervention and control schools. Researchers attempted to blind study participants (children and adolescents at the schools or within their homes) to their intervention or control condition in an attempt to reduce any performance bias and over or underreporting of the intervention effects, particularly for dietary measures that were collected through 24 hour recall or questionnaires.

Despite the measures taken by researchers, the risk of performance bias in behavioural studies could not be completely eliminated.

In terms of detection bias, 9 out of 15 trials did not provide input regarding the blinding of outcome assessors, thus reviewers rated these studies as unclear with respect to this particular risk of bias. Three trials were evaluated as having a high risk of bias as the researchers who delivered the interventions were also involved in planning and conducting the assessment of outcome and were not blinded to group assignment. Thus, there is a risk that intervention effects may have been overestimated within the intervention groups when compared to the control groups by the outcome assessors who were aware of the group assignments. This risk would be considerably high for the James et al. study (2007), given that the main researcher who developed the original idea and delivered the educational program was also carrying out all anthropometric measurements and conducting the statistical analyses.

On the other hand, detection bias may be relatively low in most of the trials included in this review given that the primary outcome of interest (SSB consumption) was reported by children themselves rather than researchers. Furthermore, the BMI calculation based on weight and height measurements were anthropometric measures that were recorded by trained personnel in these trials. With respect to attrition and selective reporting biases, the majority of the studies were rated at a low risk for both of these parameters.

Differences between studies in reporting SSB consumption behaviour led to the inclusion of only three trials from the total 15 reviewed trials for meta-analysis. Despite the extensive efforts exerted to implement well-designed educational, behavioural, and environmental programs within schools to reduce obesity, few

reviews have been published to date that identify interventions that are actually effective in implementing change in the short and long-term. Given the complexity and the multi-factorial nature of obesity, most of the published studies and reviews assessing childhood obesity tackle the various factors that may influence the dietary and physical activity behaviour of children. Although these studies may be very comprehensive in their approach, they may be harder to sustain in the long-run given the associated cost, implementation challenges, and the need for rigorous follow up to ensure consistency. The challenge is to decipher which components of the comprehensive school-based interventions work best. Given the limitations of the studies included within this current review, there is still insufficient evidence to determine if single component interventions are more powerful and effective than multi-component interventions in preventing excessive weight gain, thus continuous long-term interventions with extended follow up periods of time are needed to answer some of these questions.

The implications for practice and recommendation for future studies are discussed in the next chapter (chapter 5 section (5.6.9).

Chapter 5

Overall Discussion, Limitations, Strengths and Recommendations

5.1 Introduction

This dissertation used a mixed methods research design to examine the parental/guardian behaviour of adding sugar to milk and other drinks for their school aged children attending the Lebanese public schools. This is the first research work of its kind in Lebanon that has investigated the adding sugar to beverages behaviour (ASB) from the perspective of primary caregivers of Lebanese children, a behaviour that may be more habitual in the Lebanese culture than in western cultures. The qualitative component of this dissertation preceded the quantitative component which utilized the Theory of Planned Behaviour (TPB) as a theoretical framework. The rationale of this sequential exploratory mixed methods design was to gain a better understanding of the adding sugar behaviour in the diet of Lebanese children. In addition, a systematic review of interventional studies to reduce the intake of sugar sweetened beverages (SSBs) was undertaken to supplement the understanding of the effectiveness of interventional approaches specifically applied to address SSB intake or consumption.

Applying the mixed method approach has been useful in complementing the findings from the qualitative data with the quantitative data. The mixed methods approach helped to shed light on the potential social and parental predictors of this behaviour. This complex unhealthy behaviour of adding sugar to children's

beverages and milk is associated with an increased risk for diseases and is considered a public health problem. While exploring complex behaviours, researchers recommend the use of a broad spectrum of qualitative and quantitative approaches using their corresponding specific techniques with the same level of rigour, critique and research process. In addition, the mixed methods approach helped in substantiating results, validating conclusions, and ensuring that the process of research was transparent. Findings from the data collected in the qualitative component of this study were insufficient to describe and substantiate a full understanding of the behaviour of adding sugar. Hence, the mixed methods approach identified additional explanations to this multifaceted behaviour with possible generalizable results. In this dissertation, the mixed methods approach detected consistent relationships among study measures for the parents' practice of adding sugar to their children's beverages in both the qualitative and the quantitative studies. Thus, the mixed methods combined the strengths of each of the qualitative (mainly inductive) and quantitative (mainly deductive) methods to generate a more powerful and complete answer to the research question (Creswell, 2009). An overview of the undertaken studies is presented to introduce the discussion of the findings.

5.2 Overview of Study Results (chapter 2, chapter3, and chapter 4)

Question 1: What are the views of parents and grandparents about adding sugar to beverages particularly milk?

Three successive phases were implemented in the mixed method study as described in chapter two of this dissertation. Five themes emerged from the third phase interviews with 26 caregivers namely (1) parental practices of adding sugar to

various types of beverages at home, (2) knowledge, attitudes and beliefs related to adding sugar to beverages in particular milk, (3) ingrained behaviours throughout generations (4) parental feeding practices and parental style (5) taste perception. All the identified themes were tightly entangled together to explain the adding sugar behaviour.

In the theme 'parental practices of adding sugar to various types of beverages', the ASB behaviour is shown to be a very common practice among the interviewed participants. It was so common that it was accepted as a normal and appropriate conventional social behaviour. The addition of sugar facilitated a smoother transition of infants from breastfeeding to baby formula and for toddlers from baby formula to powdered milk. Table sugar was added to powdered milk for toddlers, preschoolers and young children. Sugar was added to tea, herbal infusions and lemonade to make it sweet in taste for children to accept to drink it. Sugar, honey, molasses, sweetened cocoa powder, and instant cereal were commonly used as alternative sweeteners to milk and to other prepared beverages. These behaviours were perceived as the norm, and that publicly known, practiced and accepted.

In the theme 'knowledge, attitude and beliefs related to adding sugar to milk' was based on the medicinal/curable properties of sugars that were developed over generations. Sugar was perceived as a highly nutritional substance needed by the human body and with numerous perceived health benefits. Participating mothers stated different types of sweeteners including table sugar that were introduced early in life as home "medicine" to cure jaundice with a soothing effect to reduce stomach pain, alleviate the feeling of dizziness, as well as decrease child irritability and bad temper. This socially constructed knowledge was intertwined and reinforced by

health beliefs, perceptions of risk, and perceived susceptibility to diseases. Beliefs included (i) total disbelief in the potential harmfulness of sugar, (ii) sugar was not harmful if used in moderation, (iii) acknowledgment of the harmfulness of sugar, yet they still added it to their children's beverages.

Ingrained behaviours are reflected as habitual behaviours inherited over generations that are applicable to their children as well as to themselves. The ASB behaviour has been inherited from previous generations in the old customs and habits of making food in the region. Participants put a great value on behaviours learned from parents rather than those learned from peers. Parents who added sugar to their children's beverages also added sugar to their own beverages.

Taste was one of the most reported reasons behind the addition of sugar to enhance the palatability of offered drinks and foods. The inherited preference for sweet taste and aversion for sour and bitter tastes was reflected in the interviews as parents thought that adding sugar to milk and tea increased the acceptability of such beverages for children.

These ingrained behaviours are reinforced by the parents own feeding habits and parenting styles. A permissive parenting style was reflected in participant's replies where the choice of food and drinks was left to their children. New-born infants were given a mixture of water and sugar shortly after birth. This behaviour was common among breastfed babies until the milk supply was adequate. Mothers allowed their infants to taste sweet water and foods as early as 40 days after birth. Sugar was introduced to infants by placing sugar on the pacifiers to help them calm down, stop crying, and sleep well. Sometimes, rice and sugar were added to the milk bottle to increase acceptability of new food. After weaning the child of the milk

bottle, mothers compensated for the milk with several other diary alternatives e.g. cheese, labneh (a creamy yogurt based spread), or yogurt. Desserts with rice, milk, and a lot of sugar, like *mouhalabieh* (rice pudding with apricots) and *riz bi halib* (rice pudding with pistachios), were very frequently offered to toddlers. Grandparents added rice and sugar to milk and cooked it to let it be acceptable by children.

Q2: What are the predictors of adding sugar behaviour to beverages using the theory of planned behaviour (TPB)?

In the quantitative study using the TPB framework (chapter 3) mothers reported a mean addition of 1.99 (±2.83) teaspoons of table sugar to the most commonly home prepared beverages (milk, tea, or other drinks). The majority of mothers reported sweetening their child's drinks using table sugar, and the most popular beverages sweetened were milk and tea. Concerning sugar sweetened beverages (not diet type drinks), such as fizzy drinks and juices, about half of the mothers offered it to their children most days or every day. Participating mothers tended to have a relatively neutral attitude, perceived little social pressure showed some control over the ASB behaviour, and tended to express a moderatly positive intention to stop/reduce ASB to beverages offered to their children. The TPB model statistically but moderately (22%) predicted behavioural intention with attitude and perceived behavioural control as independent predictors. The analysis of the cross sectional data showed that the TPB minimally (9%) explained the variance in the mother's actual ASB behaviour with perceived behavioural control as an independent predictor. However, the analysis of the prospective data showed no significance in predicting the behaviour.

Q 3: What are the most effective behavioural interventions to reduce the intake of sugar sweetened beverages among children and adolescents?

A total of 15 studies were included in the final review, whereas 58 studies were excluded from the analysis with reasons of exclusion (chapter 4). A total of 11 trials were school-based, seven of which included educational approaches along with a reduction in SSB consumption by children and adolescents. The remaining four school-based trials included a combination of educational and environmental components. With regards to the four non-school based trial settings: one included only an educational intervention, and the other three included both educational and environmental interventions. A meta-analysis of three trials with 3,004 participants showed that behavioural and educational interventions were associated with a trend towards reduction in SSB intake compared to the no intervention control groups; however, this trend did not reach statistical significance.

5.3 Discussion of the Main Findings

The findings from both the qualitative and quantitative studies showed that adding sugar to children's beverages was a common practice among a sample of Lebanese primary caregivers of low socioeconomic status (SES). This was reflected in a majority of participants' responses and quotes (qualitative study), and was reported by the sample of participating mothers in the quantitative survey (TPB study). In addition, it was clearly indicated in all papers included in the systematic review (Study 3) that the intake of sugar sweetened beverages, sweetened milk, sweetened tea and coffee, and juices among adolescents has become harmfully elevated worldwide (refer to chapter 4).

The quantitative component did not strongly support the ability of the TPB model to predict the ASB behaviour**.** Yet, the qualitative results together with the quantitative results can be argued to have supported the TPB limited efficacy in explaining or predicting the ASB behaviour. Section 5.3.1 proceeds with an introductory discussion of the ASB behaviour as a common practice and sheds light on the reported frequency of intake of SSBs by participating children as well as on the overall estimated quantity of consumed "added sugar" within the Lebanese context. Section 5.3.2 relates quantitative results to identified health beliefs and perceptions of risk in the qualitative results. Section 5.3.3 discusses the role of taste as one of the main influencial factors in the adding sugar behaviour. Section 5.3.4 elaborates on the influence of parenting style and feeding practices. Section 5.3.5 expands on the habitual nature of the adding sugar behaviour. Sections 5.3.6 and 5.3.7 discuss how some methodological issues might (the mothers affective state and social desirability) have influenced the findings of the qualitative and quantitative studies. Behaviour change interventions identified from the systematic review and meta-analysis are briefed in section 5.4. Strengths and limitations are addressed in section 5.5. Recommendations for future work are presented in section 5.6 followed by a concluding paragraph.

5.3.1 ASB behaviour to children's beverages is a common practice among a sample of low SES Lebanese families.

According to Melnyk, Van Herpen and Van Trijp (2010), social norms are considered a major determinant of human behaviour. Human behaviour tends to be influenced by what is commonly practiced by others. Participants considered the

ASB behaviour as a normal practice and were thus surprised that the researcher was investigating it. The findings of this dissertation showed that the ASB behaviour is a common practice among low SES families in Lebanon. Participating mothers acknowledged when interviewed that it is a habit inherited from their parents. In addition, the participants' responses showed that the maternal feeding style influenced the intake of added sugar. This is consistent with the findings from published studies (Tylka, Lumeng, & Eneli, 2015). In the Tylka et al. (2015) study, the authors stressed the influence of maternal eating habits on their child's food intake, and the importance of addressing maternal eating habits in any interventional study designed to enhance the child's eating habits.

In a few of the quotes retrieved, participants considered that the amount of two teaspoons of sugar added to an average of 200-250 ml cup of milk, or to a 100 ml cup of tea, was not excessive. In the structured questionnaire survey, the majority of mothers reported a mean addition of 1.99 teaspoons of sugar to the most commonly home prepared beverages (milk, tea, and other drinks). Assuming that one teaspoon of sugar is equivalent to 4 grams of granulated white sugar (Sizer, Piché, Whitney, & Whitney, 2012, p. 137), the average number of teaspoons of sugar reported added in drinks offered at home (1.99 teaspoons) was equivalent to 7.96 grams of white granulated sugar. This value, however, does not include what they drank outside the home. The food based dietary guidelines for Lebanon (FAFS, 2013) specify the maximum limit for daily sugar intake for adults to be less than 10 teaspoons of added sugar per day (<50 grams of added sugar or 10% total energy based on 2000 calories diet). This report does not specify the recommended maximum limit for added sugar by age group, or specifically for children. However,

according to the American Heart Association (AHA) 2005 guidelines, children should not exceed the consumption of 3 teaspoons of sugar per day (or 12 grams). This calculation of white sugar excludes SSBs consumed at home or outside the home. It also excludes all types of added sugars in solid food. Examples of different brands of beverages available in the Lebanese market and in public schools give an idea about the amount of sugar included in each type. For instance, BONJUS, a very popular brand, claims 19.2 grams in a 180 ml serving, and MR JUICY, another popular and inexpensive brand, available at public schools, claims the amount of 18.2 grams in one serving of 125 ml. There are even other brands like UNO that claim the amount of 25.2 grams of sugar in each serving of 125 ml (Appendix. W). Thus, these parameters indicate the excessive overall intake of sugar by children in Lebanon, especially when other sources of added sugars are considered in the calculation of total sugar intake. However, the scope of this dissertation study does intend to measure or quantify the overall intake of added sugar in different SSB products. In conclusion, the reported frequency of the intake of different SSBs, and the estimated quantity of added sugar consumed by children whether at home or outside is consistent with an elevated intake of SSBs as evidenced in both global and local literature reviewed in chapter 1 of this dissertation.

5.3.2 Beliefs related to adding sugar to beverages

In the qualitative interviews, participants said that it was important to add sugar to beverages due to potential health benefits. This could be true as it stems from the medicinal properties or effect of sugar on the human physiology. It is well known that simple sugars have been traditionally incorporated in medicinal products

for respiratory diseases (cough or throat tablets or suspension solutions) among other products because of its soothing effect on the irritated membranes (Dharmananda, 2010).

Health beliefs and the perception of risk to disease seem to influence the behaviour of adding sugar to children's beverages as evident from the participants' responses. Some participants' responses reflected that they did not perceive any harm from the sugar added or that the harm was minimal. Therefore, it can be argued that their implicit perception of the risk of harm and the implicit perceived susceptibility of their children to disease could be low among the participating mothers. Thus, these qualitative findings can be considered to be in agreement with the TPB results of this study in terms of a neutral attitude (M=3.11) and moderate intention (M=4.74) to modify the behaviour of adding sugar to children's beverages.

Triggered by the interview questions, some of the responses tended to reflect the activation of compensatory beliefs. The quotes of some of the participants suggested they activated their compensatory beliefs by giving more weight or importance to milk intake (because of its benefits to the human body) over any potential harm from added sugar. Compensatory health beliefs (CHBs) pertaining to added sugar were not measured in this current dissertation study. Nevertheless, the activation of such CHBs can be argued to be consistent with the neutral attitude and moderated intention as previously stated. As reflected in the quotes of participants and cited literature, CHBs interacted with the perceptions of risk and susceptibility to disease. CHBs seem to be negatively associated with the control of the ASB behaviour. This is consistent with other studies that found that individuals who held higher CHBs did not properly adhere to a controlled diet (Miquelon, Knäuper, &

Vallerand, 2012), and consumed more calories (Kronick, Auerbach, Stich, & Knäuper, 2011) and less fruits and vegetables (Kaklamanou & Armitage, 2012). The Radtke, Kaklamanou, Scholz, Hornung, and Armitage (2014), modeling analyses showed that diet-specific CHBs were only positively associated with intention in women with a high risk perception but not in women with a low risk perception. Berli, Loretini, Radtke, Hornung and Scholz (2014), discussed their findings in relation to physical activity among 430 adolescents from four different Swiss schools, and showed that CHBs added significantly to the prediction of intention. Higher CHBs were associated with a lower intention to be physically active at follow up time and a reduction of intention at the second time period.

5.3.3 Taste

Researchers such as Grimm and Steinle (2011) considered that the control of dietary choices is a very complex phenomenon because of the multiplicity of factors and processes that can interact and lead to these choices. Among other factors such as education, time, accessibility, availability, family income, appetite, beliefs, culture, and peers, taste plays a major influence on eating habits. Taste was reflected in participants' rational thinking in this dissertation where the need to add sugar was believed to increase palatability. De Castro (2010) argued that non-physiological factors such as palatability seem to influence the control of food intake and eating habits much more the physiological factors. As stated above, taste was an influence to adding sugar to milk and other drinks, to increase the acceptability of sweetened beverages by children, facilitate a smoother transition from breastfeeding to baby formula and from baby formula to powdered milk.

The eating behaviour of humans is also influenced by a combination of the rewarding properties and processes of palatable food (especially those rich in fats and sugars) which together with emotional and environmental triggers can override the homeostatic processes of energy balance (satiation and satiety signals) to promote overeating despite a state of satiety. This can be attributed to the hedonic properties (reward or pleasure from eating) of certain types of foods. Sugar stimulates neuronal pathways in the brain similar to illicit drugs and activates the reward area of the brain making the experience of eating sugar pleasurable (Gold, Frost-Pineda, & Jacobs, 2003; Stice, Spoor, Ng, & Zald, 2009; Volkow, Wang, Fowler, & Telang, 2008). Similar dissertations also found that taste was among the most important themes influencing the intake of SSBs among children (Krzeski, 2011; Balian 2009).

5.3.4 Parenting feeding practices and parenting style

Published literature differentiated between general parenting practices and parental feeding style as specific and separate parenting practices. Parenting practices affected the ASB behaviour and this concept has been extensively discussed in the published literature (Farrow, 2012; Tylka et al. 2013, Eneli, Van Diest, & Lumeng, 2013; Tylka, Lumeng, & Eneli, 2015; Hughes, Power, Fisher, Mueller, & Nicklas, 2005; Hughes, et al., 2011; O'Conner et al., 2010; Gubbels et al., 2011; Vollmer & Mobley 2013; Sleddens, Kremers, Stafleu, Dagnelie, de Vries, & Thijs, 2014; Lo, Cheung, Lee, Tam, & Keung, 2015).

While parental feeding styles were not assessed through specific measures in this study, nevertheless, the responses of participants showed emotional feeding styles. The participating parents and grandparents tended to be permissive allowing

their children to eat as they liked, and expressed their love to their children through serving food they liked (as noted in quotes, chapter 2). This is consistent with the findings of a qualitative study by Jingxiong et al. (2007), among 12 parents and 11 grandparents in Beijing, China. In this study, grandparents played an important role in influencing their grandchildren's eating behaviour. The grandparents' love and caring were expressed through food which was not necessarily associated with a healthy diet for the child. The emotional parenting style was also reported in the Lo et al. (2015) study. The authors studied the influence of four parental feeding styles (i.e. instrumental feeding, emotional feeding, prompting and encouragement to eat**,** and control over eating) on children's dietary patterns among 4553 preschoolers in Hong Kong. Their multivariable analysis showed that emotional feeding was associated with an unhealthy diet (i.e. inadequate consumption of fruit, vegetables and breakfast at the expense of high energy-dense food). Sleddens et al. (2014) also found that the emotional parenting style was negatively associated with a child's healthy dietary intake (assessed in terms of water and fruit intake) and it was positively associated with unhealthy snacking and the intake of SSBs. The study of Sleddens et al. (2014), used data of 1654 children (aged between 6-8 years) from the Birth Cohort Study (KOALA) in the Netherlands

Furthermore, the association of the ASB behaviour to the parental feeding style was clearly evident from mothers who stated that the choice of food and drink was left to their children, and parents were not able to oblige any kind of food and drinks on their children. This is in agreement with the 'indulgent' parenting style as parents who tend to be lenient, do not require mature behaviour from their children and avoid confrontation with them (Baumrind, 1991, p.62). The parental feeding

style of this sample requires further examination. To conclude this section, emotional feeding styles have not been associated with healthy feeding styles as shown in various studies (Collins et al., 2014; Lo et al., 2015; Sleddens et al., 2014; Vollmer & Mobley, 2013; Gubbels et al., 2011). Extending this reasoning to the findings of both the qualitative interviews and the reported teaspoons of added sugar by participants in the quanitative survey, it can be argued that the qualitative and quantitative data findings in the overall study are consistent in the sense that emotional feeding styles do not seem to be associated with healthy feeding styles (i.e. evidenced by the ASB behaviour to home prepared drinks and the reported intake of SSBs by participating children).

5.3.5 Habitual nature of the ASB behaviour

The themes from the qualitative component of the mixed method study revealed that the adding sugar behaviour in particular to milk is a common practice among participants inherited through generations. This further supports the available accumulating literature showing that children's consumption of food and beverages is directly related to and affected by their parents' eating and drinking behaviour (Savage et al., 2007). In the quantitative study, the finding that perceived behavioural control and not intention predicted the ASB behaviour suggests that the ASB behaviour is not subject to full volitional control, but could be driven by habit (Ajzen, 1991; Armitage & Conner, 2001). The possible role of habit on influencing intention and behaviour warrants attention as the habitual nature of the ASB behaviour might have also influenced, to some extent, the predictive power of the TPB model.

Habit is a repeated behaviour that tends to be enacted without purposeful thinking or sense of awareness (Nilsen, Roback, Brostrom, & Ellstrom, 2012). Habits are developed through a gradual shift from intentional cognitive control to automatic processes triggered by situational or contextual cues (Gardner, Corbridge & McGowan, 2015). Verplanken, Aarts, Knippenberg and Moonen (1998) noted that in the presence of a strong habit, there was no relationship between intention and behaviour. Studies in the last decade have documented the role of 'habit' in moderating the relationship between intention and behaviour as having an addictive effect (Brug, De Vet, De Nooijer, & Verplanken, 2006); Reinaerts, de Nooijer, Candel, & de Vries, 2007) or an interactive effect on health behaviours (De Bruijn et al., 2007).

De Bruijn and colleagues (2007) have shown that the stronger the health habit is, the less the health behaviour is intentional. In a longitudinal study, De Bruijn et al. (2007), investigated whether habit strength moderated the influence of intention on fruit consumption in a random sample of 18-55 year old participants serving as members of a Dutch internet panel. In this study, the TPB variables and habit strength were assessed at baseline. The behaviour of fruit consumption was assessed then after 5 weeks of collecting TPB and habit strength measures. The results showed that intention was a significant predictor of fruit consumption in both low and medium habit groups, but a non-significant predictor in the high habit group.

In another study, De Bruijn (2010) investigated the additive and interactive effect of habit strength in the explanation of fruit consumption among 538 undergraduate college students. He also examined which behavioural and control belief-based variables can differentiate participants' profiles based on "fruit

consumption motivation", "fruit consumption habit strength", and "current fruit consumption". De Bruijn (2010) showed the incorporation of habit strength as an additional measure to the TPB to study this behaviour significantly increased the amount of explained variance in intake. The habit component was found to be the strongest predictor of fruit consumption – a similar finding as previous studies correlating habit with fat consumption (De Bruijn et al., 2008), bicycle use for transportation (De Bruijn & Van den Putte, 2009), and fruit and vegetable consumption (Reinaerts et al., 2007). They all argued that external motivation might activate or enhance the intention, but it is habit that actually limits the efficacy of the TPB and eventually controls the behaviour.

Recent studies have argued that habit responses are influenced by cues which were established in particular situations as well as past experiences which is the case of the ASB behaviour in this dissertation study (Wood & Neal, 2009; Neal, Wood, Labrecque, & Lally, 2012; Neal, Wood, & Drolet, 2013). In investigating the relationship between goal and habit, Neal et al. (2012) demonstrated through their research that the past performance of a behaviour and its cues in a stable context influence strong habits. Neal et al. (2013) further argued that (i) the psychological mechanisms that lock people into performing bad habits also extend to good habits, and (ii) people have a default tendency to enact good and bad habitual responses cued by their immediate environment regardless of whether those responses are congruent or incongruent with their reported intentions and motivations. In a series of five studies, Neal et al. (2013) suggest that habits are a regulatory mechanism that can enable people to engage in an action. Recently, Gardner et al. (2015) argued that habits did not necessarily interact with intention to predict a dietary behaviour. In

their study, they investigated the effect of habit in unhealthy snacking and the relationship between intention to avoid unhealthy snacks and snack intake. Their study results showed that habit and intention independently predicted snack intake, but there was no moderating impact of habit on the intention-behaviour relationship. This means that individuals with intention can act on an intention (with difficulty) despite having a habit. Gardner et al. (2015) concluded that previous evidence of the moderating effect of habit on the intention-behaviour relationship might have been influenced by the strong correlation between habit and intention. Gardner et al. (2015) called for a further theoretical understanding of the role of habit in predicting health behaviour using more sophisticated data collection and analysis that could better capture the influence of habit and intention on individuals.

In this research and with the reasoning that low self-control habits may function like other low-effort means of self-regulation, they can be equally well utilized to promote the adherence to healthier goals; but to do so, there is a need for a better understanding of the habitual processes pertaining to the control of the ASB behaviour, and how it interacts with individual self-control processes in different contexts.

5.3.6 Mother's affective state influenced findings of the qualitative and quantitative studies

First, the findings of this dissertation's TPB study differ from those of other studies (Kassem et al., 2003; Kassem & Lee, 2004; Zoellner et al., 2012), but are similar to those of Tipton (2014) in the sense that it was assessing the mothers' ASB behaviour to their children in relation to the TPB psychological predictors: intention,

attitude, subjective norms and the mothers' perceived behavioural control. The results of the TPB study are not directly comparable to the results of other studies because the modification of targeted behavioural variables and the efficacy of this modified behaviour are not at the sole discretion of the person participating in the study. In this study, the intention, act or behaviour of one person (e.g. mother) influences someone else (her child). The controlling or minimizing of the intake of beverages and drinks with added sugar is not at the sole discretion of the mothers' decision, or will. As such, other predictors are likely to influence the ASB behaviour and the ability of the TPB model to predict such outcome behaviour. Some of these factors are discussed in the next paragraphs.

Participating mothers' affective states (mood and stress level) at the time of doing the interview or completing the questionnaire might have affected their responses. According to basic hedonistic assumptions, individuals are motivated to engage in behaviours that enable their positive mood while they are motivated to avoid behaviours that can result in a negative mood (Martin, 2001). The mothers who perceived that their children's feeding behaviour and/or weight (among other health issues) were not good, they would be more likely to express an intention to control their children's feeding behaviour, and actually become engaged in the "perceived good behaviour" in order to uplift their mood. Whereas, according to the dynamic effect of evaluation theories (Andrade, 2005), a mother at the time of the questionnaire completion might have assessed her current feelings towards her child feeding behaviour versus what she might feel in the future as a result of changing her child feeding behaviour; how it would affect her child's weight or other health issues, how her child would react towards the change in feeding style, and how/if she

would be able to maintain the change in behaviour. Such types of dynamics affecting assessment are likely to guide her decision to maintain or change her current child feeding behaviour, and how these decisions would affect her current mood towards her feeding behaviour for her child.

In planning her decision regarding the change in targeted feeding behaviour, mothers are assumed to evaluate the information at hand. Mothers are not just concerned about how the change of the behaviour would influence her affective state; but also implicitly concerned about their child's preferences and acceptance to consume the offered drink/beverage without added sugar, and about their ability to maintain or sustain the reduced intake of such drinks/beverages with added sugar by their child over longer periods of time given (i) the child's health status and preferences, (ii) active support by other family members to reduce the intake of added sugar, and (iii) the easy accessibility of drinks/beverages in the home by significant family members or others, nearby shops, school and other public settings. Mothers with a regular ASB behaviour and positive intention might be able to avoid engaging in the ASB behaviour if their perception of self-regulation was high or strong, as well as having strong intention towards stopping/reducing the ASB behaviour. Hughes et al. (2011) highlighted that the parental emotional climate may influence the child feeding behaviour and the parent's actual attempt to modify their child feeding practices (e.g. to counsel their child or to correct their child feeding behaviour if it is improper or unhealthy). As such, the parental emotional climate or affective state of influencing parents (e.g. mothers) may need to be concurrently investigated in future studies along with TPB psychological variables. The next

section discusses the design issues related to the TPB study using a structured questionnaire.

5.3.7 Change in the 'adding sugar' behaviour over the two time periods: Social desirability

The results of the TPB study (chapter 3) showed that the ASB behaviour was not stable over time as the mean behaviour collected at Time 1 (2 teaspoons) was significantly decreased by 1.00 unit at Time 2 (1 teaspoon). This change in behaviour can be the influence of the participants' affective moods or states at the time of assessment as indicated above. It can also be attributed to time lag, self-assessment, social desirability bias, prior exposure, recall bias, attrition bias, or study design methodological issues that might have affected the level of accuracy in the self-reported answers of the participants.

Self-reported data is always prone to self-assessment and recall bias (error in estimation of frequency) due to memory lapses. While it is possible to assume that some of this study's participants were not 'realistically' aware of the exact frequency and amount of the sugar added to their children's beverages; nevertheless, the longitudinal nature of the study made it more prone to social desirability bias and bias due to prior exposure. Some participants might have given an answer that was socially acceptable or that was in line with the impression they want to give to the researcher. Thus, their answers would not reflect their real behaviour. Evidence has noted that self-reporting of behaviour such as dietary intake is particularly prone to social desirability biases (Kimberlin & Winterstein, 2008). It is possible that the mothers' responses at Time 2 were confounded by potential effects of prior exposure

to the questionnaire at Time 1 and providing desirable answers (e.g. lower quantity of added sugar) especially in the follow up questionnaires (i.e. the first questionnaire serving as a type of intervention in and of itself (Kimberlin & Winterstein, 2008).

5.4 Behaviour Change Interventions Identified from the Systematic Review and Meta-Analysis

Overall, when studying the effect of behaviour change interventions on the reduction of SSB intake among children and adolescents, the meta-analysis of 3 studies showed that behavioural and educational interventions did not significantly reduce SSB consumption. Results from the systemic review highlight that behavioural interventions are possibly superior to no intervention at all in reducing SSB intake. When studying the effect of behaviour change interventions on the reduction of SSB intake among children and adolescents, the meta-analysis of three trials with 3,004 participants showed that behavioural and educational interventions were associated with a trend towards a reduction in SSB intake compared to the control groups; however, this trend did not reach statistical significance.

As for the influence of habit in interventional studies, earlier studies noted that strong habits were likely to make behavioural change interventions less effective and persuasive (Verplanken et al., 1998; De Bruijn et al., 2007; Verplanken & Aarts, 1999; Verplanken & Wood, 2006). The reason for this being because habits are behaviours formed out of recurrent performance in similar environments, making them unaffected by minor changes in these environmental conditions, and less in need of new information and thinking in performing the behaviour, and therefore less mind-demanding; thus they are not easily changed with simple informational

campaigns and interventions (Verplanken & Wood, 2006). Verplanken and Wood (2006) also concluded that interventions aimed at changing daily behaviours are unlikely to succeed unless these habit change interventions involve strategic key steps. The De Bruijn (2010) study results, suggest that interventions aiming to increase fruit consumption may need to develop persuasive messages focusing on beliefs, rather than emphasizing health outcomes.

The failure of many health behaviour change interventions can be attributed, to some extent, to ignoring the habitual tendency of health behaviours; most interventions focus on providing knowledge rather than on changing a habit, whereas individuals with strong habits are unresponsive to new information (Nilsen, Bourne, & Verplanken, 2008). Habitual health behaviour is less information-dependent and more situational cues-dependent (Van't Riet, Sijtsema, Dagevos, & De Bruijn, 2011). Thus campaigns targeting health behaviour change should consider focusing less on health knowledge and more on situational triggers that stimulate the desired behaviour performance.

In addition, and based on De Bruijn's (2010) findings that the effect of the behaviour on health and weight management did not influence change of the behaviour itself, and therefore interventions may need to focus more on the beliefs pertaining to the perceived control of the behaviour for the targeted population. Thus, when planning for health behaviour change interventions, a greater focus should be made on changing the actual beliefs pertaining to the behaviour to be modified (such as compensatory health beliefs identified in the qualitative interviews) and their ability to control the behaviour, rather than on simply promoting the health benefits or harm generated from the behaviour. Similar to the approach reported by Keogh et

al. (2011), family based interventions can be applied (e.g. for children with dental caries or other diseases related to the balance of diet) and have been recruited in clinics, for whom the intervention would consist of a specific number of sessions by a trained health psychologist or nutritionist "with expertise in motivational interviewing". The sessions would take place in the patient's home setting or designated location and specially tailored to the participants' needs in an attempt to clarify any inaccuracies in perception about the participants' disease in relation to dietary intake, specifically the 'adding sugar' behaviour, and other types of foods with added sugar that are likely to affect their health status or the progression of certain medical conditions. Such a psychological family intervention utilizing motivational interviewing techniques such as "exchanging information", "eliciting change talk", "reducing resistance", "building self-efficacy", "identifying a workable action plan" and achievable goals among other measures has been useful in improving the health indicators of patients with type 2 diabetes (Keogh et al., 2011).

This dissertation's findings fill a significant gap in the literature in relation to this unhealthy behaviour: adding sugar to milk, hot beverages and fresh juices prepared at home. Further research is needed to fully explore the adding sugar behaviour and its predictors. Factors influencing this behaviour will help define preventive measures as well as educational and behavioural interventions to reduce adding sugar to beverages specifically targeting children and their primary caregivers in Lebanese communities.

5.5 Strengths and Limitations

This section presents an overview of the strengths and limitations of this dissertation study.

5.5.1 Research strengths

Rationale of this research: The wide range of dynamics investigated for this health behaviour in this new field is the key strength of the current study. This study, set in Lebanon, is the first to explore the determinants of a behaviour that can potentially impact children's health. This study has targeted four groups from the main religions (Christian, Sunni, Shia and Druze) existing in the country reflecting the different cultures which make up the blend of the Lebanese community. Providing new insights to guide developing family interventions characterize the unique feature of this study.

Research design: Most other studies tackling a proxy behaviour such as the intake of sugar sweetened beverages have used either qualitative methods (to examine the views of parents) or quantitative methods (involving parents filling a FFQ). But the mixed method approach used here is innovative. A complementary exploratory sequential design has been employed in this thesis (Ivankova et al., 2006). This approach has allowed for in-depth views of mothers and a study of the determinants of the ASB behaviour using a theoretical framework. In addition, this dissertation ends with a systematic review of interventions tested to reduce the intake of sugar sweetened beverages. This gives a more holistic conclusion bringing together the data generated from parents who participated in this study, and the results of the systematic review of published literature. The current study has

involved a qualitative design providing an in-depth view of parent opinions, followed by a quantitative design underpinned by a theoretical framework, and supported thereafter by a systematic review. The qualitative component of the study brings to discussion other factors (compensatory beliefs, parenting practices and habitual nature) that might influence the casual relation between the investigated variables. The overall findings can be relatively generalizable to any population with characteristics similar to the sample of participants who were included in this study.

In the qualitative study, the participants were sampled in three phases (as described in chapter 2) targeting primary caregivers and children which gave a robust framework to the design of the study. The face to face interviews which were done in the third phase were collected from parents and grandparents from the above listed regions in the country, reaching from the extreme north and to the extreme south, as well as near the Syrian border despite the chaotic situation in the country. In a very recent study in China exploring caregivers' beliefs about healthy eating for children, the same design was followed: data was collected from children, and from in-depth interviews of caregivers, including parents and grandparents as well as uncles and aunts (Zhang, Bécares, Chandola, & Callery, 2015). In a study examining how feeding attitudes and practices have changed from one generation to another, a qualitative approach was adopted and semi-structured interviews were conducted with caregivers, including mother, grandparents, great-aunts and great-grandparents (Higgins & Murray, 2010). Participants in our study recruited from the main religions in the country gave the ability to explore the behaviour from the perspective of different subcultures existing within the country. McDowell and Bond (2006),

suggest that eating attitudes and behaviors in many ethnic groups are guided by their sociocultural and religious beliefs.

The sampling strategy in the quantitative study was projected to represent all pre-elementary divisions existing in Lebanese public schools and from all five Lebanese Mouhafazahs (governorates or districts), thus also reflecting the various religions and cultures existing in the country (McCabe et al., 2013). Reaching the diverse areas in Lebanon was seriously challenging, but it proved to benecessary to explore the influence of different subcultures for dietary habits.

To overcome potential limitations of the cross-sectional design where the ASB behaviour measure was collected concurrently with the TPB constructs, the author of this dissertation measured this behaviour prospectively after a few months from the collection of the TPB constructs (Conner et al. 2002; De Bruijn et al. 2007; Backman et al. 2002; Masalu & Astrom 2003). This was done despite theunstable and unsafe situation existing in the country making data collection in the far reaches a seriously challenging task.

The systematic review in this thesis is the first to conduct a review and meta-analysis of trials to assess the effectiveness of educational and behavioural interventions targeting the reduction of SSB consumption. This review included only RCTs which are considered among the best platforms for studying the causal processes that underlie behavioural interventions, and strengthen the evidence base for intervention design (Improved Clinical Effectiveness through Behaviour Research Group-ICEBeRG-2006).

A validated risk of bias tool adopted from the Cochrane review manual was used to assess the quality of the RCTs in this review (Higgins & Green, 2011).

Furthermore, this systematic review included a substantialnumber of studies reflecting a significant sample of participants.

This systematic review identified a gap in the literature in relation to the lack of a standardized tool to measure the intake of sugar sweetened beverages. Thus, the pooling of outcomes and comparisons between studies was challenging.

5.5.2 Research limitations

Self-reporting is commonly used for studying dietary intake and interpreting diet-health outcome relationships. The accuracy of the 24-hour dietary recall has been proven to be reliable in most instances. According to Moore, Braid, Falk and Klentrou (2007), the 24-hour recall method was proven to be more accurate in estimating the daily calcium intake than the Rapid Assessment Method for both children and adolescents. Moreover, when comparing food frequency questionnaires FFQ's and 24-hour recalls, the average correlation coefficients for reported versus true intakes for energy and protein rose significantly when using multiple 24-hour recalls as compared to FFQ's and a single 24-hour food recall sheets. Also, the average rate of underreporting of energy intake has been noted to be lower with a 24-hour recall than with a FFQ (Freedman et al., 2014). However, this method has also been criticized as data can be influenced by memory and recall bias.

While the inability to re-contact participants in the qualitative interviews to verify their recorded or transcribed replies (as part of member checking) might be a limitation of the qualitative component, the sequential studies (qualitative and quantitative) yielded consistent results reinforcing accurate data interpretation. Data analysis in qualitative research is generally evaluated based on the extent to which

results are negotiated with participants. In fact, member checking is a major technique considered in order to ensure trustworthiness, as well as credibility and rigour of the research methodology (Koch & Harrington, 1998). It refers to the procedure for validating the authenticity of the data and its interpretation by involving the participants in a process of negotiation with the researcher to ensure an accurate representation of their views (Nastasi & Schensul, 2005). However, there were several practical problems that did not allow the principal investigator to return the data to participants. It was often not feasible to trace back to the interviewees after the data collection, especially since there were initial challenges faced in interviewing parents and grandparents. First, the list of parents' names and their phone numbers was provided by the school principal. Most of these phone numbers were cellular phone numbers and not landlines. While there was success in establishing contact by cellular phone with some parents (85%, N=22), there were a few instances where parents could not be reached, despite repeated attempts, either because the cellular phone was switched off, or their phone account was closed (15%, N=4). Second, during the first contact phone conversation, parents were asked about their home address so that the researcher could visit them at that address and interview them. In many instances, addresses were given inaccurately and given without house or building numbers. This added more time than expected to conduct interviews especially since it was very difficult to reach the low-income areas in Lebanon. In addition, the unstable political situation in Lebanon did not allow the researcher to go back to certain areas in particular those which were close to the Syrian borders.

Additional limitation of the current dissertation study stems partly from not extending the TPB model and not including other factors that would further explain the variance of intention and behaviour. As stated earlier, various factors can influence the relationship between the TPB constructs and the ASB behaviour. These potential factors can include mood change, perception of risk and susceptibility to diseases, compensatory beliefs, specific feeding practices, and the habitual nature of this behaviour. Methodological issues previously stated such as social desirability, self-assessment bias, bias in recall, or prior exposure to the measuring instrument might have affected the participants' replies particularly in the follow up survey.

The systematic review also has a number of limitations that need to be taken into consideration when interpreting the results. The overall completeness of data is a major issue for this systematic review. Out of a total of 15 trials, 12 trials could not be included in the meta-analyses due to the variability of scales used to report the outcomes of interest. These 12 studies would have contributed 15,819 additional participants to the meta-analysis (3004 participants are currently included). Despite this limitation, most of these trials showed effects similar to the findings reported from the meta-analysis of fewer studies. In addition, findings from the present review may have been subject to potential biases including clinical heterogeneity that could not be accounted for. Clinical heterogeneity may be attributed to the substantial variability amongst trials with respect to a number of factors: 1) the setting (school vs out-of-school) 2) baseline characteristics of participants and their body weight status (percentage of normal weight versus overweight participants), 3) the level of involvement of parents in the interventions, 4) the intervention strategies conducted such as *educational* alone versus *a combination of educational and environmental*

change. These factors contribute to the heterogeneity of the studies, and may limit the validity of this summary for effective estimates. In addition, and as in all meta-analyses, publication bias is also a potential concern. However, in analyses of this systematic review, there was limited evidence of publication bias based on the inspection of the funnel plot. Moreover, it was not feasible to include a larger number of trials in the meta-analyses because of difficulties faced in obtaining comparable units; nonetheless, these trials were reviewed qualitatively. Furthermore, the risk of bias assessment suggested that the majority of trials had a low or unclear risk of bias for the domains that were evaluated, which need to be better considered in future randomized controlled trials targeting SSB consumption and similar health-related behaviours.

5.6 Recommendations for Future Work

This innovative study is the first to explore this particular behaviour, ASB, in the Middle Eastern setting. Hence the scope of future work is extensive, but key issues need to be addressed. Based on the exploratory results of the current dissertation, the ASB behaviour is influenced by many factors that need to be further explored prior to the design and implementation of any future interventional studies.

5.6.1 Using focus groups among children for better understanding of their beliefs and factors influencing intake patterns of SSBs

There is a need for a better understanding of the beliefs among children related to the consumption of different SSB products and how these beliefs are influenced by their peers, parenting practices and feeding styles, advertising, and

marketing approaches. Focus groups among children can further help in exploring this behaviour in-depth. In the qualitative study (chapter 2), data were collected from children to identify if they added sugar to beverages. It is worth noting that when collecting data for this phase, the main challenge was in getting the approval to enter the schools. However, once the approval was obtained, the school principals, health educators and all concerned were very supportive in facilitating the process of data collection. This fact would encourage the researchers to take one step further and complement the overall view of the picture by conducting focus groups among children. By doing so, the ASB behaviour could be addressed from different angles, such as obtaining the views of children and parents. In the last 10 years, the expansion of the use of focus groups with children and young people in the area of health education and health psychology has been noticed (Hennessy & Hear, 2009; Gibson & Neate, 2007). Thus, internationally, the acceptance of children's views validates their ability to be competent and legitimate participants in the field of research (Porcellato, Dughill, & Springett, 2002). There is now a growing awareness that children's involvement in research is needed to truly understand their personal perspective and experiences in order to plan and provide appropriate child and youth health services (Darbyshire, MacDougall, & Schiller, 2005).

5.6.2 Using the self-reported habit index (SRHI)

As discussed throughout the previous chapters, the parents' addition of sugar to their children's beverages is a potentially inherited common practice. However, it remains essential to design a future study investigating the ASB behaviour as its primary outcome.

Habit measures rely on the frequency of behaviour in stable contexts (Labrecque & Wood, 2015). Yet, Gardner (2015) argued that these habit measures assess the likelihood that habit has formed but do not give an idea about the strength of the habit. As such, future studies should address / investigate the habitual nature of the ASB behaviour in terms of its frequency and strength and how it is influenced by the situational context or environmental cues unique to the Lebanese culture. Past behaviour needs to be clearly differentiated in the measurement subscale of habit strength as it serves as a measurement bias to its results.

One of the most reliable measurement tools for habit is the 12-item self-reported habit index (SRHI) (Verplanken & Orbell, 2003). This index has proved high test-retest reliability and a high internal reliability when used for different health behaviours (Brug, et al., 2005; De Bruijn et al., 2009). The SRHI consists of the following 12 questions to which a response varies on at least a 5-likert scale from agree to disagree. These items include: "(1) I do frequently, (2) I do automatically, (3) I do without having to consciously remember, (4) makes me feel weird if I do not do it, (5) I do without thinking, (6) would require effort not to do it, (7) belongs to my (daily, weekly, monthly) routine, (8) I start doing before I realize I'm doing it, (9) I would find hard not to do, (10) I have no need to think about doing, (11) that's typically "me", and (12) I have been doing for a long time" (Verplanken & Orbell, 2003, p 57).

5.6.3 Controlled test to confirm questionnaire behaviour effect

As it was stated previously in Chapter 3, there was indicative evidence that giving parents and caregivers a questionnaire about exploring the determinants and

predictors of ASB behaviour may have influenced the noted decrease in this behaviour among participants. A controlled test of a potential intervention strategy aiming to reduce the ASB behaviour is needed. For example, designing a study on ASB behaviour between a group of participants that has received a questionnaire and a group of participants that has not received a questionnaire could provide interesting evidence whether the questionnaire itself can work as an intervention, and if it related to the decrease in mean behaviour levels.

5.6.4 Investigating the interaction of other variables with the TPB constructs

The possibility of interaction effects between the TPB constructs and other variables needs to be investigated. Radtke and Rackow (2014), called for studies to examine moderators and stage-specific differences of the association between compensatory health beliefs, intention, and health-behaviour. A better understanding of these beliefs can be useful in designing theory-based interventional studies, and at a later stage targeting the ASB behaviour in light of its long term consequences on the development of chronic diseases among future generations. Michie argues in a series of her published works that for interventions to be effective and replicable, they should be based on accumulated science and evidence, and guided by theory (Michie et al., 2005; Michie et al., 2011; Michie & Johnston., 2012).

5.6.5 Inclusion of measures of health and compensatory beliefs of the ASB behaviour under different situational contexts

The findings of this exploratory dissertation call for further qualitative research for a more thorough understanding of the beliefs pertaining to the ASB

behaviour among Lebanestse parents including compensatory beliefs, misconceptions about the different types of sweeteners and consumption of SSBs in general. From the various participants' quotes, it can be argued that the perceived importance of milk's nutritional value influences the ASB behaviour more than the perceived susceptibility of disease. Compensatory health beliefs seem to be interfering with perceptions of risk, so it would be worthwhile to investigate the specific compensatory health beliefs pertaining to the ASB behaviour, as well as those pertaining to the intake of SSB products in Lebanon in follow up studies. Such a thorough understanding of compensatory beliefs would enable refinement of the measurement tool for use in future quantitative studies. The further investigation of compensatory beliefs, could also affect the frequency and strength of the ASB behaviour along with other standard TPB constructs.

5.6.6 Inclusion of measures of parental feeding styles and adoption of interventional approaches

The findings of this exploratory dissertation also underscore the need for a further understanding of the range of culture-specific parenting practices, feeding styles and other modifiable characteristics. These variables may influence child feeding behaviours within the home dietary environment from both a caregiver's perspective and the children's perspective.

Collins et al. (2014) addressed the need for the development of a measurement tool that could reflect the overall child feeding behaviour, as well as conducting studies targeting fathers for a better understanding of the association between parenting style and child feeding behaviour. O'Connor et al. (2010) also

argued that most of the cross-sectional research studies focused on counterproductive parental feeding practices such as parental control and pressure to eat were negatively associated with children's fruit and vegetable consumption. Sleddens and Colleagues (2014) called for further research to investigate parenting practices relative to child temperament and eating style to obtain more successful behavioural interventions.

More importantly, there is a need for a more comprehensive understanding of parenting food practices and approaches that could promote the reduction of the ASB behaviour early in childhood. The extent of parental involvement in home-based or school-based interventions needs to be evaluated to investigate possible differences in maternal and paternal support and role modeling for healthy behaviours. The findings of such studies could better guide the development of interventions to encourage the reduction of SSB intake early in childhood and adolescents. Any interventional programs through the Lebanese public school system or TV designed to increase the awareness about the presence of intrinsic sugars in different food types (among other objectives) needs to target grandparents or more specifically grand-mothers because of their influential role in the family.

5.6.7 Questionnaire pretesting and validity using cognitive means

The validity of future questionnaires can be enhanced with a cognitive type of interviewing technique that can be employed in the pretesting of measurement scales to evaluate the complexity or difficulty in interpreting the TPB variables. Questionnaire validity can also be enhanced by accounting for different types of biases, for example, including measures that are likely to influence the hypothesized

relationship between variables such as the emotional status of the participants and social desirability bias. Kimberlin and Winterstein (2008) argued that self-reported questions may elicit an estimation of behavioural frequency rather than the actual and accurate recall and count response desired by the researcher. Future studies can benefit from the inclusion of the Marlow–Crowne social desirability scale to measure the extent of bias in responses. Being a potential confounding variable, child temperament also needs to be assessed in concurrent future studies specifically using; e.g. a caregiver's feeding style and a child's behaviour questionnaire that can detect individual differences in reactivity and self-regulation similar to the questionnaires adopted by O'Connor et al. (2010).

5.6.8 TPB study among Lebanese Children in public schools: predicting ASB behaviour and the intake of SSB

The TPB study can be repeated but instead refocused to collect data on children in Lebanese public schools aged between 12-14 years. Exploring the predictors of two behaviours, ASB and the intake of SSBs will help in establishing the elements of a successful intervention.

5.6.9 Systematic review: Implication for practice and future research

The results from the systemic review highlight that behavioral interventions are likely superior to no intervention at all in reducing SSBs intake among children and adolescents. However, it is worth noting that most of the trials included in this review were conducted in high income countries with only two conducted in Brazil,

representative of a lower-middle income country. Thus, the applicability of the findings for developing countries, such as Lebanon, may be limited.

Furthermore, the included studies in this review were heterogeneous in nature rendering it more difficult to identify which components and strategies were the most effective in reducing the behaviour of interest (intake of sugar sweetened beverages). In addition, limited trials have been identified in the literature addressing a change in SSB consumption as their primary outcome. Trials also differed in terms of duration of intervention and follow up periods.

Moreover, from the systematic review reported in this dissertation, there is insufficient evidence to evaluate whether a single strategy intervention (educational strategy alone versus educational and environmental combined) is more effective than a multiple strategy intervention in reducing SSB consumption. In addition, this review could not compare the effectiveness of single-component interventions versus multicomponent interventions (i.e. interventions targeting SSBs as the primary component versus SSBs as one of a number of dietary and physical activity-related behaviours) in changing the SSB consumption of children and adolescents. Future research studies and reviews are needed to address and assess these questions.

Based on this review, the fundamental role of the home environment is a key aspect that can be taken into consideration while designing and delivering future interventions. Although the active involvement of parents in educational interventions enhanced their efficacy, the number of studies describing this component is small. Thus, parental involvement in limiting SSB consumption needs further exploration in future trials. Future designed interventions among children and adolescents may consider other factors that influence the SSB intake of children

besides their knowledge about the benefits and risks from drinking these beverages to targeting skill development and reinforcement of the intake of healthier beverage alternatives within schools and at home. It is recommended that program planners highlight which established theoretical constructs and mediators assist in decreasing and maintaining the lower intake of SSBs among children and adolescents. The length of the intervention is pivotal to evaluate the efficacy of the delivered program. Furthermore, interventions need to consider adequate follow up periods up to 2-3 years in order to ensure the sustainability of health outcomes.

It is worth noting that some of the school-based interventions included in this systematic review were conducted by teachers, and others were conducted by the research group. One of the advantages of teacher-led sessions is the ability to integrate information within the school curriculum beyond the time frame of the study, thus reinforcing the sustainability of the school-based projects. However, the way teachers were trained to deliver the interventions should be clearly stated in the intervention protocol.

Further studies and programs are needed to target children from resource-poor households and communities through school or community-based interventions to reduce the intake of SSBs and the burden of health risk factors and their associated comorbidities. Parental involvement in school-based interventions should be evaluated to investigate possible differences in maternal and paternal support and role modeling of healthy behaviours.

Process evaluation and behavioral constructs need to be reported for all interventions to identify which elements of the multicomponent interventions best address the intended behavioral change.

Future studies need to explore and clearly report the expenses incurred from the various components of interventions in order to improve cost effectiveness analysis and comparisons among and within school and community-based interventions. Only one trial included within this review reported the intervention costs and with the lack of data from other studies regarding financial expenses, cost-effectiveness analysis cannot be determined to identify which interventions are most effective in reaching the intended behavioral and clinical outcomes.

More standardized evaluation schemes are required to assist researchers in improving their research study protocols and minimize possible risks of bias, as well as support the task of reviewers and public health professionals in synthesizing the evidence to develop sound recommendations and design scientifically-valid and practical effective interventions.

There are numerous methods, checklists, and evaluation grids used to grade the evidence and the quality of trials included in published reviews assessing the effectiveness of educational, behavioral, and environmental programs in making dietary and weight-related changes. Differences in grading and evaluation schemes may help in capturing the various study designs, settings, and protocols used by researchers as well as methodological preferences and expertise of reviewers; however, these differences may be a source of confusion to program planners and implementers when synthesizing results from various systematic and comparative effectiveness reviews to design evidence-based interventions. Future interventions should be theory based and include behaviour change techniques (BCT's).

There is a need to conduct trials comparing the impact of educational and behavioral interventions on various outcomes using standardized units or scales to

allow for comparisons across studies given the heterogeneity of methods, scales, and outcomes.

In addition, primary investigators of trials should consider making the raw data of randomized controlled trials, mean and standard deviation available for individual patient data meta-analysis. In addition, reported data based on gender and setting of the intervention can allow subgroup analysis.

Finally, given all of the inter-trial differences, as well as the limited number of studies that reported homogenous measures of statistical data for the primary outcome of interest in the present review, only three identified trials were included in the meta-analysis. Thus, future reviews may need to consider quasi-experimental studies and cohort studies in order to increase the opportunity of complete data to pool the results through meta-analysis.

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5.7 Overall Conclusion

The findings of this dissertation study are consistent with published literature particularly as relevant to the increased consumption of SSBs, habitual routines of the ASB behaviour, and the likely consequences of the addictive nature or rewarding properties of sugar intake. Multiple interacting factors at different genetic, individual, family-based, school or community-based levels may influence food intake through different pathways. Furthermore, the complexity and challenging nature of controlling sugar intake, as evidenced in biological studies and studies addressing eating habits, beliefs and general parenting feeding practices have been consistent. The parents' ASB behaviour to their children's beverages is a common practice and potential habit among low SES Lebanese families inherited from one generation to

the next. Individuals are inheriting the ASB behaviour to beverages (such as milk and tea) from their parents. Thus, as this becomes a regular behaviour, pregnant mothers who are drinking their sweetened beverages, unintentionally expose their fetus to sugar via the placenta, and parents in general expose their infants and children to sugars through serving sweetened beverages. From foetal life throughout childhood, new generations are acquiring this sugary taste preference and the behaviour of adding sugar to their beverages. After much repetition, the behaviour becomes a habit engraved in every new generation and the cycle begins again for their children. Nevertheless, it remains scientifically essential to prove this finding with future longitudinal studies under different explanatory predictors such as parenting practices and feeding styles, as well as compensatory beliefs to be able to create effective interventions.

The findings from the the first two studies (mixed method study and the TPB study) will be shared with the school healh programs in the Lebanese Ministry of education and higher education in order to inform more effective interventions. In addition program planers in the NOHC can benefit from the findings for better development of printed material in relation to dietary intake among children. The themes generated from the qualitative component of the mixed method study (chapter 2) were incorporated in the food based dietary guidelines recently produced by the Maerican university of Beirut and the Lebanese centre for research and development (The Lebanese Cedar Food guide, 2013 p.53).

The studies included in the systematic review are from developed countries which limit their applicability in the Lebanese context. However, researchers in the field need to consider school based education interventions with active parental

involvement. In addition, the length of the intervention (2 -3 years) is a key factor to be assumed. It is imperative to design interventions based on theories and including behaviour change techniques with a well written protocol. Researchers are required to train the personnel in charge of the intervention delivery ensuring an ultimate efficacy in the delivered intervention. Decision makers in the public health program may consider involving a multidisciplinary team including dietitian, health psychologist health economist and a physical education trainer.

References

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology, 78*, 53-63. doi:10.1037//0022-3514.78.1.53

AbiHabib, L. E., Chemaitelly, H. S., Jaalouk, L. Y., & Karam, N. E. (2011). Developing capacities in aging studies in the Middle East: Implementation of an Arabic version of the CANE IV among community-dwelling older adults in Lebanon. *Aging & Mental Health, 15*(5), 605-617. doi:10.1080/13607863.2011.562351

Abowitz, D. A., & Toole, T. M. (2010). Mixed method research: Fundamental issues of design, validity, and reliability in construction research. *Journal of Construction Engineering and Management, 136*(1), 108-116. doi:10.1061/(asce)co.1943-7862.0000026

Adair, P. M., Pine, C. M., Burnside, G., Nicoll, A. D., Gillett, A., Anwar, S., Metropolitana, M. (2004). Familial and cultural perceptions and beliefs of oral hygiene and dietary practices among ethnically and socio-economically diverse groups. *Community Dental Health, 21*, 102-111.

Agrawal, R., & Gomez-Pinilla, F. (2012). 'Metabolic syndrome' in the brain: deficiency in omega-3 fatty acid exacerbates dysfunctions in insulin receptor signaling and cognition. *The Journal of Physiology, 590*(10), 2485-2499. doi:10.1113/jphysiol.2012.230078

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211. doi:10.1016/0749-5978(91)90020-T

Ajzen, I. (2002). Residual effects of past on later behavior: Habituation and reasoned action perspectives. *Personality and Social Psychology Review, 6*(2), 107-122. doi:10.1207/s15327957pspr0602_02

Ajzen, I. (2006). Constructing a TpB questionnaire: Conceptual and methodological considerations. Retrieved from http://www.uni-bielefeld.de/ikg/zick/ajzen%20construction%20a%20tpb%20questionnaire.pdf

Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. *Psychology & Health, 26*(9), 1113-1127. doi:10.1080/08870446.2011.613995

Ajzen, I., & Fishbein, M. (1975). A Bayesian analysis of attribution processes. *Psychological Bulletin, 82*(2), 261-277. doi:10.1037/h0076477

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I., & Fishbein, M. (2005). The influence of attitudes on behavior. In D. Albarracín, B. T. Johnson, & M. P. Zanna (Eds.), *The handbook of attitudes* (pp. 173-221). Mahwah, NJ: Erlbaum.

Ajzen, I., & Timko, C. (1986). Correspondence between health attitudes and behavior. *Basic and Applied Social Psychology*, *7*(4), 259-276. doi:10.1207/s15324834basp0704_2

Albala, C., Ebbeling, C. B., Cifuentes, M., Lera, L., Bustos, N., & Ludwig, D. S. (2008). Effects of replacing the habitual consumption of sugar-sweetened beverages with milk in Chilean children. *American Journal of Clinical Nutrition,88*(3), 605-611.

Al-Hazzaa, H., & Musaiger, A. (2011). Arab Teens Lifestyle Study (ATLS): Objectives, design, methodology and implications. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, *4*, 417-426. doi:10.2147/dmso.s26676

Al-Zahrani, A. M., & Al-Raddadi, R. M. (2009). Nutritional knowledge of primary health care physicians in Jeddah, Saudi Arabia. *Saudi Medical Journal*, *30*(2), 248-7.

Ambrosini, G. L. (2014). Sugar: What are the current facts and where to now? *Current Nutrition Report*, *3*(4), 299-301. doi:10.1007/s13668-014-0097-z

Ambrosini, G. L., Oddy, W. H., Huang, R. C., Mori, T. A., Beilin, L. J., & Jebb, S. A. (2013). Prospective associations between sugar-sweetened beverage intakes and cardiometabolic risk factors in adolescents. *American Journal of Clinical Nutrition*, *98*(2), 327-334. doi:10.3945/ajcn.112.051383

American Academy of Pediatrics. (2015). Snacks, sweetened beverages, added sugars, and schools. *Pediatrics*, *135*(3), 575-583. doi:10.1542/peds.2014-3902

American Heart Association. (2014). *American Heart Association comments on the World Health Organization's "Guideline: Sugars intake for adults and children."* Retrieved from https://www.heart.org/idc/groups/ahaecc-public/@wcm/@adv/documents/ downloadable/ucm_463487.pdf

Andrade, E. (2005). Behavioral consequences of affect: Combining evaluative and regulatory mechanisms. *Journal of Consumer Research*, *32*(3), 355-362. doi:10.1086/497546

Andrieu, E., Darmon, N., & Drewnowski, A. (2006). Low-cost diets: More energy, fewer nutrients. *European Journal of Clinical Nutrition*, *60*, 434–436. doi:10.1038/sj.ejcn.1602331

Arcan, C., Kubik, M. Y., Fulkerson, J. A., Davey, C., & Story, M. (2011). Association between food opportunities during the school day and selected dietary behaviors of alternative high school students, Minneapolis/Saint Paul, Minnesota, 2006. *Preventing Chronic Disease*, *8*(1), A08. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=21159220

Armitage, C. J., & Conner, M. (1999). The theory of planned behaviour: Assessment of predictive validity and 'perceived control. *British Journal of Social Psychology*, *38*(1), 35-54. doi:10.1348/014466699164022

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology*, *40*(4), 471-499. doi:10.1348/014466601164939

Assari, S., Caldwell, C. H., & Zimmerman, M. A. (2015). Low parental support in late adolescence predicts obesity in young adulthood; Gender differences in a 12-year cohort of African Americans. *Journal of Diabetes & Metabolic Disorders*, *14*(1), 1-9. doi:10.1186/s40200-015-0176-8

Avery, A., Bostock, L., & McCullough, F. (2014). A systematic review investigating interventions that can help reduce consumption of sugar-sweetened beverages in children leading to changes in body fatness. *Journal of Human Nutrition and Dietetics*,*28*, 52-64. doi:10.1111/jhn.12267

Baba, N. H. (1998). Food consumption pattern in Lebanon. *Rivista di Antropologia*, *76*, 193-204.

Baban, A., Cracuim, C. (2007). Changing health risk behaviors: A review of theory and evidence-based interventions in health psychology. *Journal of Evidence Based Psychotherapies*, 7(1). 45-67

Bachman, C. M., Baranowski, T., & Nicklas, T. A. (2006). Is there an association between sweetened beverages and adiposity? *Nutrition Reviews*, *64*(4), 153-174. doi:10.1111/j.1753-4887.2006.tb00199.x

Backman, D. R., Haddad, E. H., Lee, J. W., Johnston, P. K., & Hodgkin, G. E. (2002). Psychosocial predictors of healthful dietary behavior in adolescents. *Journal of Nutrition Education and Behavior*, *34*(4), 184-193. doi:10.1016/s1499-4046(06)60092-4

Baker, C. W., Little, T. D., & Brownell, K. D. (2003). Predicting adolescent eating and activity behaviors: The role of social norms and personal agency. *Health Psychology*, *22*(2), 189-198. doi:10.1037//0278-6133.22.2.189

Balian, A. (2009). *Influences on school-age children's milk and soft drinks intake* (Doctoral dissertation, Case Western Reserve University).

Ballew, C., Kuester, S., & Gillespie, C. (2000). Beverage choices affect adequacy of children's nutrient intakes. *Archives of Pediatric and Adolescent Medicine, 154*(11), 1148. doi:10.1001/archpedi.154.11.1148

Bandura, A. (1997). Health promotion from the perspective of social cognitive theory. *Psychology and Health, 13*, 623-649.

Barbour, R. S. (1998). Mixing Qualitative Methods: Quality Assurance or Qualitative Quagmire? *Qualitative Health Research, 8*(3), 352-361. doi:10.1177/104973239800800306

Barclay, A. W., & Brand-Miller, J. (2011). The Australian Paradox: A substantial decline in Sugars intake over the same timeframe that overweight and obesity have increased. *Nutrients, 3*(12), 491-504. doi:10.3390/nu3040491

Barquera, S., Campirano, F., Bonvecchio, A., Hernandez-Barrera, L., Rivera, J. A., & Popkin, B. M. (2010). Caloric beverage consumption patterns in Mexican children. *Nutrition Journal, 9*(1), 47. doi:10.1186/1475-2891-9-47

Barush, A., George, M., & Gringeri, C. (2011). Rigor in qualitative social work research: A review of strategies used in published articles. *Social Work Research, 35*(1), 11-19.

Bartholomew, L. K., & Mullen, P. D. (2011). Five roles for using theory and evidence in the design and testing of behavior change interventions. *Journal of Public Health Dentistry, 71*, S20-S33. doi:10.1111/j.1752-7325.2011.00223.x

Bassett-Gunter, R. L., Levy-Milne, R., Naylor, P. J., Symons Downs, D., Benoit, C., Warburton, D. E., … Rhodes, R. E. (2013). Oh baby! Motivation for healthy eating during parenthood transitions: a longitudinal examination with a theory of planned behavior perspective. *International journal of behavioral nutrition and physical activity,10*(1), 88. doi:10.1186/1479-5868-10-88

Bates, B., Lennox, A., Prentice, A., Bates, C., Page, P., Nicholson, S., & Swan, G. (Eds.). (2014). *National Diet and Nutrition Survey Results from Years 1, 2, 3 and 4 (combined) of the Rolling Program (2008/2009-2011/2012): A Survey Carried Out on Behalf of Public Health England and the Food Standards Agency*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207708/NDNS-Y3-report_All-TEXT-docs-combined.pdf

Bauer, K. W., Neumark-Sztainer, D., Fulkerson, J. A., Hannan, P. J., & Story, M. (2011). Familial correlates of adolescent girls' physical activity, television use, dietary intake, weight, and body composition. *International Journal of Behavioral Nutrition and Physical Activity*, *8*(25), 1-10. doi:10.1186/1479-5868-8-25

Baumrind, D. (1991). The influence of parenting style on adolescent competence and substance use. *The Journal of Early Adolescence*, *11*(1), 56-95. doi:10.1177/0272431691111004

Bayer, O., Von Kries, R., Strauss, A., Mitschek, C., Toschke, A. M., Hose, A., & Koletzko, B. V. (2009). Short- and mid-term effects of a setting based prevention program to reduce obesity risk factors in children: A cluster-randomized trial. *Clinical Nutrition*, *28*(2), 122-128. doi:10.1016/j.clnu.2009.01.001

Beale, D., & Manstead, A. (1991). Predicting mothers' intentions to limit frequency of infants' sugar intake: Testing the theory of planned behavior. *Journal of Applied Social Pyschology*, *21*(5), 409-431. doi:10.1111/j.1559-1816.1991.tb00528.x

Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*, *25*(24), 3186-3191.

Beauchamp, G. K., Cowart, B. J., Mennella, J. A., & Marsh, R. R. (1994). Infant salt taste: Developmental, methodological, and contextual factors. *Developmental Psychobiology*, *27*(6), 353-364. doi:10.1002/dev.420270604

Beauchamp, G. K., & Mennella, J. A. (2009). Early flavor learning and its impact on later feeding behavior. *Journal of Pediatric Gastroenterology and Nutrition*, *48,* S25–S30. doi:10.1097/MPG.0b013e31819774a5

Beech, B. M., Klesges, R. C., Kumanyika, S. K., Murray, D. M., Klesges, L., McClanahan, B., … Pree-Cary, J. (2003). Child- and parent-targeted interventions: the Memphis GEMS pilot study. *Ethnicity & Disease*, *13*(1), S40-53.

Bere, E., Glomnes, E. S., Velde, S. J., & Klepp, K. (2008). Determinants of adolescents' soft drink consumption. *Public Health Nutrition*, *11*(1), 49–56.. doi:10.1017/S1368980007000122

Berg, C., Jonsson, I., & Conner, M. (2000). Understanding choice of milk and bread for breakfast among Swedish children aged 11–15 years: An application of the Theory of Planned Behaviour. *Appetite*, *34*(1), 5-19. doi:10.1006/appe.1999.0269

Berli, C., Loretini, P., Radtke, T., Hornung, R., & Scholz, U. (2014). Predicting physical activity in adolescents: The role of compensatory health beliefs within the Health Action Process Approach. *Psychology & Health*, *29*(4), 458-474. doi:10.1080/08870446.2013.865028

Birch, L. L. (1998). Psychological Influences on the Childhood Diet. *The Journal of Nutrition*, *128*(2), 407S-410S.

Birch, L. L. (1999). Development of food preferences. *Annual Review of Nutrition*, *19*, 41–62. doi:10.1146/annurev.nutr.19.1.41

Birch, L., Savage, J. S., & Ventura, A. (2007). Influences on the development of children's eating behaviours: From infancy to adolescence. *Canadian journal of dietetic practice and research: a publication of Dietitians of Canada= Revue canadienne de la pratique et de la recherche en dietetique: une publication des Dietetistes du Canada*, *68*(1).

Biró, G., Hulshof, K., Ovesen, L., & Cruz, J. A. (2002). Selection of methodology to assess food intake. *European Journal of Clinical Nutrition*, *56*(2), S25-S32. doi:10.1038/sj.ejcn.1601426

Bisogni, C. A., Connors, M., Devine, C. M., & Sobal, J. (2002). Who we are and how we eat: A qualitative study of identities in food choice. *Journal of Nutrition Education and Behavior*, *34*(3), 128-139. doi:10.1016/s1499-4046(06)60082-1

Bisogni, C. A., Jastran, M., Seligson, M., & Thompson, A. (2012). How people interpret healthy eating: Contributions of qualitative research. *Journal of Nutrition Education and Behavior*, *44*(4), 282-301. doi:10.1016/j.jneb.2011.11.009

Bjelland, M., Bergh, I. H., Grydeland, M., Klepp, K., Andersen, L. F., Anderssen, S. A., Lien, N. (2011). Changes in adolescents' intake of sugar-sweetened beverages and sedentary behaviour: Results at 8 month mid-way assessment of the HEIA study - a comprehensive, multi-component school-based randomized trial. *International Journal of Behavioral and Nutritional Physical Activity*, *8*(1), 63. doi:10.1186/1479-5868-8-63

Bjelland, M., Brantsæter, A., Haugen, M., Meltzer, H., Nystad, W., & Andersen, L. (2013). Changes and tracking of fruit, vegetables and sugar-sweetened beverages intake from 18 months to 7 years in the Norwegian mother and child cohort study. *BMC Public Health*, *13*(1), 793. doi:10.1186/1471-2458-13-793

Blanchard, C. M., Fisher, J., Sparling, P. B., Shanks, T. H., Nehl, E., Rhodes, R. E., … Courneya, K. S. (2009). Understanding adherence to 5 servings of fruits and vegetables per day: A theory of planned behavior perspective. *Journal of Nutrition Education and Behavior*, *41*(1), 3-10. doi:10.1016/j.jneb.2007.12.006

Blissett, J., Haycraft, E., & Farrow, C. (2010). Inducing preschool children's emotional eating: relations with parental feeding practices. *American Journal of Clinical Nutrition*, *92*(2), 359-365. doi:10.3945/ajcn.2010.29375

Bogers, R., Brug, J., Van Assema, P., & Dagnelie, P. (2004). Explaining fruit and vegetable consumption: The theory of planned behaviour and misconception of personal intake levels. *Appetite*, *42*(2), 157-166. doi:10.1016/j.appet.2003.08.015

Bowling, A. (2009). *Research methods in health: invesigating health and health services*. New York: Open University Press.

Bowman, S. A. (2002). Beverage choices of young females: changes and impact on nutrient intakes. *Journal of the American Dietetic Association*, *102*(9), 1234-1239.

Boynton, P. M., & Greenhalgh, T. (2004). Selecting, designing, and developing your questionnaire. *British Medical Journal*, *328*(7451), 1312-1315. doi:10.1136/bmj.328.7451.1312

Bradley, E. H., Curry, L. A., & Devers, K. J. (2007). Qualitative data analysis for health services research: Developing Taxonomy, Themes, and Theory. *Health Service Research*, *42*(4), 1758-1772. doi:10.1111/j.1475-6773.2006.00684.x

Branscum, P., & Sharma, M. (2014). Comparing the utility of the theory of planned behavior between boys and girls for predicting snack food consumption: implications for practice. *Health Promotion Practice*, *15*(1), 134-140. doi:10.1177/1524839913481974

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*, 77-101.

Braun, V., & Clarke, V. (2014). What can "thematic analysis" offer health and wellbeing researchers? *International Journal of Qualitative Studies on Health and Well-Being*, *9*(0), 1-2. doi:10.3402/qhw.v9.26152

Brislin, R. W. (1970). Back translation for cross cultural research. *Journal of Cross-Cultural Psychology*, *1*(3), 185-216.

Britten, N., Stevenson, A. F., Barry, A. C., Barber, N., & Bradley, P. C. (2000). Misunderstandings in prescribing decisions in general practice: Qualitative study. *British Medical Journal, 320,* 484-488.

Broom, A., & Willis, E. (2007). Competing paradigms and health research. *Researching health: Qualitative, quantitative and mixed Methods*, 16-30.

Brown, C. M., Dulloo, A. G., & Montani, J. (2008). Sugary drinks in the pathogenesis of obesity and cardiovascular diseases. *International Journal of Obesity, 32*(6), S28-34. doi:10.1038/ijo.2008.204

Brown, R., & Ogden, J. (2004). Children's eating attitudes and behaviour: a study of the modelling and control theories of parental influence. *Health Education Research*, *19*(3), 261-271. doi:10.1093/her/cyg040

Brown, T., & Summerbell, C. (2009). Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: An update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obesity Reviews*, *10*(1), 110-141. doi:10.1111/j.1467-789x.2008.00515.x

Brug, J., Oenema, A., & Ferreira, I. (2005). Theory, evidence and Intervention Mapping to improve behavior nutrition and physical activity interventions. *International Journal of Behavioral Nutrition and Physical Activity, 2*(1), 1-7.

Bruss, M., Morris, J., Dannison, L., Orbe, M., Quitugua, J., & Palacios, R. (2005). Food, culture, and family: Exploring the coordinated management of meaning regarding childhood obesity. *Health Communication*, *18*(2), 155-175. doi:10.1207/s15327027hc1802_4

Burger, J. M., Bell, H., Harvey, K., Stewart, C., Dorian, K., & Sweroe, M. (2010). Nutritious or delicious? The effect of descriptive norm information on food choice. *Journal of Social and Clinical Psychology*, *29*(2), 228-242.

Campbell, M., Fitzpatrick, R., Haines, A., Kinmonth, A. L., Sandercock, P., Spiegelhalter, D., & Tyrer, P. (2000). Framework for design and evaluation of complex interventions to improve health. *British Medical Journal, 321,* 694-696. doi:10.1136/bmj.321.7262.694

Caprio, S., Daniels, S. R., Drewnowski, A., Kaufman, F. R., Palinkas, L. A., Rosenbloom, A. L., & Schwimmer, J. B. (2008). Influence of race, ethnicity, and culture on childhood obesity: Implications for prevention and treatment: A consensus statement of shaping America's health and the obesity society. *Diabetes Care, 31*(11), 2211-2221. doi:10.2337/dc08-9024

Centers for Disease Control and Prevention. (2011). *School Health Guidelines to Promote Healthy Eating and Physical Activity*. Retrieved from U.S. Department of Health and Human Services website: http://www.cdc.gov/healthyschools/npao/strategies.html

Chan, T., Lin, W., Huang, H., Lee, C., Wu, P., Chiu, Y., … Lee, C. (2014). Consumption of sugar-sweetened beverages is associated with components of the metabolic syndrome in adolescents. *Nutrients*, *6*(5), 2088-2103. doi:10.3390/nu6052088

Clarke, K. A., & Iphofen, R. (2005). Believing the patient with chronic pain: A review of the literature. *British Journal of Nursing*, *14*(9), 490-493. doi:10.12968/bjon.2005.14.9.18073

Cluss, P. A., Ewing, L., King, W. C., Reis, E. C., Dodd, J. L., & Penner, B. (2013). Nutrition knowledge of low-income parents of obese children. *Translational Behavioral Medicine*,*3*(2), 218-225. doi:10.1007/s13142-013-0203-6

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral sciences*. Routledge.

Collins, C., Duncanson, K., & Burrows, T. (2014). A systematic review investigating associations between parenting style and child feeding behaviours. *Journal of Human Nutrition and Dietetics*, *27*(6), 557-568. doi:10.1111/jhn.12192

Centers for Disease Control and Prevention. (2011). *School Health Guidelines to Promote Healthy Eating and Physical Activity*. Retrieved from U.S. Department of Health and Human Services website: http://www.cdc.gov/healthyschools/npao/strategies.html

Commonwealth scientific industrial research organisation. (2007). *Australian National Children's Nutrition and Physical Activity Survey [Data File]*. Retrieved from https://www.health.gov.au/internet/main /publishing.nsf/Content/8F4516D5FAC0700ACA257BF0001E0109/$File/childrens-nut-phys-survey.pd

Conner, M., Kirk, S. F., Cade, J. E., & Barrett, J. H. (2001). Why do women use dietary supplements? The use of the theory of planned behaviour to explore beliefs about their use. *Social Science & Medicine*, *52*(4), 621-633. doi:10.1016/s0277-9536(00)00165-9

Conner, M., Norman, P., & Bell, R. (2002). The theory of planned behavior and healthy eating. *Health Psychology*, *21*(2), 194-201. doi:10.1037//0278-6133.21.2.194

Cook, D. A., & Beckman, T. J. (2006). Current concepts in validity and reliability for psychometric instruments: Theory and application. *The American Journal of Medicine*,119(2), 166.e7-166.e16. doi:10.1016/j.amjmed.2005.10.036

Cook, D. A., & West, C. P. (2012). Conducting systematic reviews in medical education: a stepwise approach. *Medical Education*, 46(10), 943-952.

Cooke, L. (2007). The importance of exposure for healthy eating in childhood: A review. *Journal of Human Nutrition and Dietetics*, *20*, 294–301. doi:10.1111/j.1365-277X.2007.00804.x

Cooke, L. J., Haworth, C. M., & Wardle, J. (2007). Genetic and environmental influences on children's food neophobia 1-3. *American Journal of Clinical Nutrition*, *86*(2), 428-433.

Cooke, L., Wardle, J., & Gibson, E. L. (2003). Relationship between parental report of food neophobia and everyday food consumption in 2–6-year-old children. *Appetite*, *41*, 205-206. doi:10.1016/S0195-6663(03)00048-5

Cooper, A. M., O'Malley, L. A., Elison, S. N., Armstrong, R., Burnside, G., Adair, P., … Pine, C. (2013). Primary school-based behavioural interventions for preventing caries. *Cochrane Database of Systematic Reviews*. doi:10.1002/14651858.cd009378.pub2

Corbin, J., & Morse, J. M. (2003). The unstructured interactive Interview: Issues of reciprocity and risks when dealing with sensitive topics. *Qualitative Inquiry*, *9*(3), 335-354. doi:10.1177/1077800403009003001

Corbin, J., Strauss, A., & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, California: Sage Publications.

Cradock, A. L. McHugh, A. Mont-Ferguson, H. Grant, L. Barrett, J. L. Claire Wang, C. Y. Gortmaker, S. L. (2011). Effect of school district policy change on consumption of sugar-sweetened beverages among high school students, Boston, Massachusetts, 2004-2006. *Preventing Chronic Disease*, *8*(4), A74.

Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2011). *Best practices for mixed methods research in the health sciences*. Bethesda (Maryland): National Institutes of Health, 2094-2103.

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice*, *39*(3), 124-130.

Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. California: Sage Publications.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed method approaches*. Thousand Oaks, CA: Sage Publications.

Cullen, K. W., Baranowski, T., Rittenberry, L., Cosart, C., Hebert, D., & Moor, C. D. (2001). Child-reported family and peer influences on fruit, juice and vegetable consumption: Reliability and validity of measures. *Health Education Research*, *16*(2), 187-200. doi:10.1093/her/16.2.187

Cummings, J. H., & Stephen, A. M. (2007). Carbohydrate terminology and classification. *European Journal of Clinical Nutrition, 61*, S5-S18. doi:10.1038/sj.ejcn.1602936

Cunha, D. B., Souza, B. D., Pereira, R. A., & Sichieri, R. (2013). Effectiveness of a randomized school-based intervention involving families and teachers to prevent excessive weight gain among adolescents in Brazil. *PLoS ONE, 8*(2), e57498. doi:10.1371/journal.pone.0057498

Curhan, G. C., & Forman, J. P. (2010). Sugar-sweetened beverages and chronic disease. *Kidney International, 77*(7), 569-570. doi:10.1038/ki.2009.543

Curry, L. A., Nembhard, I. M., & Bradley, E. H. (2009). Qualitative and mixed methods provide unique contributions to outcomes research. *Circulation, 119*, 1442-1452. doi:10.1161/CIRCULATIONAHA.107.742775

Darbyshire, P., MacDougall, C., & Schiller, W. (2005). Multiple methods in qualitative research with children: More insight or just more? *Qualitative Research*, *5*(4), 417-436. doi:10.1177/1468794105056921

Darmon, N., & Drewnowski, A. (2008). Does social class predict diet quality? *American Journal of Clinical Nutrition, 87*(5), 1107-17.

De Bruijn, G. J. (2010). Understanding college students' fruit consumption. Integrating habit strength in the theory of planned behaviour. *Appetite, 54*(1), 16-22. doi:10.1016/j.appet.2009.08.007

De Bruijn, G., Kremers, S. P., De Vries, H., Van Mechelen, W., & Brug, J. (2007). Associations of social-environmental and individual-level factors with adolescent soft drink consumption: Results from the SMILE study. *Health Education Research*, *22*(2), 227-237. doi:10.1093/her/cyl066

De Bruijn, G., & Van den Putte, B. (2009). Adolescent soft drink consumption, television viewing and habit strength. Investigating clustering effects in the Theory of Planned Behaviour. *Appetite, 53*(1), 66-75. doi:10.1016/j.appet.2009.05.008

De Castro, J. M. (2010). The control of food intake of free-living humans: Putting the pieces back together. *Physiology & Behavior, 100*(5), 446-453. doi:10.1016/j.physbeh.2010.04.028

De Coen, V., Vansteelandt, S., Maes, L., Huybrechts, I., De Bourdeaudhuij, I., & Vereecken, C. (2012). Parental socioeconomic status and soft drink consumption of the child. The mediating proportion of parenting practices. *Appetite, 59*(1), 76-80. doi:10.1016/j.appet.2012.03.024

De Genna, N. M., Stack, D. M., Serbin, L. A., Ledingham, J. E., & Schwartzman, A. E. (2006). From risky behavior to health risk: Continuity across two generations. *Developmental and Behavioral Pediatrics, 27*(4), 297-309. doi:0196-206X/06/2704-0297

DeVellis. (2003). *Scale Development Theory and Applications* (2nd ed.). London: SAGE Publications.

Dharmananda, S. (2016). Taste and action of Chinese herbs: Traditional and modern viewpoints. *Taste and Action of Chinese Herbs,* 1-9.

Dholakia, U. M., & Morwitz, V. G. (2002). The Scope and Persistence of Mere-Measurement Effects: Evidence from a Field Study of Customer Satisfaction Measurement. *Journal of Consumer Research, 29*(2), 159-167. doi:10.1086/341568

Drews, K. L., Harrell, J. S., Thompson, D., Mazzuto, S. L., Ford, E. G., Carter, M., … Roullet, J. (2009). Recruitment and retention strategies and methods in the HEALTHY study. *International Journal of Obesity Related Metabolic Disorders, 33*(4), S21-S28. doi:10.1038/ijo.2009.113

Dubois, L., Farmer, A., Girard, M., & Peterson, K. (2007). Regular sugar-sweetened beverage consumption between meals increases risk of overweight among preschool-aged children. *Journal of The American Dietetic Association, 107*(6), 924-934. doi:10.1016/j.jada.2007.03.004

Duffey, K. J., Huybrechts, I., Mouratidou, T., Libuda, L., Kersting, M., Vriendt, T. D., … Popkin, B. M. (2012). Beverage consumption among European adolescents in the HELENA study. *European Journal of Clinical Nutrition, 6*(2), 244–252. doi:10.1038/ejcn.2011.166

Dunning, H., Williamns, A., Abonyi, S., & Crooks, V. (2008). A mixed method approach to quality of life research: a case study approach. *Social Indicators Research, 85,* 145-158.

Dunn, K. I., Mohr, P., Wilson, C. J., & Wittert, G. A. (2011). Determinants of fast-food consumption. An application of the Theory of Planned Behaviour. *Appetite, 57*(2), 349-357. doi:10.1016/j.appet.2011.06.004

Easton, K. L., McComish, J. F., & Greenberg, R. (2000). Avoiding common pitfalls in qualitative data collection and transcription. *Qualitative Health Research, 10*(5), 703-707. doi:10.1177/104973200129118651

Ebbeling, C. B., Feldman, H. A., Osganian, S. K., Chomitz, V. R., Ellenbogen, S. J., & Ludwig, D. S. (2006). Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: A Randomized, Controlled Pilot Study. *PEDIATRICS, 117*(3), 673-680. doi:10.1542/peds.2005-0983

Ebbeling, C. B., Swain, J. F., Feldman, H. A., Wong, W. W., Hachey, D. L., Garcia-Lago,, E., & Ludwig, D. S. (2012). Effects of dietary composition on energy expenditure during weight-loss maintenance. *The Journal of the American Medical Association, 307*(24), 2627-2634. Retrieved from l10.1001/jama.2012.6607

Egger, M., & Smith, G. D. (1997). Meta-analysis: Potentials and promise. *British Medical Journal, 315*(7119), 1371-1374. doi:10.1136/bmj.315.7119.1371

Elliott, M. A., Thomson, J. A., Robertson, K., Stephenson, C., & Wicks, J. (2013). Evidence that changes in social cognitions predict changes in self-reported driver behavior: Causal analyses of two-wave panel data. *Accident Analysis & Prevention, 50*, 905-916. doi:10.1016/j.aap.2012.07.017

Erickson, J., & Slavin, J. (2015). Total, added, and free sugars: Are restrictive guidelines science-based or achievable? *Nutrients, 7*(4), 2866-2878. doi:10.3390/nu7042866

Erkkola, M., Kronberg-Kippilä, C., Kyttälä, P., Lehtisalo, J., Reinivuo, H., Tapanainen, H., Virtanen, S. M. (2009). Sucrose in the diet of 3-year-old Finnish children: sources, determinants and impact on food and nutrient intake. *British Journal of Nutrition, 101*(8), 1209-1217. doi:10.1017/S0007114508057619

Ervin, R. B., & Ogden, C. L. (2013). Consumption of added sugars among US adults, 2005-2010. *NCHS Data Brief, 122*, 1-8.

European Food Safety Authority. (2010). Scientific opinion on dietary reference values for carbohydrates and dietary fiber. *EFSA Journal, 8*(3), 1462. doi:10.2903/j.efsa.2010.1462

Ezendam, N. P., Brug, J., & Oenema, A. (2012). Evaluation of the web-based computer-tailored FATaintPHAT intervention to promote energy balance among adolescents. *Archives of Pediatric and Adolescent Medicine, 166*(3), 248. doi:10.1001/archpediatrics.2011.204

FagT, S., Gunnarsdottir, I., Hallas-Møller, T., Anni Helldán, A., Halldorsson, T. I., & Knutsen, H. (2012). Nordic dietary surveys Study designs, methods, results and use in food-based risk assessments. *Nordic Council of Ministers.*

Feferbaum, R., De Abreu, L., & Leone, C. (2012). Fluid intake patterns: An epidemiological study among children and adolescents in Brazil. *BMC Public Health, 12*(1), 1005. doi:10.1186/1471-2458-12-1005

Fein, S. B., & Falci, C. D. (1999). Infant formula preparation, handling, and related practices in the United States. *Journal of the American Dietetic Association*, *99*(10), 1234-1240. doi:10.1016/s0002-8223(99)00304-1

Feldens, C., Giugliani, E., Vigo, Á., & Vítolo, M. (2010). Early feeding practices and severe early childhood caries in four-year-old children from southern Brazil: A birth cohort study. *Caries Research*, *44*(5), 445-452. doi:10.1159/000319898

Fila, S. A., & Smith, C. (2006). Applying the Theory of Planned Behavior to healthy eating behaviors in urban Native American youth. *International Journal of Behavioral Nutrition and Physical Activity*, *3*(1), 11. doi:10.1186/1479-5868-3-11

Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Fishbein, M. & Ajzen, I. (2010). *Predicting and changing behavior. The Reasoned Action Approach*. New York Psychology Press, New York.

Flodmark, C., Lissau, I., Moreno, L. A., Pietrobelli, A., & Widhalm, K. (2004). New insights into the field of children and adolescents' obesity: The European perspective. *International Journal of Obesity*, *28*(10), 1189-1196. doi:10.1038/sj.ijo.0802787

Francis, J. Eccles, M. P. Johnston, M. Walker, A. E. Grimshaw, J. M. Foy, R. Kaner, E. F. S. Smith, L. Bonetti, D. (2004). *Constructing questionnaires based on the theory of planned behaviour: A manual for health services researchers*. Centre for Health Services Research, University of Newcastle upon Tyne.

Freedman, L. S., Commins, J. M., Moler, J. E., Arab, L., Baer, D. J., Kipnis, V., … Willett, W. (2014). Pooled results from 5 validation studies of dietary self-report instruments using recovery biomarkers for energy and protein intake. *American Journal of Epidemiology*, *180*(2), 172-188. doi:10.1093/aje/kwu116

French, D. P., & Sutton, S. (2010). Reactivity of measurement in health psychology: How much of a problem is it? What can be done about it? *British Journal of Health Psychology*,*15*(3), 453-468. doi:10.1348/135910710x492341

French, S. A. (2004). School soft drink intervention study. *British Medical Journal*, *329*(7462), E315-E316. doi:10.1136/bmj.329.7462.e315

Frey, J. H., & Fontana, A. (1991). The group interview in social research. *The Social Science Journal*, *28*(2), 175-187. doi:10.1016/0362-3319(91)90003-m

Friedberg, J. P., Lipsitz, S. R., & Natarajan, S. (2010). Challenges and recommendations for blinding in behavioral interventions illustrated using a case study of a behavioral intervention to lower blood pressure. *Patient Education and Counseling*, *78*(1), 5-11. doi:10.1016/j.pec.2009.04.009

Gardner, B. (2015). Defining and measuring the habit impulse: Response to commentaries. *Health Psychology Review*, *9*(3), 318-322. doi:10.1080/17437199.2015.1009844

Gardner, B., Corbridge, S., & McGowan, L. (2015). Do habits always override intentions? Pitting unhealthy snacking habits against snack-avoidance intentions. *BMC Psychology*,*3*(8), 1-9. doi:10.1186/s40359-015-0065-4

Gardner, B., Sheals, K., Wardle, J., & McGowan, L. (2014). Putting habit into practice, and practice into habit: a process evaluation and exploration of the acceptability of a habit-based dietary behaviour change intervention. *International Journal of Behavioral Nutrition and Physical Activity*, *11*(135), 1-13. doi:10.1186/s12966-014-0135-7

Gibson, E., Wardle, J., & Watts, C. (1998). Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite*, *31*(2), 205-228. doi:10.1006/appe.1998.0180

Gibson, S., & Neate, D. (2007). Sugar intake, soft drink consumption and body weight among British children: Further analysis of National Diet and Nutrition Survey data with adjustment for under-reporting and physical activity. *International Journal of Food Sciences and Nutrition*, *58*(6), 445-460. doi:10.1080/09637480701288363

Glanz, K., Rimer, B. K., & VIiswanath, K. (Eds.). (2004). *Health behavior and health education, Theory, research, and practice.* (4th ed.). Jossey-Bass.

Glanz, K., Rimer, B. K., & Viswanath, K. (2008). *Health behavior and health education: theory, research, and practice* .John Wiley & Sons.

Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion*, *11*(2), 87-98. doi:10.4278/0890-1171-11.2.87

Goh, D. Y., & Jacob, A. (2011). Children's consumption of beverages in Singapore: Knowledge, attitudes and practice. *Journal of Pediatrics Child Health*, *47*(7), 465-472. doi:10.1111/j.1440-1754.2010.01999.x

Gold, M. S., Frost-Pineda, K., & Jacobs, W. S. (2003). Overeating, binge eating, and eating disorders as addictions. *Psychiatric Annals*, *33*(2), 117-122. doi:10.3928/0048-5713-20030201-08

Goodell, L. S., Pierce, M. B., Amico, K. R., & Ferris, A. M. (2012). Parental information, motivation, and behavioral skills correlate with child sweetened beverage consumption. *Journal of Nutrition Education and Behavior*, *44*(3), 240-245. doi:10.1016/j.jneb.2010.07.012

Greenfield, H., & Southgate, D. A. (2003). *Food composition data: Production, management, and use*. Food & Agriculture Organization.

Green, J., & Britten, N. (1998). Qualitative research and evidence based medicine. *British Medical Journal*, *316*(7139), 1230-1232. doi:10.1136/bmj.316.7139.1230

Grimm, E. R., & Steinle, N. I. (2011). Genetics of eating behavior: Established and emerging concepts. *Nutrition Reviews, 69*(1), 52-60. doi:10.1111/j.1753-4887.2010.00361.x

Grimm, G. C., Harnack, L., & Story, M. (2004). Factors associated with soft drink consumption in school-aged children. *Journal of the American Dietetic Association*, *104*(8), 1244-1249. doi:10.1016/j.jada.2004.05.206

Groves, R. M., Fowler, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau, R. (2004). *Survey methodology*. New Jersey: John Wiley and Sons, Inc., Hoboken.

Grummer-Strawn, L. M., Scanlon, K. S., & Fein, S. B. (2008). Infant feeding and feeding transitions during the first year of life. *Pediatrics*, *122*(2), S36-S42. doi:10.1542/peds.2008-1315d

GSHS. (2005). *Global School-Based Student Health Survey.* Lebanon. Retrieved from: http://www.cdc.gov/gshs/countries/eastmediter/lebanon.htm

GSHS. (2011). *Global School-Based Student Health Survey* [Fact Sheet]. Retrieved from: http://www.cdc.gov/gshs/countries/eastmediter/lebanon.htm

Gubbels, J. S., Kremers, S. P., Stafleu, A., De Vries, S. I., Goldbohm, R. A., Dagnelie, P. C., … Thijs, C. (2011). Association between parenting practices and children's dietary intake, activity behavior and development of body mass index: the KOALA Birth Cohort Study. *International Journal of Behavioral and Nutritional Physical Activity*, *8*(1), 18. doi:10.1186/1479-5868-8-18

Gummeson, L., Jonsson, I., & Conner, M. (1997). Predicting intentions and behaviour of Swedish 10–16-year-olds at breakfast. *Food Quality and Preference*, *8*(4), 297-306. doi:10.1016/s0950-3293(97)00013-x

Hackman, C., & Knowlden, A. (2014). Theory of reasoned action and theory of planned behavior-based dietary interventions in adolescents and young adults: A systematic review. *Adolescent Health, Medicine and Therapeutics, 5,* 101. doi:10.2147/ahmt.s56207

Haerens, L., De Bourdeaudhuij, I., Maes, L., Vereecken, C., Brug, J., & Deforche, B. (2007). The effects of a middle-school healthy eating intervention on adolescents' fat and fruit intake and soft drinks consumption. *Public Health Nutrition*, *10*(5), 443-449. doi:10.1017/s1368980007219652

Hafekost, K., Mitrou, F., Lawrence, D., & Zubrick, S. R. (2011). Sugar sweetened beverage consumption by Australian children: Implications for public health strategy. *BMC Public Health*, *11*(1), 950. doi:10.1186/1471-2458-11-950

Hagger, S. M., Chatzisarantis, L. N., & Biddle, J. S. (2002). A meta-analytic review of the theories of reasoned action and planned behaviourin physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport & Exercise Psychology*,*24*(1), 3-32.

Hall, P. A., & Fong, G. T. (2007). Temporal self-regulation theory: A model for individual health behavior. *Health Psychology Review*, *1*(1), 6-52. doi:10.1080/17437190701492437

Hallström, L., Vereecken, C. A., Ruiz, J. R., Patterson, E., Gilbert, C. C., Catasta, G., … Sjöström, M. (2011). Breakfast habits and factors influencing food choices at breakfast in relation to socio-demographic and family factors among European adolescents. The HELENA Study. *Appetite*, *56*(3), 649-657. doi:10.1016/j.appet.2011.02.019

Hamel, C., Stevens, A., Singh, K., Ansari, M. T., Myers, E., Ziegler, P., … Moher, D. (2014). Do sugar-sweetened beverages cause adverse health outcomes in adults? A systematic review protocol. *Systematic Reviews*, *3*(1), 108. doi:10.1186/2046-4053-3-108

Han, E., Kim, T. H., & Powell, L. M. (2013). Beverage consumption and individual-level associations in South Korea. *BMC Public Health*, *13*(1), 195. doi:10.1186/1471-2458-13-195

Han, E., & Powell, L. M. (2013). Consumption patterns of sugar-sweetened beverages in the United States. *Journal of the Academy of Nutrition and Dietetics*, *113*(1), 43-53. doi:10.1016/j.jand.2012.09.016

Hanson, N. I., Neumark-Sztainer, D., Eisenberg, M. E., Story, M., & Wall, M. (2005). Associations between parental report of the home food environment and adolescent intakes of fruits, vegetables and dairy foods. *Public Health Nutrition*, *8*(1), 77-85. doi:10.1079/PHN2005661

Happ, M. B., Dabbs, A. D., Tate, J., Hricik, A., & Erlen, J. (2006). Exemplars of mixed methods data combination and analysis. *Nursing Research*, *55*(Supplement 1), S43-S49. doi:10.1097/00006199-200603001-00008

Harrington, S. (2008). The role of sugar-sweetened beverage consumption in adolescent obesity: A review of the literature. *The Journal of School Nursing*, *24*(1), 3-12. doi:10.1177/10598405080240010201

Harris, R., Nicoll, A. D., Adair, P. M., & Pine, C. M. (2004). Risk factors for dental caries in young children: a systematic review of the literature. *Community Dental Health*, *21*, 71-85.

Hayles, E., Harvey, D., Plummer, D., & Jones, A. (2015). PERSPECTIVE: Focusing on Families' Experiences of Health Care: Choosing a Qualitative Research Design. *Journal on Developmental Disabilities*, *21*(2). 110-118.

Hedrick, V. E., Comber, D. L., Estabrooks, P. A., Savla, J., & Davy, B. M. (2010). The beverage intake questionnaire: Determining initial validity and reliability. *Journal of the American Dietetic Association*, *110*(8), 1227-1232. doi:10.1016/j.jada.2010.05.005

Hennessy, E., & Heary, C. (2009). The development of children's understanding of common psychological problems. *Child and Adolescent Mental Health*, *14*(1), 42-47. doi:10.1111/j.1475-3588.2008.00494.x

Henríquez-Sánchez, P., Sánchez-Villegas, A., Doreste-Alonso, J., Ortiz-Andrellucchi, A., Pfrimer, K., & Serra-Majem, L. (2009). Dietary assessment methods for micronutrient intake: a systematic review on vitamins. *British Journal of Nutrition*, *102*(S1), S10. doi:10.1017/s0007114509993126

Herbold, N. H., & Scott, E. (2008). A pilot study describing infant formula preparation and feeding practices. *International Journal of Environmental Health Research*, *18*(6), 451- 459. doi:10.1080/09603120802272185

Hernandez, L. M., & Blazer, D. G. (Eds.). (2006). Genes, behavior, and the social environment: Moving beyond the nature/nurture debate. Washington, DC: National Academies Press.

Hess, J., Latulippe, M. E., Ayoob, K., & Slavin, J. (2012). The confusing world of dietary sugars: Definitions, intakes, food sources and international dietary recommendations. *Food Function*, *3*(5), 477-486. doi:10.1039/c2fo10250a

Hewitt, A. M., & Stephens, C. (2007). Healthy eating among 10 – 13-year-old New Zealand children: Understanding choice using the Theory of Planned Behaviour and the role of parental influence. *Psychology, Health & Medicine*, *12*(5), 526-535. doi:10.1080/13548500601164396

Higgins, J. P., & Green, S. (2011). Cochrane handbook for systematic reviews of interventions version 5.1. 0 [updated March 2011]. The Cochrane Collaboration.

Higgins, M. M., & Murray, B. J. (2010). Nutrition-related practices and attitudes of Kansas skipped-generation(s) caregivers and their grandchildren. *Nutrients*, *2*(12), 1188-1211. doi:10.3390/nu2121188

Hilton, I. V., Stephen, S., Barker, J. C., & Weintraub, J. A. (2007). Cultural factors and children's oral health care: a qualitative study of carers of young children. *Community Dentistry and Oral Epidemiology*, *35*(6), 429-438. doi:10.1111/j.1600-0528.2006.00356.x

Hochuli, M., Aeberli, I., Weiss, A., Hersberger, M., Troxler, H., Gerber, P. A., … Berneis, K. (2014). Sugar-sweetened beverages with moderate amounts of fructose, but not sucrose, induce fatty acid synthesis in healthy young men: A randomized crossover study. *The Journal of Clinical Endocrinology & Metabolism*, *99*(6), 2164-2172. doi:10.1210/jc.2013-3856

Houghton, C. E., Casey, D., Shaw, D., & Murphy, K. (2012). Students' experiences of implementing clinical skills in the real world of practice. *Journal of Clinical Nursing*,*22*(13-14), 1961-1969. doi:10.1111/jocn.12014

Houghton, C., Casey, D., Shaw, D., & Murphy, K. (2013). Rigor in qualitative case-study research. *Nurse Researcher, 20*(4), 12-17.

Howard, B. V., & Wylie-Rosett, J. (2002). Sugar and cardiovascular disease a statement for healthcare professionals from the committee on nutrition of the council on nutrition, physical activity, and metabolism of the American Heart Association. *Circulation*,*106*(4), 523-527.

Hughes, S. O., Power, T. G., Papaioannou, M. A., Cross, M. B., Nicklas, T. A., Hall, S. K., & Shewchuk, R. M. (2011). Emotional climate, feeding practices, and feeding styles: An observational analysis of the dinner meal in head start families. *International Journal of Behavioral Nutrition and Physical Activity*, *8*(1), 60. doi:10.1186/1479-5868-8-60

Hwalla, N., Deligia, C., Palma, G., Solal Céligny, A., & Dop, M. C. (2007). Nutrition country profile of Lebanese Republic. In FAO: Nutrition Country Profiles. FAO.

Hwalla, N., Weaver, C. M., Mekary, R. A., & El Labban, S. (2016). Editorial: Public health nutrition in the Middle East. *Frontiers in Public Health, 4*. doi:10.3389/fpubh.2016.00033

Ickes, M. J., & Sharma, M. (2011). Does behavioral intention predict nutrition behaviors related to adolescent obesity? *ICAN: Infant, Child, & Adolescent Nutrition*, *3*(1), 38-48. doi:10.1177/1941406410395017

Idris, A., McDermott, M., Raucci, J., Morrabel, A., McGorray, S., & Hendeles, L. (1993). Emergency department treatment of severe asthma. Metered-dose inhaler plus holding chamber is equivalent in effectiveness to nebulizer. *Chest*, *103*(3), 665-672. doi:10.1378/chest.103.3.665

Institute of Medicine IOM. (2002/2005). *Dietary Reference Intakes: Macronutrients.* Retrieved from: http://www.nap.edu/

Ivankova, N. V., Creswell, J. W., & Stick, S. L. (2006). Using mixed-methods sequential explanatory design: From theory to practice. *Field Methods*, *18*(1), 3-20. doi:10.1177/1525822x05282260

James, J., Thomas, P., & Kerr, D. (2002). Childhood obesity: a big prblem for small people. *Diabetes Primary Care, 4*(3), 75-79.

James, J., Cavan, D., & Kerr, D. (2004). Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. *BMJ*, *328*(7450), 1236-1236. doi:10.1136/bmj.328.7450.1236

James, J., Thomas, P., & Kerr, D. (2007). Preventing childhood obesity: Two year follow-up results from the Christchurch obesity prevention programme in schools (CHOPPS). *British Medical Journal*, *335*(7623), 762-762. doi:10.1136/bmj.39342.571806.55

Jaye, C. (2002). Doing qualitative research in general practice: Methodological utility and engagement. *Family Practice*, *19*(5), 557-562. doi:10.1093/fampra/19.5.557

Jingxiong, J., Rosenqvist, U., Huishan, W., Greiner, T., Guangli, L., & Sarkadi, A. (2007). Influence of grandparents on eating behaviors of young children in Chinese three-generation families. *Appetite*, *48*(3), 377-383. doi:10.1016/j.appet.2006.10.004

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, *33*(7), 14-26. doi:10.3102/0013189x033007014

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, *1*(2), 112-133. doi:10.1177/1558689806298224

Johnson, R. K., & Yon, B. A. (2010). Weighing in on added sugars and health. *Journal of the American Dietetic Association*, *110*(9), 1296-1299. doi:10.1016/j.jada.2010.06.013

Jootun, D., McGhee, G., & Darland, G. R. (2009). Reflexivity: Promoting rigour in qualitative research. *Nursing Standard*, *23*, 42-46.

Kaklamanou, D., & Armitage, C. J. (2012). Testing compensatory health beliefs in a UK population. *Psychology & Health*, *27*(9), 1062-1074. doi:10.1080/08870446.2012.662974

Kassem, N. O., Lee, J. W., Modeste, N. N., & Johnston, P. K. (2003). Understanding soft drink consumption among female adolescents using the Theory of Planned Behavior. *Health Education Research*, *18*(3), 278-291. doi:10.1093/her/cyf017

Kassem, N. O., & Lee, J. W. (2004). Understanding soft drink consumption among male adolescents using the Theory of Planned Behavior. *Journal of Behavioral Medicine*, *27*(3), 273-296.

Kearney, J. (2010). Food consumption trends and drivers. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365*(1554), 2793-2807. doi:10.1098/rstb.2010.0149

Kelishadi, R., & Azizi-Soleiman, F. (2014). Controlling childhood obesity: A systematic review on strategies and challenges. *Journal of Research Medical Sciences*, *19*(10), 993-1008.

Keogh, K. M., Smith, S. M., White, P., McGilloway, S., Kelly, A., Gibney, J., & O'Dowd, T. (2011). Psychological family intervention for poorly controlled type 2 diabetes. *The American Journal of Managed Care*, *17*(2), 105-113. doi:10.1186/1471-2296-8-36

Kilani, H., Al-Hazzaa, H. M., Waly, M. I., & Musaiger, A. O. (2013). Lifestyle habits: Diet, physical activity and sleep duration among Omani adolescents. *Medical Journal*, *13*(4), 510-519.

Kimberlin, C. L., & Winterstein, A. G. (2008). Validity and reliability of measurement instruments used in research. *American Journal of Health-System Pharmacy*, *65*(23), 2276-2284. doi:10.2146/ajhp070364

Kime, N. (2008). Children's eating behaviours: The importance of the family setting. *Area*,*40*(3), 315-322.

Kit, B. K., Fakhouri, T. H., Park, S., Nielsen, S. J., & Ogden, C. L. (2013). Trends in sugar-sweetened beverage consumption among youth and adults in the United States: 1999-2010. *American Journal of Clinical Nutrition*, *98*(1), 180-188. doi:10.3945/ajcn.112.057943

Koch, T., & Harrington, A. (1998). Reconceptualizing rigour: the case for reflexivity. *Journal of Advanced Nursing*, *28*(4), 882-890. doi:10.1046/j.1365-2648.1998.00725.x

Kodl, M. M., & Mermelstein, R. (2004). Beyond modeling: parenting practices, parental smoking history, and adolescent cigarette smoking. *Addictive Behaviors*, *29*(1), 17-32. doi:10.1016/S0306-4603(03)00087-X

Kosova, E. C., Auinger, P., & Bremer, A. A. (2013). The relationships between sugar-sweetened beverage intake and cardiometabolic markers in young children. *Journal of the Academy of Nutrition and Dietetics*, *113*(2), 219-227. doi:10.1016/j.jand.2012.10.020

Kothe, E. J., Sainsbury, K., Smith, L., & Mullan, B. A. (2015). Explaining the intention-behaviour gap in gluten-free diet adherence: The moderating roles of habit and perceived behavioural control. *Journal of Health Psychology*, *20*(5), 580-591. doi:10.1177/1359105315576606

Kreuger, A., & Casey, A. (2009). *Focus groups: a practical guide for applied research*. London: Sage Publications, Inc.

Kronick, I., Auerbach, R. P., Stich, C., & Knäuper, B. (2011). Compensatory beliefs and intentions contribute to the prediction of caloric intake in dieters. *Appetite, 57*(2), 435-438. doi:10.1016/j.appet.2011.05.306

Krzeski, E. (2011). Using the theory of planned behavior to understand drink choices in Southwest Virginians (Doctoral dissertation, Virginia Polytechnic Institute and State University)

Kvaavik, E., Lien, N., Tell, G. S., & Klepp, K. (2005). Psychosocial predictors of eating habits among adults in their mid-30s: The Oslo Youth Study follow-up 1991–1999.*International Journal of Behavioral Nutrition and Physical Activity*, *2*(9), 1-11. doi:10.1186/1479-5868-2-9

Labiner-Wolfe, J., Fein, S. B., & Shealy, K. R. (2008). Infant formula-handling education and safety. *Pediatrics*, *122*(2), S85-S90. doi:10.1542/peds.2008-1315k

Labrecque, J. S., & Wood, W. (2015). What measures of habit strength to use? Comment on Gardner (2015). *Health Psychology Review*, *9*(3), 303-310. doi:10.1080/17437199.2014.992030

Lally, P., & Gardner, B. (2013). Promoting habit formation. *Health Psychology Review*, *7*(1), S137-S158. doi:10.1080/17437199.2011.603640

Lally, P., Van Jaarsveld, C. H., Potts, H. W., & Wardle, J. (2010). How are habits formed: Modelling habit formation in the real world. *European Journal of Social Psychology*,*40*(6), 998-1009. doi:10.1002/ejsp.674

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, *33*(1), 159. doi:10.2307/2529310

LaRowe, T. L., Moeller, S. M., & Adams, A. K. (2007). Beverage patterns, diet quality, and body mass index of US preschool and school-aged children. *Journal of the American Dietetic Association, 107*(7), 1124-1133. doi:10.1016/j.jada.2007.04.013

Laverty, A. A., Magee, L., Monteiro, C. A., Saxena, S., & Millett, C. (2015). Sugar-sweetened and artificially sweetened beverage consumption and adiposity changes: a national longitudinal study. *The Lancet, 386*, S49. doi:10.1016/s0140-6736(15)00887-9

Laverty, A. A., Palladino, R., Lee, J. T., & Millett, C. (2015). Associations between active travel and weight, blood pressure and diabetes in six middle income countries: A cross-sectional study in older adults. *International Journal of Behavioral Nutritional Physical Activity, 12*(1). doi:10.1186/s12966-015-0223-3

Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry*, *7*(1), 24-25. doi:10.1038/sj.ebd.6400375

Levy, D. T., Friend, K. B., & Wang, Y. C. (2011). A review of the literature on policies directed at the youth consumption of sugar sweetened beverages. *Advances in Nutrition: An International Review Journal*, *2*(2), 182S-200S. doi:10.3945/an.111.000356

Levy, R. B., Claro, R. M., Bandon, D. H., Mondin, L., & Monteiro, C. A. (2012). Availability of added sugars in Brazil: distribution, food sources and time trends. *Revista Brasileira de Epidemiologia*,*15*(1), 3-12.

Lewis, C. W., Grossman, D. C., Domoto, P. K., & Deyo, R. A. (2000). The role of the pediatrician in the oral health of children: A national survey. *Pediatrics*, *106*(6), 1-7. doi:10.1542/peds.106.6.e84

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., … Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Journal of Clinical Epidemiology*, *62*(10), e1-e34. doi:10.1016/j.jclinepi.2009.06.006

Lincoln, Y. S., & Guba, E. E. (1986). Research, evaluation, and policy analysis: Heuristics for disciplined inquiry. *Review of Policy Research*, *5*(3), 546-565.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Beverly Hills: Sage.

Lien, N., Bjelland, M., Bergh, I. H., Grydeland, M., Anderssen, S. A., Ommundsen, Y., … Klepp, K. I. (2010). Design of a 20-month comprehensive, multicomponent school-based randomised trial to promote healthy weight development among 11-13 year olds: The Health in adolescents study. *Scandinavian Journal of Public Health, 38*(5 Suppl), 38-51. doi:10.1177/1403494810379894

Littell, J. H., Corcoran, J., & Pillai, V. (2008). Systematic reviews and meta-analysis. Oxford: Oxford University Press.

Liu Y.H., Stein M.T.: Feeding behaviour of infants and young children and its impact on child psychosocial and emotional development. In: Tremblay R.E., Barr R.G., Peters R. (eds.) Encyclopedia on Early Childhood Development (online). Montreal, Quebec: Centre of Excellence for Early Childhood Development; 2005:1-7. Retrieved from http:// www.child-encyclopedia.com/documents/Liu-SteinANGxp. pdf.

Livingstone, M. B., & Robson, P. J. (2000). Measurement of dietary intake in children. *Proceedings of the Nutrition Society, 59*(2), 279-293. doi:10.1017/s0029665100000318

Lobstein, T. (2014). Reducing consumption of sugar-sweetened beverages to reduce the risk of childhood overweight and obesity. World Health Organization.

Lo, K., Cheung, C., Lee, A., Tam, W. W., & Keung, V. (2015). Associations between parental feeding styles and childhood eating habits: A survey of Hong Kong pre-school children. *Plos One*, *10*(4), e0124753. doi:10.1371/journal.pone.0124753

Lub, V. (2015). Validity in qualitative evaluation linking purposes, paradigms, and perspectives. *International Journal of Qualitative Methods*, *14*(5), 1609406915621406.

Mack, N., Woodsong, C., Macqueen, K. M., Guest, G., & Name, E. (2005). *Qualitative research methods: A data Collector's field guide*. Research Triangle Park, North Carolina 27709 USA: Family Health International.

Malagon-Maldonado, G. (2014). Qualitative research in health design. HERD: Health Environments Research & Design Journal, 7(4), 120-134.Malik, V. S., Pan, A., Willett, W. C., & Hu, F. B. (2013). Sugar-sweetened beverages and weight gain in children and adults: A systematic review and meta-analysis. *American Journal of Clinical Nutrition*, *98*(4), 1084-1102. doi:10.3945/ajcn.113.058362

Malik, V. S., Pan, A., Willett, W. C., & Hu, F. B. (2013). Sugar-sweetened beverages and weight gain in children and adults: A systematic review and meta-analysis. *American Journal of Clinical Nutrition*, *98*(4), 1084-1102. doi:10.3945/ajcn.113.058362

Malik, V. S., Popkin, B. M., Bray, G. A., Despres, J., & Hu, F. B. (2010). Sugar-sweetened beverages, obesity, Type 2 Diabetes Mellitus, and cardiovascular disease risk. *Circulation*, *121*(11), 1356-1364. doi:10.1161/circulationaha.109.876185

Malik, V. S., Schulze, M. B., & Hu, F. B. (2006). Intake of sugar-sweetened beverages and weight gain: A systematic review. *The American Journal of Clinical Nutrition*, *84*(2), 274-288.

Malterud, K. (2015). Theory and interpretation in qualitative studies from general practice: Why and how? *Scandinavian Journal of Public Health*. doi:1403494815621181

Mann, C. J. (2003). Observational research methods. Research design II: cohort, cross sectional, and case-control studies. *Emergency Medicine Journal*, *20*, 54-60. doi:10.1136/emj.20.1.54

Mantzoukas, S. (2005). The inclusion of bias in reflective and reflexive research: A necessary prerequisite for securig validity. *Journal of Research in Nursing, 10*(3), 279-295.

Marriott, B. P., Fink, C. J., & Krakower, T. (2014). Worldwide consumption of sweeteners and recent trends. doi:10.1007/978-1-4899-8077-9_6

Marriott, B. P., Olsho, L., Hadden, L., & Connor, P. (2010). Intake of added sugars and selected nutrients in the United States, National Health and Nutrition Examination Survey (NHANES) 2003—2006. *Critical Reviews in Food Science and Nutrition*, *50*(3), 228-258. doi:10.1080/10408391003626223

Martin, L. L. (2001). Mood as input: a configural view of mood effects. Theories of mood and cognition: A user's guidebook, 135-157.

Masalu, J. R., & Åstrøm, A. N. (2003). The use of the theory of planned behavior to explore beliefs about sugar restriction. *American Journal of Health Behavior*, *27*(1), 15-24. doi:10.5993/ajhb.27.1.2

Mathias, K. C., Slining, M. M., & Popkin, B. M. (2013). Foods and beverages associated with higher intake of sugar-sweetened beverages. *American Journal of Preventive Medicine, 44*(4), 351-357. doi:10.1016/j.amepre.2012.11.036

Mays, N., & Pope, C. (2000). Qualitative research in health care: Assessing quality in qualitative research. *British Medical Journal*, *320*(7226), 50-52. doi:10.1136/bmj.320.7226.50

Mazarello, V., Hesketh, K., O'Malley, C., Moore, H., Summerbell, C., Griffin, S., … Lakshman, R. (2015). Determinants of sugar-sweetened beverage consumption in young children: a systematic review. *Obesity Reviews*, *16*(11), 903-913. doi:10.1111/obr.12310

McCabe, M. P., Waqa, G., Dev, A., Cama, T., & Swinburn, B. A. (2013). The role of cultural values and religion on views of body size and eating practices among adolescents from Fiji, Tonga, and Australia. *British Journal of Health Psychology*, *18*(2), 383-394. doi:10.1111/j.2044-8287.2012.02090.x

McCambridge, J., & Kypri, K. (2011). Can simply answering research questions change behaviour? Systematic review and meta analyses of brief alcohol intervention trials. *PLoS ONE*, *6*(10), e23748. doi:10.1371/journal.pone.0023748

McCarthy, S. (2014). Weekly patterns, diet quality and energy balance. *Physiology & Behavior*, *134*, 55-59. doi:10.1016/j.physbeh.2014.02.046

McClain, A. D., Chappuis, C., Nguyen-Rodriguez, S. T., Yaroch, A. L., & Spruijt-Metz, D. (2009). Psychosocial correlates of eating behavior in children and adolescents: a review. *International Journal of Behavioral Nutrition and Physical Activity*, *6*(1), 54. doi:10.1186/1479-5868-6-54

McColl, E., Jacoby, A., Thomas, L., Soutter, J., Bamford, C., Steen, N., … Bond, J. (2001). Design and use of questionnaires: A review of best practice applicable to surveys of health service staff and patients. *Health Technology Assessment*, *5*(31), 1-256. doi:10.3310/hta5310

McDowell, A. J., & Bond, M. J. (2006). Body image differences among Malay, Samoan, and Australian women. *Asia Pacific Journal of Clinical Nutrition*, *15*(2), 201-207.

McEachan, R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the Theory of Planned Behaviour: a meta-analysis. *Health Psychology Review*, *5*(2), 97-144. doi:10.1080/17437199.2010.521684

McGuire, S. (2011). U.S. Department of Agriculture and U.S. Department of Health and Human Services, Dietary Guidelines for Americans, 2010. 7th Edition, Washington, DC: U.S. Government Printing Office, January 2011. *Advances in Nutrition: An International Review Journal*, *2*(3), 293-294. doi:10.3945/an.111.000430

Mello, T., Antunes, I., Waldman, E., Ramos, E., Relvas, M., & Barros, H. (2008). Prevalence and severity of dental caries in schoolchildren of Porto, Portugal. *Community Dental Health*, *25*(2), 119-125.

Melnyk, V., Van Herpen, E., & Van Trijp, C. M. (2010). The influence of social norms in consumer decision making: A meta-analysis. *Advances in Consumer Research, 37,* 463-464.

Mennella, J. A., Finkbeiner, S., Lipchock, S. V., Hwang, L., & Reed, D. R. (2014). Preferences for salty and sweet tastes are elevated and related to each other during childhood. *PLoS ONE, 9*(3), e92201. doi:10.1371/journal.pone.0092201

Merchant, A. T., & Dehghan, M. (2006). Food composition database development for between country comparisons. *Nutrition Journal, 5*(1), 1.

Merrell, J., & Williams, A. (1994). Participant observation and informed consent: Relationships and tactical decision-making in nursing research. *Nursing Ethics, 1*(3), 163-172. doi:10.1177/096973309400100305

Michie, S., & Abraham, C. (2004). Interventions to change health behaviours: evidence-based or evidence-inspired? *Psychology & Health, 19*(1), 29-49. doi:10.1080/0887044031000141199

Michie, S., Abraham, C., Whittington, C., McAteer, J., & Gupta, S. (2009). Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychology, 28*(6), 690-701. doi:10.1037/a0016136

Michie, S., Abraham, C., Eccles, M. P., Francis, J. J., Hardeman, W., & Johnston, M. (2011). Strengthening evaluation and implementation by specifying components of behaviour change interventions: a study protocol. *Implementation Science, 6*(1), 10. doi:10.1186/1748-5908-6-10

Michie, S., Ashford, S., Sniehotta, F. F., Dombrowsk, S. U., Bishop, A., & French, D. P. (2011). A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: the CALO-RE taxonomy. *Psychology & Health, 26*(11), 1479- 1498. doi:10.1080/08870446.2010.540664

Michie, S., Johnston, M., Francis, J., Hardeman, W., & Eccles, M. (2008). From theory to intervention: Mapping theoretically derived behavioural determinants to behaviour change techniques. *Applied Psychology, 57*(4), 660-680. doi:10.1111/j.1464-0597.2008.00341.x

Michie, S., & Johnston, M. (2012). Theories and techniques of behaviour change: Developing a cumulative science of behaviour change. *Health Psychology Review, 6*(1), 1-6. doi:10.1080/17437199.2012.654964

Miquelon, P., Knäuper, B., & Vallerand, R. J. (2012). Motivation and goal attainment. The role of compensatory beliefs. *Appetite, 58*(2), 608-615. doi:10.1016/j.appet.2011.12.025

Mirmiran, P., Yuzbashian, E., Asghari, G., Hosseinpour-Niazi, S., & Azizi, F. (2015). Consumption of sugar sweetened beverage is associated with incidence of metabolic syndrome in Tehranian children and adolescents. *Nutrition & Metabolism, 12*(1). doi:10.1186/s12986-015-0021-6

Mollen, S., Rimal, R. N., Ruiter, R. A., & Kok, G. (2013). Healthy and unhealthy social norms and food selection. Findings from a field-experiment. *Appetite, 65*, 83-89. doi:10.1016/j.appet.2013.01.020

Moore, M., Braid, S., Falk, B., & Klentrou, P. (2007). Daily calcium intake in male children and adolescents obtained from the rapid assessment method and the 24-hour recall method. *Nutrition Journal*, *6*(1), 24. doi:10.1186/1475-2891-6-24

Moraeus, L., Lissner, L., Olsson, L., & Sjöberg, A. (2015). Age and time effects on children's lifestyle and overweight in Sweden. *BMC Public Health, 15*(1). doi:10.1186/s12889-015-1635-3

Moret, L., Nguyen, J., Pillet, N., Falissard, B., Lombrail, P., & Gasquet, I. (2007). Improvement of psychometric properties of a scale measuring inpatient satisfaction with care: a better response rate and a reduction of the ceiling effect. *BMC Health Services Research,7*(197), 1-9. doi:10.1186/1472-6963-7-197

Morgan, D. L. (1998). Practical strategies for combining qualitative and quantitative methods: Applications to health research. *Qualitative Health Research, 8*(3), 362-376. doi:10.1177/104973239800800307

Moynihan, P. J., & Kelly, S. A. (2014). Effect on caries of restricting sugars intake: systematic review to inform WHO guidelines. *Journal of Dental Research*, *93*(1), 8-18. doi:10.1177/0022034513508954

Muckelbauer, R., Libuda, L., Clausen, K., Toschke, A. M., Reinehr, T., & Kersting, M. (2009). Promotion and provision of drinking water in schools for overweight prevention: Randomized, controlled cluster trial. *Pediatrics*, *123*(4), e661-e667. doi:10.1542/peds.2008-2186

Mullie, P., Aerenhouts, D., & Clarys, P. (2012). Demographic, socioeconomic and nutritional determinants of daily versus non-daily sugar-sweetened and artificially sweetened beverage consumption. *European Journal of Clinical Nutrition*, *66*(2), 150-155. doi:10.1038/ejcn.2011.138

Musaiger, A. O. (2011). Overweight and obesity in Eastern Mediterranean region: Prevalence and possible causes. *Journal of Obesity, 2011*, 1-17. doi:10.1155/2011/407237

Musaiger, A. O., Takruri, H. R., Hassan, A. S., & Abu-Tarboush, H. (2012). Food-based dietary guidelines for the Arab Gulf countries. *Journal of Nutrition and Metabolism, 2012*, 1-10. doi:10.1155/2012/905303

Mäkinen, J., Hannukainen, J. C., Karmi, A., Immonen, H. M., Soinio, M., Nelimarkka, L., … Nuutila, P. (2015). Obesity-associated intestinal insulin resistance is ameliorated after bariatric surgery. *Diabetologia, 58*(5), 1055-1062. doi:10.1007/s00125-015-3501-3

Nasreddine, L., Hwalla, N., Sibai, A., Hamzé, M., & Parent-Massin, D. (2006). Food consumption patterns in an adult urban population in Beirut, Lebanon. *Public Health Nutrition, 9*(2). doi:10.1079/phn2005855

Nasreddine, L., Naja, F., Aki, C., Chamieh, M. C., Karam, S., Sibai, A. M., & Hwalla, N. (2014). Dietary, lifestyle and socio-economic correlates of overweight, obesity and central adiposity in Lebanese children and adolescents. *Nutrients, 6*(3), 1038-1062.. doi:10.3390/nu6031038

Nastasi, B. K., & Schensul, S. L. (2005). Contributions of qualitative research to the validity of intervention research. *Journal of School Psychology, 43*(3), 177-195. doi:10.1016/j.jsp.2005.04.003

Nathan, N., Wolfenden, L., Williams, C. M., Yoong, S. L., Lecathelinais, C., Bell, A. C., … Wiggers, J. (2014). Adoption of obesity prevention policies and practices by Australian primary schools: 2006 to 2013. *Health Education Research, 30*(2), 262-271. doi:10.1093/her/cyu068

Neal, D. T., Wood, W., Labrecque, J. S., & Lally, P. (2012). How do habits guide behavior? Perceived and actual triggers of habits in daily life. *Journal of Experimental Social Psychology, 48*(2), 492-498. doi:10.1016/j.jesp.2011.10.011

Neal, D. T., Wood, W., & Drolet, A. (2013). How do people adhere to goals when willpower is low? The profits (and pitfalls) of strong habits. *Journal of Personality and Social Psychology, 104*(6), 959-975. doi:10.1037/a0032626

Nejad, L. M., Wertheim, E. H., & Greenwood, K. M. (2004). Predicting dieting behavior by using, modifying, and extending the Theory of Planned Behavior. *Journal of Applied Social Psychology, 34*(10), 2099-2131. doi:10.1111/j.1559-1816.2004.tb02692.x

Netemeyer, R. G., Burton, S., & Johnston, M. (1991). A comparison of two models for the prediction of volitional and goal-directed behaviors: A confirmatory analysis approach. *Social Psychology Quarterly, 54*(2), 87-100. doi:10.2307/2786928

Neumark-Sztainer, D., Story, M., Perry, C., & Casey, M. A. (1999). Factors influencing food choices of adolescents: Findings from focus-group discussions with adolescents. *Journal of the American Dietetic Association, 99*(8), 929-937.

Newens, K. J., & Walton, J. (2015). A review of sugar consumption from nationally representative dietary surveys across the world. *Journal of Human Nutrition and Dietetics, 29*(2), 225-240. doi:10.1111/jhn.12338

Ng, S. W., Ni Mhurchu, C., Jebb, S. A., & Popkin, B. M. (2012). Patterns and trends of beverage consumption among children and adults in Great Britain, 1986–2009. *British Journal of Nutrition, 108*(03), 536-551. doi:10.1017/s0007114511006465

Nickelson, J., Lawrence, J. C., Parton, J. M., Knowlden, A. P., & McDermott, R. J. (2014). What Proportion of Preschool-Aged Children Consume Sweetened Beverages? *Journal of School Health, 84*(3), 185-194.

Nicklas, T. A., & Hayes, D. (2008). Position of the American Dietetic Association: Nutrition guidance for healthy children ages 2 to 11 Years. *Journal of the American Dietetic Association, 108*(6), 1038-1047. doi:10.1016/j.jada.2008.04.005

Nielsen, S. J., & Popkin, B. M. (2004). Changes in beverage intake between 1977 and 2001.*American Journal of Preventive Medicine, 27*(3), 205-210. doi:10.1016/j.amepre.2004.05.005

Nilsen, P., Bourne, M., & Verplanken, B. (2008). Accounting for the role of habit in behavioural strategies for injury prevention. *International Journal of Injury Control and Safety Promotion, 15*(1), 33-40. doi:10.1080/17457300701794253

Nilsen, P., Roback, K., Brostrom, A., & Ellstrom, P. (2012). Creatures of habit: Accounting for the role of habit in implementation research on clinical behaviour change. *Implementation Science, 7*(1), 53. doi:10.1186/1748-5908-7-53

Nilsen, S. M., Krokstad, S., Holmen, T. L., & Westin, S. (2009). Adolescents' health-related dietary patterns by parental socio-economic position, The Nord-Trondelag Health Study (HUNT). *The European Journal of Public Health, 20*(3), 299-305. doi:10.1093/eurpub/ckp137

Noar, S. M., & Zimmerman, R. S. (2005). Health behavior theory and cumulative knowledge regarding health behaviors: Are we moving in the right direction? *Health Education Research, 20*(3), 275-290. doi:10.1093/her/cyg113

Norman, P., & Conner, M. (2006). The theory of planned behaviour and binge drinking: Assessing the moderating role of past behaviour within the theory of planned behaviour. *British Journal of Health Psychology*, *11*(1), 55-70. doi:10.1348/135910705x43741

O'Connor, T. M., Yang, S., & Nicklas, T. A. (2006). Beverage intake among preschool children and its effect on weight status. *Pediatrics*, *118*(4), e1010-e1018. doi:10.1542/peds.2005-2348

Oppenheim, N. (1992). *Questionnaire design, interviewing and attitude measurement*. Great Britain: Printer Publisher Limited.

Osman, H., El Zein, L., & Wick, L. (2009). Cultural beliefs that may discourage breastfeeding among Lebanese women: A qualitative analysis. *International Breastfeeding Journal*,*4*(1), 12. doi:10.1186/1746-4358-4-12

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*,*124*(1), 54-74. doi:10.1037/0033-2909.124.1.54

O'Connor, T. M., Hughes, S. O., Watson, K. B., Baranowski, T., Nicklas, T. A., Fisher, J. O., … Shewchuk, R. M. (2010). Parenting practices are associated with fruit and vegetable consumption in pre-school children. *Public Health Nutrition*, *13*(1), 91-101. doi:10.1017/s1368980009005916

Page, K. A., Chan, O., Arora, J., Belfort-DeAguiar, R., Dzuira, J., Roehmholdt, B., … Sherwin, R. S. (2013). Effects of fructose vs glucose on regional cerebral blood flow in brain regions involved with appetite and reward pathways. *Journal of the American Medical Association*, *309*(1), 63. doi:10.1001/jama.2012.116975

Palinkas, L. A., & Soydan, H. (2011). *Translation and implementation of evidence-based practice*. Oxford: Oxford University Press.

Parahoo, K., Whall, A. L., Colling, K., & Nusbaum, D. (2006). Expert nurses' use of implicit memory in the care of patients with Alzheimer's disease. *Journal of Advanced Nursing*, *54*(5), 563-571. doi:10.1111/j.1365-2648.2006.03864.x

Park, S., Lin, M., Onufrak, S., & Li, R. (2015). Association of sugar-sweetened beverage intake during infancy with dental caries in 6-year-olds. *Clinical Nutrition Research*,*4*(1), 9. doi:10.7762/cnr.2015.4.1.9

Park, S., Pan, L., Sherry, B., & Li, R. (2014). The association of sugar-sweetened beverage intake during infancy with sugar-sweetened beverage intake at 6 years of age. *Pediatrics*, *134*(Supplement), S56-S62. doi:10.1542/peds.2014-0646j

Patton, M. Q. (1990). *Qualitiative Evaluation and Research Methods* (2 nd ed.). Newbury Park: Sage.

Pawlak, R., Malinauskas, B., & Rivera, D. (2009). Predicting intentions to eat a healthful diet by college baseball players: Applying the Theory of Planned Behavior. *Journal of Nutrition Education and Behavior*, *41*(5), 334-339. doi:10.1016/j.jneb.2008.09.008

Pearson, N., Ball, K., & Crawford, D. (2012). Parental influences on adolescent fruit consumption: the role of adolescent self-efficacy. *Health Education Research*, *27*(1), 14-23. doi:10.1093/her/cyr051

Pennington, B. F. (2008). *Diagnosing learning disorders: A neuropsychological framework*. New York, NY: Guilfor Press.

Pereira, M. A. (2006). The possible role of sugar-sweetened beverages in obesity etiology: A review of the evidence. *International Journal of Obesity and Related Metabolic Disorders*, *30*, S28-S36. doi:10.1038/sj.ijo.0803489

Pereira, R. A., Duffey, K. J., Sichieri, R., & Popkin, B. M. (2014). Sources of excessive saturated fat, trans fat and sugar consumption in Brazil: An analysis of the first Brazilian nationwide individual dietary survey. *Public Health Nutrition*, *17*(1), 113-121. doi:10.1017/s1368980012004892

Piernas, C., Ng, S. W., Mendez, M. A., Gordon-Larsen, P., & Popkin, B. M. (2015). A dynamic panel model of the associations of sweetened beverage purchases with dietary quality and food-purchasing patterns. *American Journal of Epidemiology*, *181*(9), 661-671. doi:10.1093/aje/kwu317

Pinard, C. A., Davy, B. M., & Estabrooks, P. A. (2011). Beverage intake in low-income parent–child dyads. *Eating Behaviors*, *12*(4), 313-316. doi:10.1016/j.eatbeh.2011.07.012

Pine, C. M., Adair, P. M., Petersen, P. E., Douglass, C., Burnside, G., Nicoll, A. D., … Broukal, Z. (2004). Developing explanatory models of health inequalities in childhood dental caries. *Community Dental Health*, *21*(1), 86-95.

Plaza-Díaz, J., Augustín, O. M., & Hernández, A. G. (2013). Food as a source of mono- and disaccharides; biochemical and metabolic aspects. *Nutrición Hospitalaria*, *28*(4), 5-16.

Poirier, A., Kwiatkowski, F., Commer, J., D'Aillières, B., Berger, V., Mercier, M., & Bonnetain, F. (2012). Health-related quality of life in cancer patients at the end of life, translation, validation, and longitudinal analysis of specific tools: study protocol for a randomized controlled trial. *Trials*, *13*(1), 39. doi:10.1186/1745-6215-13-39

Polit, D. F., & Beck, C. T. (2004). *Nursing research: Principles and methods* (4th ed.). Philadelphia: Lippincott Williams & Wilkins.

Pommier, J., Guevel, M. R., & Jourdan, D. (2010). Evaluation of health promotion in schools: Arealistic evaluation approach using mixed methods. *BMC Public Health, 10*(43), 1-12. doi:10.1186/1471-2458-10-43

Popkin, B. M. (2010). Patterns of beverage use across the lifecycle. *Physiology & Behavior*, *100*(1), 4-9. doi:10.1016/j.physbeh.2009.12.022

Popkin, B. M., & Nielsen, S. J. (2003). The sweetening of the world's diet. *Obesity*, *11*(11), 1325-1332. doi:10.1038/oby.2003.179

Porcellato, L., Dughill, L., & Springett, J. (2002). Using focus groups to explore children's perceptions of smoking: Reflections on practice. *Health Education*, *102*(6), 310-320. doi:10.1108/09654280210446856

Povey, R., Conner, M., Sparks, P., James, R., & Shepherd, R. (2000). The theory of planned behaviour and healthy eating: Examining additive and moderating effects of social influence variables. *Psychology & Health, 14*(6), 991-1006. doi:10.1080/08870440008407363

Price, V. E., Klaassen, R. J., Bolton-Maggs, P. H., Grainger, J. D., Curtis, C., Wakefield, C., Young, N. L. (2009). Measuring disease-specific quality of life in rare populations: A practical approach to cross-cultural translation. *Health and Quality of Life Outcomes*,*7*(1), 92. doi:10.1186/1477-7525-7-92

Radtke, T., Kaklamanou, D., Scholz, U., Hornung, R., & Armitage, C. J. (2014). Are diet-specific compensatory health beliefs predictive of dieting intentions and behaviour? *Appetite*, *76*, 36-43. doi:10.1016/j.appet.2014.01.014

Radtke, T., & Rackow, P. (2014). Autonomous motivation is not enough: The role of compensatory health beliefs for the readiness to change stair and elevator use. *International Journal of Environmental Research and Public Health*, *11*(12), 12412-12428. doi:10.3390/ijerph111212412

Rah, J. H., Hasler, C. M., Painter, J. E., & Chapman-Novakofski, K. M. (2004). Applying the theory of planned behavior to women's behavioral attitudes on and consumption of soy products. *Journal of Nutrition Education and Behavior*, *36*(5), 238-244. doi:10.1016/s1499-4046(06)60386-2

Rampersaud, G. C., Bailey, L. B., & Kauwell, G. P. (2003). National survey beverage consumption data for children and adolescents indicate the need to encourage a shift toward more nutritive beverages. *Journal of the American Dietetic Association*, *103*(1), 97-100. doi:10.1053/jada.2003.50006

Rampersaud, G. C., Kim, H., Gao, Z., & House, L. A. (2014). Knowledge, perceptions, and behaviors of adults concerning nonalcoholic beverages suggest some lack of comprehension related to sugars. *Nutrition Research*, *34*(2), 134-142. doi:10.1016/j.nutres.2013.11.004

Randall, D. M., & Wolff, J. A. (1994). The time interval in the intention-behaviour relationship: Meta-analysis. *British Journal of Social Psychology, 33*(4), 405-418. doi:10.1111/j.2044-8309.1994.tb01037.x

Rashidian, A., Miles, J., Russell, D., & Russell, I. (2006). Sample size for regression analyses of theory of planned behaviour studies: Case of prescribing in general practice. *British Journal of Health Psychology, 11*(4), 581-593. doi:10.1348/135910705x66043

Rasmussen, M., Krølner, R., Klepp, K. I., Lytle, L., Brug, J., Bere, E., & Due, P. (2006). Determinants of fruit and vegetable consumption among children and adolescents: A review of the literature. Part I: quantitative studies. *International Journal of Behavioral Nutrition and Physical Activity*, *3*(1), 22.

Reinaerts, E., De Nooijer, J., Candel, M., & De Vries, N. (2007). Explaining school children's fruit and vegetable consumption: The contributions of availability, accessibility, exposure, parental consumption and habit in addition to psychosocial factors. *Appetite*, *48*(2), 248-258. doi:10.1016/j.appet.2006.09.007

Rise, J., Sheeran, P., & Hukkelberg, S. (2010). The role of self-identity in the theory of planned behavior: A meta-analysis. *Journal of Applied Social Psychology, 40*(5), 1085-1105. doi:10.1111/j.1559-1816.2010.00611.x

Robins, A., & Hetherington, M. M. (2005). A comparison of pre-competition: Eating patterns in a group of non-elite triathletes. *International Journal of Sport Nutrition and Exercise Metabolism*, *15*(4), 442-457.

Robson, C. (2002). *Real world research*. Oxford, UK: Blackwell Publisher.

Rodgers, W. M., Conner, M., & Murray, T. C. (2008). Distinguishing among perceived control, perceived difficulty, and self-efficacy as determinants of intentions and behaviours. *British Journal of Social Psychology*, *47*(4), 607-630. doi:10.1348/014466607x248903

Rolfe, G. (2006). Validity, trustworthiness and rigour: Quality and the idea of qualitative research. *Journal of Advanced Nursing, 3*(3), 304-310.

Roos, E. B., Hirvonen, T., Mikkilä, V., Karvonen, S., & Rimpelä, M. (2001). Household educational level as a determinant of consumption of raw vegetables among male and female adolescents. *Preventive Medicine, 33*(4), 282-291. doi:10.1006/pmed.2001.0882

Roos, E. H., & Donly, K. J. (2002). In vivo dental plaque pH variation with regular and diet soft drinks. *Pediatric Dentistry*, *24*(4), 350-353.

Rosenstock, M. (1974). Historical origins of the health belief model. *Health Education Monographs, 2,* 328-355.

Rosenkranz, R. R., Behrens, T. K., & Dzewaltowski, D. A. (2010). A group-randomized controlled trial for health promotion in Girl Scouts: Healthier Troops in a SNAP (Scouting Nutrition & Activity Program). *BMC Public Health*, *10*(1), 81. doi:10.1186/1471-2458-10-81

Rosário, R., Araújo, A., Oliveira, B., Padrão, P., Lopes, O., Teixeira, V., … Moreira, P. (2013). Impact of an intervention through teachers to prevent consumption of low nutrition, energy-dense foods and beverages: A randomized trial. *Preventive Medicine, 57*(1), 20-25. doi:10.1016/j.ypmed.2013.02.027

Rugg-Gunn, A. J., Fletcher, E. S., Hackett, A. F., Mathers, J. C., Adamson, A. J., Zohouri, F. V., & Moynihan, P. J. (2004). Changes in water intake of Northumbrian adolescents 1980 to 2000. *British Dental Journal, 196*(9), 547-52; discussion 537. doi:10.1038/sj.bdj.4811226

Saleh, S. S., Alameddine, M. S., & El-Jardali, F. (2009). The case for developing publicly-accessible datasets for health services research in the Middle East and North Africa (MENA) region. *BMC Health Services Research, 9*(1), 197. doi:10.1186/1472-6963-9-197

Sandberg, T., & Conner, M. (2008). Anticipated regret as an additional predictor in the theory of planned behaviour: A meta-analysis. *British Journal of Social Psychology*, *47*(4), 589-606. doi:10.1348/014466607x258704

Savage, J. S., Fisher, J. O., & Birch, L. L. (2007). Parental influence on eating behavior: conception to adolescence. *The Journal of Law, Medicine & Ethics*, *35*(1), 22-34. doi: 10.1111/j.1748-720X.2007.00111

Savige, G. S., Ball, K., Worsley, A., & Crawford, D. (2007). Food intake patterns among Australian adolescents. *Asia Pacific Journal of Clinical Nutrition*, *16*(4), 738-746.

Sayegh, A., Dini, E., Holt, R., & Bedi, R. (2002). Food and drink consumption, sociodemographic factors and dental caries in 4–5-year-old children in Amman, Jordan. *British Dental Journal*, *193*(1), 37-42. doi:10.1038/sj.bdj.4801478a

Scaglioni, S., Salvioni, M., & Galimberti, C. (2008). Influence of parental attitudes in the development of children eating behaviour. *British Journal of Nutrition*, *99*(1), S22-S25. doi:10.1017/S0007114508892471

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information, 22*, 63-75.

Schifter, D. E., & Ajzen, I. (1985). Intention, perceived control, and weight loss: An application of the theory of planned behavior. *Journal of Personality and Social Psychology, 49*(3), 843-851. doi:10.1037/0022-3514.49.3.843

Schorin, M. D., Sollid, K., Edge, M. S., & Bouchoux, A. (2012). The science of sugars, part I. *Nutrition Today*, *47*(3), 96-101. doi:10.1097/NT.0b013e3182435de8

Seo, H., Lee, S., & Nam, S. (2011). Factors influencing fast food consumption behaviors of middle-school students in Seoul: An application of theory of planned behaviors. *Nutrition Research and Practice*, *5*(2), 169. doi:10.4162/nrp.2011.5.2.169

Serra-Majem, L., Frost Andersen, L., Henríque-Sánchez, P., Doreste-Alonso, J., Sánchez-Villegas, A., Ortiz-Andrelluchi, A., … La Vecchia, C. (2009). Evaluating the quality of dietary intake validation studies. *British Journal of Nutrition*, *102*(S1), S3. doi:10.1017/s0007114509993114

Sharifirad, G., Yarmohammadi, P., Azadbakht, L., Morowatisharifabad, M. A., & Hassanzadeh, A. (2013). Determinants of fast food consumption among Iranian high school students based on planned behavior theory. *Journal of Obesity, 2013*, 1-7. doi:10.1155/2013/147589

Sharma, M. (2011). Dietary education in school-based childhood obesity prevention programs. *Advances in Nutrition: An International Review Journal*, *2*(2), 207S-216S. doi:10.3945/an.111.000315

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*, 63-75.

Sherman, S. J. (1980). On the self-erasing nature of errors of prediction. *Journal of Personality and Social Psychology*, *39*(2), 211-221. doi:10.1037//0022-3514.39.2.211

Shim, J., Oh, K., & Kim, H. C. (2014). Dietary assessment methods in epidemiologic studies.*Epidemiological Health*, *36*, e2014009. doi:10.4178/epih/e2014009

Short, R. V. (1994). Human reproduction in an evolutionary context. *Annals of the New York Academy of Sciences*, *709*(1), 416-425. doi:10.1111/j.1749-6632.1994.tb30427.x

Sichieri, R., Trotte, A. P., De Souza, R. A., & Veiga, G. V. (2009). School randomised trial on prevention of excessive weight gain by discouraging students from drinking sodas. *Public Health Nutrition*, *12*(2), 197. doi:10.1017/s1368980008002644

Siega-Riz, A. M., El Ghormli, L., Mobley, C., Gillis, B., Stadler, D., Hartstein, J., …Health Study Group, H. (2011). The effects of the HEALTHY study intervention on middle school student dietary intakes. *International Journal of Behavioral Nutrition and Physical Activity*, *8*(1), 7. doi:10.1186/1479-5868-8-7

Sigman-Grant, M., & Morita, J. (2003). Defining and interpreting intakes of sugars. *The American Journal of Clinical Nutrition, 78*(4), 815-826.

Silverman, D. (2003). Analyzing talk and text. In N. K. Denzin, Lincoln, Yvonna S. (Ed.), In Collecting and Interpreting Qualitative Materials (pp. 340-362). Thousand Oaks, CA: SAGE.

Silverman, D. (2011). *Qualitative research: Issues of theory, method and practice*. London: Sage.

Singh, A. S., Chin A Paw, M. J., Kremers, S. P., Visscher, T. L., Brug, J., & Van Mechelen, W. (2006). Design of the Dutch Obesity Intervention in Teenagers (NRG-DOiT): Systematic development, implementation and evaluation of a school-based intervention aimed at the prevention of excessive weight gain in adolescents. *BMC Public Health*, *6*(1), 304. doi:10.1186/1471-2458-6-304

Singh, A. S., Paw, M. J., Brug, J., & Van Mechelen, W. (2009). Dutch obesity intervention in teenagers. *Archives of Pediatric and Adolescent Medicine*, *163*(4), 309-317. doi:10.1001/archpediatrics.2009.2

Sizer, F. S., Piché, L. A., Whitney, E. N., & Whitney, E. (2012). *Nutrition: Concepts and controversies* (2nd ed.). Brooks Cole.

Skinner, J. D., Carruth, B. R., Bounds, W., & Ziegler, P. J. (2002). Children's food preferences: A longitudinal analysis. *Journal of the American Dietetic Association*, *102*(11), 1638-1647. doi:10.1016/s0002-8223(02)90349-4

Slavin, J. L. (2015). The challenges of nutrition policymaking. *Nutrition Journal*, *14*(1), 15. doi:10.1186/s12937-015-0001-8

Sleddens, E. F., Kremers, S. P., Stafleu, A., Dagnelie, P. C., De Vries, N. K., & Thijs, C. (2014). Food parenting practices and child dietary behavior. Prospective relations and the moderating role of general parenting. *Appetite*, *79*, 42-50. doi:10.1016/j.appet.2014.04.004

Slining, M. M., & Popkin, B. M. (2013). Trends in intakes and sources of solid fats and added sugars among U.S. children and adolescents: 1994-2010. *Pediatric Obesity*, *8*(4), 307-324. doi:10.1111/j.2047-6310.2013.00156.x

Sliwa, S. A., Sharma, S., Dietz, W. H., Dolan, P. R., Nelson, M. E., Newman, M. B., … Economos, C. D. (2014). Healthy kids out of school: Using mixed methods to develop principles for promoting healthy eating and physical activity in out-of-school settings in the United States. *Preventing Chronic Disease, 11,* E227. doi:10.5888/pcd11.140207

Snelgrove, S. R. (2014) Conducting qualitative longitudinal research using interpretative phenomenological analysis. *Nurse Researcher,* 22 (1), 20-25.

Sniehotta, F. F., Presseau, J., & Araujo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review, 8*(1), 1-7. doi: 10.1080/17437199.2013.869710

Solomon, R. L. (1949). An extension of control group design. *Psychological Bulletin, 46*(2), 137-150. doi:10.1037/h0062958

Sprott, D. E., Spangenberg, E. R., Block, L. G., Fitzsimons, G. J., Morwitz, V. G., & Williams, P. (2006). The question–behavior effect: What we know and where we go from here. *Social Influence*, *1*(2), 128-137. doi:10.1080/15534510600685409

Spurrier, N. J., Magarey, A. A., Golley, R., Curnow, F., & Sawyer, M. G. (2008). Relationships between the home environment and physical activity and dietary patterns of preschool children: A cross-sectional study. *International Journal of Behavioural Nutrition and Physical Activity*, *5*(1), 31. doi:10.1186/1479-5868-5-31

Stephan, B. C., Wells, J. C., Brayne, C., Albanese, E., & Siervo, M. (2010). Increased fructose intake as a risk factor for dementia. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *65A*(8), 809-814. doi:10.1093/gerona/glq079

Stice, E., Spoor, S., Ng, J., & Zald, D. H. (2009). Relation of obesity to consummatory and anticipatory food reward. *Physiology & Behavior*, *97*(5), 551–560. doi:10.1016/j.physbeh.2009.03.020

Stokes, D., & Bergin, R. (2006). Methodology or "methodolatry"? An evaluation of focus groups and depth interviews. *Qualitative Market Research: An International Journal*, *9*(1), 26-37. doi:10.1108/13522750610640530

Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: Policy and environmental approaches. *Annual. Review. Public. Health*, *29*(1), 253-272. doi:10.1146/annurev.publhealth.29.020907.090926

Sutton, S. (2002). Health Behavior: Psychosocial Theories. Retrieved from http://userpage.fu-berlin.de/~schuez/folien/Sutton.pdf

Taber, D. R., Chriqui, J. F., Powell, L. M., & Chaloupka, F. J. (2012). Banning all sugar-sweetened beverages in middle schools. *Archives of Pediatric and Adolescent Medicine, 166*(3), 256-262. doi:10.1001/archpediatrics.2011.200

Tappy, L., & Mittendorfer, B. (2012). Fructose toxicity. *Current Opinion in Clinical Nutrition and Metabolic Care*, *15*(4), 357-361. doi:10.1097/mco.0b013e328354727e

Tayyem, R. F., Al-Hazzaa, H. M., Abu-Mueiss, S. S., Bawadi, H. A., & Musaiger, A. O. (2014). Association of lifestyle factors with obesity indices among adolescents in Amman, Jordan. *Malizian Journal of Nutrition, 20*(1), 51-62.

Te Morenga, L., Mallard, S., & Mann, J. (2013). Dietary sugars and body weight: Systematic review and meta-analyses of randomized controlled trials and cohort studies. *British Medical Journal, 346*(jan153), e7492-e7492. doi:10.1136/bmj.e7492

Temple, B. (2002). Crossed wires: Interpreters, translators, and bilingual workers in cross-language research. *Qualitative Health Research, 12*(6), 844-854. doi:10.1177/104973230201200610

Terry-McElrath, Y. M., O'Malley, P. M., & Johnston, L. D. (2015). Potential impact of national school nutritional environment policies: cross-sectional associations with US secondary student overweight/obesity, 2008-2012.JAMA. *Pediatrics, 169*(1), 78-85.

Tipton, J. A. (2014). Using the theory of planned behavior to understand caregivers' intention to serve sugar-sweetened beverages to non-Hispanic Black preschoolers. *Journal of Pediatric Nursing, 29*(6), 564-575. doi:10.1016/j.pedn.2014.07.006

Tolvanen, M., Lahti, S., Poutanen, R., Seppä, L., Pohjola, V., & Hausen, H. (2009). Changes in children's oral health-related behavior, knowledge and attitudes during a 3.4-yr randomized clinical trial and oral health-promotion program. *European Journal of Oral Sciences*, *117*(4), 390-397. doi:10.1111/j.1600-0722.2009.00640.x

Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review, 96*(3), 506-520. doi:10.1037/0033-295x.96.3.506

Tuckett, A. G. (2004). Qualitative research sampling: The very real complexities. *Nurse Researcher*, *12*(1), 47-61. doi:10.7748/nr2004.07.12.1.47.c5930

Twinn, D. S. (1998). An analysis of the effectiveness of focus groups as a method of qualitative data collection with Chinese populations in nursing research. *Journal of Advanced Nursing*, *28*(3), 654-661. doi:10.1046/j.1365-2648.1998.00708.x

Tylka, T. L., Eneli, I. U., Kroon Van Diest, A. M., & Lumeng, J. C. (2013). Which adaptive maternal eating behaviors predict child feeding practices? An examination with mothers of 2- to 5-year-old children. *Eating Behaviors*, *14*(1), 57-63. doi:10.1016/j.eatbeh.2012.10.014

Tylka, T. L., Lumeng, J. C., & Eneli, I. U. (2015). Maternal intuitive eating as a moderator of the association between concern about child weight and restrictive child feeding. *Appetite*, *95*, 158-165. doi:10.1016/j.appet.2015.06.023

Vågstrand, K., Linné, Y., Karlsson, J., Elfhag, K., & Karin Lindroos, A. (2009). Correlates of soft drink and fruit juice consumption among Swedish adolescents. *British Journal of Nutrition*, *101*(10), 1541. doi:10.1017/s0007114508083542

Van den Berg, S. W., Mikolajczak, J., & Bemelmans, W. J. (2013). Changes in school environment, awareness and actions regarding overweight prevention among Dutch secondary schools between 2006–2007 and 2010–2011. *BMC Public Health*, *13*(1), 672. doi:10.1186/1471-2458-13-672

Van der Horst, K., Kremers, S., Ferreira, I., Singh, A., Oenema, A., & Brug, J. (2007). Perceived parenting style and practices and the consumption of sugar-sweetened beverages by adolescents. *Health Education Research*, *22*(2), 295-304. doi:10.1093/her/cyl080

Van Grieken, A., Renders, C. M., Veldhuis, L., Looman, C. W., Hirasing, R. A., & Raat, H. (2014). Promotion of a healthy lifestyle among 5-year-old overweight children: health behavior outcomes of the 'Be active, eat right' study. *BMC Public Health, 14*(1), 59. doi:10.1186/1471-2458-14-59

Van Grieken, A., Veldhuis, L., Renders, C. M., Borsboom, G. J., Van der Wouden, J. C., Hirasing, R. A., & Raat, H. (2013). Population-based childhood overweight prevention: outcomes of the 'Be Active, Eat Right' study. *PLoS ONE, 8*(5), e65376. doi:10.1371/journal.pone.0065376

Van Nassau, F., Singh, A. S., Cerin, E., Salmon, J., Van Mechelen, W., Brug, J., & Chinapaw, M. J. (2014). The Dutch Obesity Intervention in Teenagers (DOiT) cluster controlled implementation trial: intervention effects and mediators and moderators of adiposity and energy balance-related behaviours. *International Journal of Behavioral Nutrition and Physical Activity, 11*(1), 1-11. doi:10.1186/s12966-014-0158-0

Vandevijvere, S., Monteiro, C., Krebs-Smith, S. M., Lee, A., Swinburn, B., Kelly, B., … Sacks, G. (2013). Monitoring and benchmarking population diet quality globally: A step-wise approach. *Obesity Reviews*, *14*, 135-149. doi:10.1111/obr.12082

Vangeepuram, N., Carmona, J., Arniella, G., Horowitz, C. R., & Burnet, D. (2015). Use of focus groups to inform a youth diabetes prevention model. *Journal of Nutrition Education and Behavior*, *47*(6), 532-539.e1. doi:10.1016/j.jneb.2015.08.006

Van't Riet, J., Sijtsema, S. J., Dagevos, H., & De Bruijn, G. (2011). The importance of habits in eating behaviour. An overview and recommendations for future research. *Appetite*,*57*(3), 585-596. doi:10.1016/j.appet.2011.07.010

Vartanian, L. R., Schwartz, M. B., & Brownell, K. D. (2007). Effects of soft drink consumption on nutrition and health: A systematic review and meta-analysis. *American Journal of Public Health*, *97*(4), 667-675. doi:10.2105/ajph.2005.083782

Veldhuis, L., Struijk, M. K., Kroeze, W., Oenema, A., Renders, C. M., Bulk-Bunschoten, A. M., … Raat, H. (2009). 'Be active, eat right', evaluation of an overweight prevention protocol among 5-year-old children: design of a cluster randomised controlled trial. *BMC Public Health*, *9*(1), 177. doi:10.1186/1471-2458-9-177

Ventura, A., & Worobey, J. (2013). Early influences on the development of food preferences. *Current Biology*, *23*(9), R401-R408. doi:10.1016/j.cub.2013.02.037

Vereecken, C. A., Inchley, J., Subramanian, S. V., Hublet, A., & Maes, L. (2005). The relative influence of individual and contextual socio-economic status on consumption of fruit and soft drinks among adolescents in Europe. *European Journal of Public Health*, *15*(3), 224-232. doi:10.1093/eurpub/cki005

Verplanken, B., Aarts, H., Knippenberg, A., & Moonen, A. (1998). Habit versus planned behaviour: A field experiment. *British Journal of Social Psychology*, *37*(1), 111-128. doi:10.1111/j.2044-8309.1998.tb01160.x

Verplanken, B., & Aarts, H. (1999). Habit, attitude, and planned behaviour: Is habit an empty construct or an interesting case of goal-directed automaticity? *European Review of Social Psychology*, *10*(1), 101-134. doi:10.1080/14792779943000035

Verplanken, B., & Orbell, S. (2003). Reflections on past behavior: A self-report index of habit strength. *Journal of Applied Social Psychology*, *33*(6), 1313-1330. doi:10.1111/j.1559-1816.2003.tb01951.x

Verplanken, B., & Wood, W. (2006). Interventions to break and create consumer habits. *Journal of Public Policy & Marketing*, *25*(1), 90-103. doi:10.1509/jppm.25.1.90

Volkow, N. D., Wang, G., Fowler, J. S., & Telang, F. (2008). Overlapping neuronal circuits in addiction and obesity: evidence of systems pathology. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *363*(1507), 3191-3200. doi:10.1098/rstb.2008.0107

Vollmer, R. L., & Mobley, A. R. (2013). Parenting styles, feeding styles, and their influence on child obesogenic behaviors and body weight. A review. *Appetite*, *71*, 232-241. doi:10.1016/j.appet.2013.08.015

Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The strengthening the reporting of observational studies in epidemiology (STROBE) statement: Guidelines for reporting observational studies. *PLoS Medicine*, *4*(10), e296. doi:10.1371/journal.pmed.0040296

Walker, J. L. (2012). The use of saturation in qualitative research. *Canadian Journal of Cardiovascular Nursing*,*22*(2), 37-46.

Wang, Y. C., Bleich, S. N., & Gortmaker, S. L. (2008). Increasing caloric contribution from sugar-sweetened beverages and 100% fruit juices among US children and adolescents, 1988-2004. *Pediatrics*, *121*(6), e1604-e1614. doi:10.1542/peds.2007-2834

Wang, Y., & Chen, H. (2012). Use of percentiles and z-scores in anthropometry. *Handbook of Anthropometry*, 29-48. doi:10.1007/978-1-4419-1788-1_2

Waters, E., De Silva-Sanigorski, A., Burford, B. J., Brown, T., Campbell, K. J., Gao, Y., … Summerbell, C. D. (2011). Interventions for preventing obesity in children. *Cochrane Database of Systematic Reviews*. doi:10.1002/14651858.cd001871.pub3

Webber, K. J., & Loescher, L. J. (2013). A systematic review of parent role modeling of healthy eating and physical activity for their young African American children. *Journal for Specialists in Pediatric Nursing*, *18*(3), 173-188. doi:10.1111/jspn.12033

Weeks, A., Swerissen, H., & Belfrage, J. (2007). Issues, challenges, and solutions in translating study instruments. *Evaluation Review*, *31*(2), 153-165. doi:10.1177/0193841x06294184

Weidmer, B. (1994). Issues and guidelines for translation in cross-cultural research. Retrieved from http://www.amstat.org/sections/srms/Proceedings/papers/1994_215.pdf

Weinstein, N. D. (2007). Misleading tests of health behavior theories. *Annals of Behavioral Medicine, 33*(1), 1-10. doi:10.1207/s15324796abm3301_1

Welsh, J. A., Sharma, A. J., Grellinger, L., & Vos, M. B. (2011). Consumption of added sugars is decreasing in the United States. *American Journal of Clinical Nutrition*, *94*(3), 726-734. doi:10.3945/ajcn.111.018366

White, A. H., Wilson, J. F., Burns, A., Blum-Kemelor, D., Singh, A., Race, P. O., … Soto, V. (2011). Use of qualitative research to inform development of nutrition messages for low-income mothers of preschool children. *Journal of Nutrition Education and Behavior*,*43*(1), 19-27. doi:10.1016/j.jneb.2009.10.002

Wiecha, J. L., Finkelstein, D., Troped, P. J., Fragala, M., & Peterson, K. E. (2006). School vending machine use and fast-food restaurant use are associated with sugar-sweetened beverage intake in youth. *Journal of The American Dietetic Association*,*106*(10), 1624-1630. doi:10.1016/j.jada.2006.07.007

Willig, C. (2008). *Introducing qualitative research methods in psychology*.Maidenhead: McGraw H ill.

Wittekind, A., & Walton, J. (2014). Worldwide trends in dietary sugars intake. *Nutrition Research Reviews*,*27*(2), 330-345. doi:10.1017/s0954422414000237

Wood, W., & Neal, D. T. (2009). The habitual consumer. *Journal of Consumer Psychology*,*19*(4), 579-592. doi:10.1016/j.jcps.2009.08.003

World Health Organization, issuing body. (2014). *Non-communicable diseases country profiles 2014*. WHO Document Production Services.

World Health Organization. (2003). *Diet, nutrition, and the prevention of chronic diseases: Report of a joint WHO/FAO expert consultation*. Geneva: Author.

World Health Organization. (2010). *Global status report on non-communicable diseases*. Geneva, Switzerland: Author.

World Health Organization. (2015). *Guideline: Sugars intake for adults and children*. Geneva: World Health Organization.

Xie, B., Gilliland, F. D., Li, Y. F., & Rockett, H. R. (2003). Effects of ethnicity, family income, and education on dietary intake among adolescents. *Preventive Medicine*, *36*(1), 30-40. doi:10.1006/pmed.2002.1131

Young, E. M., Fors, S. W., & Hayes, D. M. (2004). Associations between perceived parent behaviors and middle school student fruit and vegetable consumption. *Journal of Nutrition Education and Behavior*, *36*(1), 2-12. doi:10.1016/S1499-4046(06)60122-X

Zarnowiecki, D., Sinn, N., Petkov, J., & Dollman, J. (2012). Parental nutrition knowledge and attitudes as predictors of 5-6-year-old children's healthy food knowledge. *Public Health Nutrition, 15*(7), 1284-1290. doi:10.1017/S1368980011003259

Zhang, N., Bécares, L., Chandola, T., & Callery, P. (2015). Intergenerational differences in beliefs about healthy eating among carers of left-behind children in rural China: A qualitative study. *Appetite, 95*, 484-491. doi:10.1016/j.appet.2015.08.024

Zoellner, J., Chen, Y., Davy, B., You, W., Hedrick, V., Corsi, T., & Estabrooks, P. (2014). Talking Health, A pragmatic randomized-controlled health literacy trial targeting sugar-sweetened beverage consumption among adults: Rationale, design & methods. *Contemporary Clinical Trials*, *37*(1), 43-57. doi:10.1016/j.cct.2013.11.003

Zoellner, W. Y., Estabrooks, J., Davy, P. A., Yi-Chun, B. M., & Wen You. (2012). Exploring the theory of planned behavior to explain sugar-sweetened beverage consumption. *Journal of Nutrition Education and Behavior, 44*(2), 172-177. doi:10.1016/j.jneb.2011.06.01

Appendices

APPENDIX A: Ethical Approval from the University of Salford (Mixed Methods study)

Academic Audit and Governance Committee

Research Ethics Panel
(REP)

THE UNIVERSITY OF SALFORD

MEMORANDUM

To	Abir Abdel Rahman
cc:	Prof Cynthia Pine, Dr Anna Robins, Prof T Warne
From	Jayne Hunter, Contracts Administrator
Date	26th September 2011

Subject: **Approval of your Project by REP**

Project Title: **The role of sugar within the diet of Lebanese children in public schools.**

REP Reference: **REP11/138**

Following your responses to the Panel's queries, based on the information you provided, I can confirm that they have no objections on ethical grounds to your project.

If there are any changes to the project and/or its methodology, please inform the Panel as soon as possible.

Regards,

Jayne Hunter
Contracts Administrator

For enquiries please contact
Jayne Hunter
Contracts Administrator
Contracts Office
Enterprise Division
Faraday House
Telephone: 0161 295 3530 Facsimile: 0161 295 5494
E-mail: j.hunter@salford.ac.uk

Appendix B: Approval from the Lebanese Ministry of Education and Higher Education (Mixed Methods study)

FROM : FAX NO. :00961 1 562109 28 Jun. 2010 11:57 P2

وزارة التربية والتعليم العالي
ديوان التربية

جامعة البلمند – كلية الصحة العامة وعلومها – البرامج المتلازمة أكاديمياً
برنامج 'المدرسة الأكثر صحة' – مشروع 'الصحة المدرسية'

بيروت، 28 حزيران 2010

سعادة الأستاذ جان حايك المحترم
مديرية الإرشاد والتوجيه
وزارة التربية والتعليم العالي في لبنان

وزارة التربية والتعليم العالي
الارشاد والتوجيه

تحية وبعد،

يسرنا أن نتقدم من حضرتكم بطلب الموافقة على أن تقوم السيدة عبير ناصر الدين عبدالرحمن (محاضرة وطالبة دكتوراه) من جامعة البلمند بإجراء دراسة تقييمية لبرنامج صحة الفم والأسنان الذي نفذته الوزارة ضمن الاستراتيجية الوطنية لصحة الفم والأسنان (2005-2010) من خلال برنامج الصحة المدرسية في التربية الصحية في مديريتكم الكريمة. إن هذه الدراسة هي موضوع الدكتوراه الذي تعمل عليه وقد تباحثت به مع المعنيين (خصوصاً د. منير ضومط) وكانوا لها من المشجعين. وإن هذه الدراسة ستكون بتصرفكم للاستفادة من نتائجها في تدعيم عمل الصحة المدرسية في لبنان.

نتمنى عليكم مساعدتنا في تأمين الموافقات اللازمة حتى يتم التخطيط والتنفيذ وفق ما ترونه مناسباً.

آملين ردكم الإيجابي، تفضلوا بقبول فائق الاحترام

حبوبة عون
المنسقة

٢٩ حزيران ٢٠١٠

المدير العام للتربية
فادي يرق

مجمع القديس جاورجيوس الصحي، الأشرفية شارع يوسف سرسق ، ص.ب. 166378 الأشرفية – بيروت 1100 2807
لبنان هاتف: 562108-1-961 فاكس: 562110-1-961

جامعة البلمند – كلية الصحة العامة وعلومها

لجانب السادة
وزارة التربية والتعليم العالي
مديرية الإرشاد والتوجيه
بيروت – لبنان

بيروت في 26 تشرين الثاني 2010

حضرة الأستاذ جان حايك المحترم

تحية طيبة وبعد،

بناء على موافقة وزارة التربية والتعليم العالي (تاريخ 29 حزيران 2010) على طلب السيدة عبير ناصر الدين من جامعة البلمند بأن تقوم بتنفيذ دراسة ميدانية هدفها تقييم الحملة الوطنية لصحة الفم والأسنان وذلك في سياق إعدادها لشهادة الدكتوراه في جامعة في بريطانيا، نحيطكم علماً أنه ولأسباب عديدة، طلبت الجامعة البريطانية (رسالة موضحة مرفقة) من السيدة عبير ناصر الدين أن تبدأ بتنفيذ دراسة أخرى تتعلق بالنظام الغذائي لشعوب العالم حيث ننتمي. بناء عليه، نكرر لكم شكرنا على الموافقة الأولى ونتمنى من حضرتكم منحنا موافقة جديدة تسمح للسيدة عبير أن تدخل خمس مدارس رسمية في بيروت تسمح لها بتنفيذ الدراسة الجديدة فيها. وستقوم السيدة عبير بالاتفاق مع المعنيين في دائرتكم الكريمة لتوضيح مواصفات المدارس المطلوبة للدراسة. المدارس المطلوبة هي: برج حمود الأولى الابتدائية، الأشرفية الثانية للبنات، ... راس بيروت المختلطة، حارة حريك الثانية الابتدائية، عاليه الثانية الرسمية

آملين موافقتكم الكريمة، نتمنى استمرار التعاون المثمر والإيجابي.

تفضلوا بقبول فائق الاحترام

حبوبة عون

١٠/٢٧٠٨
جانب السيد المدير العام للتربية
مع اقتراح الموافقة
مدير الإرشاد والتوجيه
٢٩ تشرين الثاني ٢٠١٠

مجمع القديس جاورجيوس الصحي – الأشرفية – ص.ب. 166378 الأشرفية – بيروت 1100 2807 لبنان هاتف: 562108-1-961 فاكس: 562110-1-961 خليوي:03658573

APPENDIX C: 24 hour beverage recall-Weekday for parents at a dental clinic

(phase I: Mixed Methods study)

Name: _____ ID: _____

Phase 1: beverage recall during weekend, 24 hour recall to document adding sugar to beverages. during weekdays.

1. My child name :_____

2. My Child's age is :_____

3. My child's gender is: (1) Female ☐ (2) Male ☐

4. Did you child go to school? (1) Yes ☐ (2) No . ☐

5. What did you offer to your child as breakfast before going to school yesterday?

_____

6.What did he/she drink usually during breakfast yesterday before going to school?

_____

7. If he/she drink milk did you add sugar (table sugar)?_____

8. If he/she drink tea or any other hot beverages, did you add sugar (table sugar)?_____

9. If he/she drink Fesh juice prepared at home, did you add sugar (table sugar)?_____

10.What did he drink during recess hours yesterday?

_____

11.What did you give him/her at lunch to drink when she/he came from school?

_____

12.What did you give him/her at lunch to drink?_____

13. If he/she drink milk did you add sugar (table sugar)?_____

14. If he/she drink tea or any other hot beverages, did you add sugar (table sugar)?_____

15. If he/she drink Fesh juice prepared at home, did you add sugar (table sugar)?_____

16.What did you give him/her between lunch and dinner to drink yesterday?

_____

17. If he/she drink milk did you add sugar (table sugar)?_____

18. If he/she drink tea or any other hot beverages, did you add sugar (table sugar)?_____

19. If he/she drink fesh juice prepared at home, did you add sugar (table sugar)?_____

20. What did you offer him at dinner yesterday?

_____

21.What did you give him/her at dinner to drink?

_____

22. If he/she drink milk did you add sugar (table sugar)?_____

23. If he/she drink tea or any other hot beverages, did you add sugar (table sugar)?_____

24. If he/she drink Fesh juice prepared at home, did you add sugar (table sugar)?_____

25. Did he/she drink milk at bed time?

_____

26.If yes, did you add sugar to it?_____

APPENDIX D: 24 hour beverage recall-Weekend for parents at dental clinic

(phase I: Mixed Methods study)

Name: _____ ID: _____

Phase 1: Dental Clinic. Beverage recall during weekend: 24 hour recall to document adding sugar to beverages.

1.What did you offer as breakfast to your child yesterday?

_____

2.What did he/she drink during breakfast yesterday?

_____

3. If he/she drink milk did you add sugar (table sugar)?_____

4. If he/she drink tea or any other hot beverages, did you add sugar (table sugar)?_____

5. If he/she drink Fesh juice prepared at home, did you sugar (table sugar)?_____

6.What did you give him/her to drink between breakfast and lunch?

_____

7. If he/she drink milk did you add sugar (table sugar)?_____

8. If he/she took tea or any other hot beverages, did you add sugar (table sugar)?_____

9. If he/she drink Fesh juice prepared at home, did you add sugar (table sugar)?_____

10.What did you give him/her at lunch to drink?_____

11. If he/she drink milk did you add sugar (table sugar)?_____

12. If he/she drink tea or any other hot beverages, did you add sugar (table sugar)?_____

13. If he/she drink Fesh juice prepared at home, did you add sugar (table sugar)?_____

14.What did you give to drink him/her between lunch and dinner?

_____

15. If he/she drink milk did you add sugar (table sugar)?_____

16. If he/she drink tea or any other hot beverages, did you add sugar (table sugar)?_____

17. If he/she drink fresh juice prepared at home, did you add sugar (table sugar)?_____

18.What did you give him/her at dinner to drink?_____

19.If he/she drink milk did you add sugar (table sugar)?_____

20. If he/she drink tea or any other hot beverages, did you add sugar (table sugar)?_____

21. If he/she drink Fesh juice prepared at home, did you add sugar (table sugar)?_____

22. Did he/she drink milk at bed time? _____

23.If yes, did you add sugar to it?_____

APPENDIX E: 24 hour beverage recall-Weekday for grade 6 students (Phase 2: Mixed Methods study)

Name: :_____ID: _____School:_____

Phase 2: Beverage recall during weekday: 24 hour recall to document adding sugar to beverages (ASB) among children in public schools..

1. I am a: (1) boy ☐ (2) Girl ☐

2. Whom do you live with: _____

3. What did you eat before going to school yesterday?

_____

4. What did you drink before going to school yesterday?

_____

5. If you took milk did you add sugar (table sugar)?_____

6. If you took tea or any other hot beverages, did you add sugar (table sugar)?_____

7. If you took fresh juice prepared at home, did you add sugar (table sugar)?_____

8. What did you drink during recess hour yesterday?

_____

9. What did you eat at lunch when you came from school yesterday?

_____

10. What did you drink at lunch when you came from school yesterday?

_____

11. If you took milk did you add sugar (table sugar)?_____

12. If you took tea or any other hot beverages, did you add sugar (table sugar)?_____

13. If you took fresh juice prepared at home, did you add sugar (table sugar)?

_____

14. What did you drink between meals yesterday?

_____

15. If you took milk did you add sugar (table sugar)?_____

16. If you took tea or any other hot beverages, did you add sugar (table sugar)?_____

17. If you took fresh juice prepared at home, did you add sugar (table sugar)?

_____

18. What did you eat at dinner_____

19. If you took milk did you add sugar (table sugar)?_____

20. If you took tea or any other hot beverages, did you add sugar (table sugar)?_____

21. If you took fresh juice prepared at home, did you add sugar (table sugar)?_____

22. Did you drink milk before bed time?_____

23. Did you add sugar to the milk taken at bed time?_____

APPENDIX F: 24 hour beverage recall-Weekend for grade 6 students (Phase 2: Mixed Methods study)

Date: _____School:_____ID: _____

Phase 2: Beverage recall during weekday: 24 hour recall to document adding sugar to beverages (ASB) among children in public schools..

1. What did you eat as breakfast yesterday?

_____

2. What did you drink during the breakfast yesterday?

_____

3. If you took milk did you add sugar (table sugar)?_____

4. If you took tea or any other hot beverages, did you add sugar (table sugar)?_____

5. If you took fresh juice prepared at home, did you add sugar (table sugar)?_____

6. What did you eat at lunch yesterday?

_____

7. What did you drink at lunch yesterday?

_____

8. If you took milk did you add sugar (table sugar)?_____

9. If you took tea or any other hot beverages, did you add sugar (table sugar)?_____

10. If you took fresh juice prepared at home, did you add sugar (table sugar)?

_____

11. What did you drink between meals?

_____

12. If you took milk did you add sugar (table sugar)?_____

13. If you took tea or any other hot beverages, did you add sugar (table sugar)?_____

14. If you took fresh juice prepared at home, did you add sugar (table sugar)?

_____

15. What did you eat at dinner_____

16. If you took milk did you add sugar (table sugar)?_____

17. If you took tea or any other hot beverages, did you add sugar (table sugar)?_____

18. If you took fresh juice prepared at home, did you add sugar (table sugar)?_____

19. Did you drink milk before bed time?_____

20. Did you add sugar to the milk taken at bed time?_____

APPENDIX G1: Participant Information and consent sheet of the Phase 3 in the Mixed Methods study (In depth interview) (English form)

(Abir Abdel Rahman- University of Balamand, The University of Salford-College of Health and social Care (Primary Investigator), and Co-Academic Program, University of Balamand.

Introduction

You are being invited to participate in a research study on Dietary patterns of Lebanese children. Before you decide whether to participate, you need to know why the research is being carried out. Please take the time to read all information below and should you require further clarifications, please do not hesitate to contact the main researcher as outlined below. The generated results will help in improving the dietary patterns of Lebanese children and in developing intervention aiming at reducing the 'adding sugar' to beverages offered to children.

What is the purpose of this study?

The aim of this study is to explore, via discussions with parents and grandparents, the reasons for adding sugar to beverages (milk, hot beverages and home made juices) offered to your children

Why have I been chosen and what is required from the participant?

You are being chosen because your child has already taken part in the National Oral Health Campaign and has been involved in a study that has already provided valuable information for the researcher aligned with this research area. The findings of this study will be shared with the Ministry of Education and Higher Education and the data will be an added value to the School Health Program in terms of making future interventions more effective.

Procedure

If you are willing to participate in our study, you will be asked to undertake a face-to- face interview with the researcher for approximately 30 - 45 minutes in a comfortable place. The interview will be recorded for the information can be further analyzed. The anonymous recorded tapes will be kept for three years or until the completion of the study. The researcher will keep the transcribed data for 10 years. The recommended duration of 10 years is helpful for further follow up studies.

Risk of Participant

Involvement in this study will not have any risk on the wellbeing of the participant. You will be free to withdraw from the study at any time without penalty.

Confidentiality:

All information will be kept strictly confidential. Data collected will only be used by the research team in order to serve the objective of the study. The consent forms are stored securely and locked in the central administrative office of the Faculty of Health Sciences, University of Balamand. The data is anonymous and the research team will be dealing with coded data.

Withdrawal:

It is your right to withdraw from the study at any point of time without any obligation or liability on your part. Your participation in this study is on voluntary basis. You may withdraw your consent at any time without any prejudice. It will not affect in any way the status of your child in his school, and there is no repercussion for you from your withdrawal from the study.

Consent

I agree to participate in this research: YES NO

I, _____, have been given the opportunity to ask any question concerning this procedure and all such questions have been answered to my complete satisfaction. I understand that my participation in this study is voluntary and can be terminated at any time upon my request without prejudice. I also

understand that if I have any further problems or questions I can contact the below named researcher of the study at any time.
When the participant is illiterate, and the intake of written consent is not feasible, verbal consent is deemed sufficient.

Contact details

If you would like further information about the research, please contact:

Abir Abdel Rahman: 01-562108 /03-515857

OR

Dr. Lamis Jomaa: 01-562108 ext. 132.

Signature of the participant:
Date:

APPENDIX G2: Participant Information and consent sheet of the phase 3 :

Mixed Methods study (In depth interview) (Arabic version)

معلومات مفيدة للمشارك وموافقة خطية.

الباحثون: عبير عبد الرحمن – جامعة البلمند وجامعة سالفورد – كلية الصحة والعلوم الاجتماعية (باحث رئيسي) بالتعاون مع مكتب النشاطات الأكاديمية في جامعة البلمند ووزارة التربية والتعليم العالي.

مقدمة:

أنتِ مدعوّة للمشاركة في بحث يعني في النظام الغذائي عند الأطفال. قبل الموافقة على المشاركة، من حقك أن تعرفي لماذا وماذا أهمية هذا البحث. الرجاء قراءة المعلومات وأن لا تردد للمزيد من المعلومات. نتائج هذا البحث سوف تساهم في تحسين النمط الغذائي لدى الأطفال في المدارس الرسمية وذويهم.

ما هدف هذا البحث

معرفة من الأهالي وذويهم لماذا يضعون السكر في الحليب ومشتقاته، المشروبات الساخنة والعصير المحضّر في المنزل.

لما اخترت للاشتراك في هذا البحث؟

إنكِ اخترتِ لأن إبنك كان مشاركاً في الحملة الوطنية لصحة الفم والأسنان. النتائج سوف توضع بتصرف وزارة التربية وتستعمل من قبل مكتب الصحة المدرسية.

خطة العمل

إذا قررتِ المشاركة في هذا البحث، عليكِ أن تفعلي مقابلة شخصية ومدتها لا تتراوح بين ٣٠ و ٤٠ دقيقة – المقابلة سوف تسجّل، وذلك لإمكانية تحليلها والمقابلة سوف تحفظ لعشر سنوات من أجل متابعة الدراسات.

الخطر من المشاركة

المشاركة في هذا البحث لن يكون له أية عوارض جانبية. بإمكانك الانسحاب من البحث في أي وقت.

السرية التامة:

كل المعلومات سوف تحفظ بسريةٍ تامة. والمعلومات سوف يستعملها الباحث فقط لصالح البحث ولن يحصل أي شخص آخر على أية معلومة.

الانسحاب من البحث:

إن من حقك الانسحاب من البحث في أي وقتٍ دون أي قيد أو شرط أو أي التزام منكِ. هذا لن يؤثر لا على طفلك ولا عليكِ وبالطبع لن يؤثر على إنجازاته في المدرسة.

موافقة خطية:

إنني موافقة، موافقة خطية:

☐ نعم ☐ كلا

أنا الموّقع/ة أدناه ..... قد أعطيت الفرصة أن أسأل أي سؤال له علاقة بالبحث وقد حصلت على كل الأجوبة المطلوبة وقد عرفت أنني أستطيع الانسحاب من البحث في أي وقت كان ودون أي سابق إنذار. إن مشاركتي في هذا البحث طوعية.

معلومات إضافية:

إذا أردت أي معلومات إضافية الرجاء الاتصال بـــ:

عبير عبد الرحمن

٠١/٥٦٢١٠٨

٠٣/٥١٥٨٥٧

د. لميس جمعة

٠١/٥٦٢١٠٨

التوقيع: ..... التاريخ: .....

APPENDIX H1: Data Interview Guide/Interviews with Mothers

A-Personal Profile

Name:

Participant code;

Religion:

Occupation:

Family status:

Number of children:

Years of education:

B-Interview Schedule

Can you tell me about the food your children consume during a typical day? (mainly focus on introduction of high sugar food items such as jam, chocolate spread, candies, sweets, kaak, cornflakes, and sugary drinks (Milk fresh, milk powder, Tea, hot drinks, infusion, juice, carbonated beverages)

- ✓ Pre- breakfast
- ✓ Breakfast
- ✓ Bedtime
- ✓ Lunch
- ✓ Dinner

Can you tell me more about their fluid consumption in general?

- Do you add sugar to the beverages offered to your children? (mention the beverages that the mother cited before)
- Why you add sugar to these beverages?
- Do you add other sweeteners (honey, molasses,...), why you add these sweeteners?
- How frequently you offered these beverages? (Daily? During which meals? Weekly? Occasionally?)
- Why you think it is important to offer them sugary drinks at these time interval?

- Are you offering these fluids only at home? Or you send with the, sugary drinks at schools?

Can you tell me more about their milk consumption in general?

- Have you ever breastfed? For how long? why you breastfed your children?
- Did you use to supplement children with bottled milk during breastfeeding? If yes why?
- When did you start the provision of bottled milk?
- How did you prepare the bottled milk? What did you add to it?
- Did you use to add sugar to it? Why you think it is important to add if you are doing so?
- How many time you used to give them the bottled milk? Why you think you are doing so?
- When did you stop the feeding with bottled milk?
- Why you stopped the feeding with the bottled milk? Why you decided to stop the bottled milk?
- When did you start the provision of milk in cup?
- What kind of milk you used: fresh milk? Powder milk?
- After weaning: Continuation/discontinuation of milk/ milk with added sugar
- Established eating habits: Continuation/discontinuation of milk/ milk with added sugar

  Comparing milk consumption during week days, weekends, and during summer

Can you tell me more about their weaning stage?

- Early introduction of sugary food items
- Early feeding: to pacifier, sweets used as pacifier
- After weaning: introduction of high sugar food items such as Cerelac, Bledina, biscuits and fruits

Do you consider the addition of sugar to beverages is important? Why do you think the addition of sugar to fluids is important?

- Beliefs related to sugar (Sugar is healthy / harmful)

Can you tell me more about your adding sugar habits? Their father's adding sugar habits?

- Adding sugar to fluids? Milk? How he takes milk? How he takes tea? Why he add sugar if he is doing so
- Adding other sweeteners
- Consumption of sweets

Can you tell me more about your parents' adding sugar behaviour (the child's grand-parents)

- Adding sugar to beverages? Milk? Hot beverages? Juices?
- If they are active performers, why do you think they are doing so?
- Adding other sweeteners? Why?
- Consumption of sweets

Appendix H2: Data Interview Guide/Interviews with Fathers

A-Personal Profile

Name:

Participant code;

Religion:

Occupation:

Family status:

Number of children:

Years of education:

B- Interview Schedule

Can u tell me about the food your children consume during a typical day? (mainly focus on introduction of high sugar food items such as jam, chocolate spread, candies, sweets, kaak, cornflakes, and sugary drinks (juice, carbonated beverages)? Why you offer such kind of foods to your children?

- ✓ Pre- breakfast
- ✓ Breakfast
- ✓ Bedtime
- ✓ Lunch
- ✓ Dinner

Can you tell me more about their fluid consumption in general?

- Do you offer your children sweetened drinks? Milk? Juices? Fresh home-made juices? Tea? Hot beverages? Infusions?

- Why you think it is important to offer these beverages?
- Do you add sugar to the beverages they take (mention the beverages that the mother cited before)
- Do you add other sweeteners (honey, molasses,...). If yes, why you add these sweeteners?
- How frequently you offer these beverages to your children (Daily? During which meals? Weekly? Occasionally?
- Why you think it is important to offer these drinks on such time interval?
- Are these beverages available at home? Why only at home?
- Do you give them such drinks at school? Why you think it is important to offer such drinks at schools.

Can you tell me more about their milk consumption in general?

- Did your wife breastfeed? For how long? Why?
- Have you encouraged your wife to breastfeed? If yea why? If no why?
- Did you use to supplement children with bottled milk during breastfeeding? If yes why?
- When did you start the provision of bottled milk?
- How did you prepare the bottled milk?
- What did you add to it? Did you use to add sugar to it? Why you think it is important to do it?
- How many time you used to give them the bottled milk?
- When did you stop the feeding with bottled milk? Why you decided to stop it?

Can you tell me more about their weaning stage?

- How your wife started this period?
- Early introduction of sugary food items after weaning. introduction of high sugar food items such as Cerelac, Bledina, biscuits and fruits. How each item? Why?
- When did you start the provision of milk in cup?
- When did you start the provision of milk in cup? Why?
- What kind of milk you used: fresh milk? Powder milk? Why you have chosen this kind of milk?
- How many times was offered per day? Why?
- What kind of milk you used: fresh milk? Powder milk? Why you have chosen this kind of milk?
- Do you add sugar to milk offered to you children? Why?

Can you tell me more about the sugar intake in your family?

Are your parents behaving the same in this regard? Why? How they used to take milk? How they offer it?

Do they add sugar to milk when they offer it? Why they think it is important to add sugar?

Do they add other sweeteners to milk?

APPENDIX H3: Data Interview Guide/ Interviews with grandparents

A-Personal Profile

Name:

Participant code;

Religion:

Occupation:

Family status:

Number of children:

Years of education:

B-Interview Schedule

Can u tell me about the food your children consume during a typical day? (mainly focus on introduction of high sugar food items such as jam, chocolate spread, candies, sweets, kaak, cornflakes, and sugary drinks (juice, carbonated beverages)? Why you offer such kind of foods to your children?

- ✓ Pre- breakfast
- ✓ Breakfast
- ✓ Bedtime
- ✓ Lunch
- ✓ Dinner

Can you tell me more about the beverage consumption in general in your family?

- Do you offer your children sweetened drinks? Milk? Juices? Fresh home-made juices? Tea? Hot beverages? Infusions?
- Why you think it is important to offer these beverages?
- Do you add sugar to the beverages they take (mention the beverages that the mother cited before)
- Do you add other sweeteners (honey, molasses,...). If yes, why you add these sweeteners?

- How frequently you offer these beverages to your children (Daily? During which meals? Weekly? Occasionally?
- Why you think it is important to offer these drinks on such time interval?
- Are these beverages available at home? Why only at home?
- Do you give them such drinks at school? Why you think it is important to offer such drinks at schools.

Can you tell me more about your children and grand-children milk consumption in general?

- Did the mother breastfeed your grand-children? For how long?
- Why do you think she breastfed for this period?
- What about you, did you breastfeed your children?
- Did you use to supplement children/ grand-children with bottled milk during breastfeeding?
- If yes why you did that? Do you think it was important?
- When did you start the provision of bottled milk to your children?
- How did you prepare the bottled milk? What did you add to it? Did you use to add sugar to it? How many time you used to give them the bottled milk?
- Why you prepared it this way? Did you add sugar to it?
- When did you stop the feeding with bottled milk?
- Why you stopped at this particular time?
- When did you start the provision of milk in cup?
- Why you started it at this time?
- What kind of milk you used: fresh milk? Powder milk?
- How you offer it to your children? Why you offer it this way?
- Did you add sugar to the milk? Why you added sugar to m ilk?
- Did you help in raising your grandchildren?
- Did you advise in the way they feed your grandchildren? Why?
- How did you advise them to offer milk? Why? Did you advise to use table sugar? Why?
- Are you convinced the way you raised your children?

- Are you convinced by the way they are raising their children?
- How you evaluate the diet patter concerning milk intake of your children and grandchildren?

APPENDIX I: School sampling and school selection per Mouhafazah

1. Students registered in the pre-elementary classes in the Lebanese Public Schools

		Female	Male
Grade	**N (%)**	**N (%)**	N **(%)**
Nursery	916 (3)	440 (48)	476 (52)
KG1	15694 (47)	7779 (49)	7915 (51)
KG2	16754 (50)	8300(49)	8454 (51)
Total	**33364**	**16519**	**16854**

2. Students registered in Public Schools by Mouhafaza and students recruited from each Mouhafaza

	Registered in public schools	**Participants from each Mouhafaza**	**Schools selected**
Mohafaza	**N (%)**	**N (%)**	**N (%)**
Beirut	1681 (5)	12 (5)	1 (4)
Mount Lebanon (North Suburbs)	2357 (7)	16 (7)	2 (8)
Mount Lebanon (South Suburbs)	2962 (9)	21 (9)	3 (12)
Northern Lebanon	13344 (40)	90 (40)	9 (36)
Bekaa	5286 (16)	36 (16)	4 (16)
South Lebanon	4837 (14)	32 (14)	3 (12)
Nabatiyeh	2897 (9)	21 (9)	2 (8)
Total	**33364**	**228**	**25**

Sample size= 225 mothers
schools selected= 25 (10 mothers from each school)

APPENDIX J: Lebanese map indicated the location of all Mouhafazahs

APPENDIX K: Approval of the Lebanese Ministry of Education and Higher Education (Quantitative study-TPB study)

INCOMING COMPUTER April 29,2011
SEAL OF THE MINISTRY OF EDUCATION & HIGHER TEACHING

University of Balamand –Faculty of Public Health and Sciences –Correlative Program Academically – Program of the More Healthy School –Program of the School Health

Beirut on April 27,2011

Attention Mr. Jean Hayek
Director of Guidance and Orientation
General Directorate of Education
Ministry of Education & Higher Teaching

Greeting ,

We are honored to thank you and appreciate all your supports and opportunities you grant us to facilitate our task in participating in the National effort aiming to develop and progress the Pedagogical ,Health and Cultural Sector in Lebanon .

Returning back to the approval obtained by the colleague **ABIR NASREDDINE** (Reference : Approval outgoing Number (3/15797) to implant a field study about the National Campaign for the Health of the Mouth and Teeth ,and after authorizing her to have access to a number of the Public Schools (according to the contents of your honorable approval),we kindly request you to approve to facilitate the tasks of Mrs. Abir **NASREDDINE** to interview the parents of the students interviewed in the first stage . Contacting the parents will be arranged after coordination with the Administration of the School on behalf of the School Administration ,thus after the obtainment of your honorable approval to do that ,we will co-ordinate with you and the School Administration before proceeding to any procedure related to the subject of the Study .

Hopping to receive your positive reply .

Respectfully Yours
Habbouba Aoun
Coordinator (signature and seal)

1541/10
Attention Mr. the General Director of Education
Proposing the approval as a continuity to the prior approval .
The Director of Guidance and Orientation
JEAN HAYEK (signature and seal) 29/4/2011

True and correct translation of the Arabic attached document .
The Sworn Translator Boulos Joseph Misk Tel/Fax 01/561995

REPUBLIC OF LEBANON
Ministry of Education & Higher Teaching
General Directorate of Education

Outgoing Number : 7731/3
Beirut on May 4, 2011

Attention the University of El Balamand
Faculty of Public Health & Sciences

Subject : Execution of a study regarding the National Campaign for the Health of the Mouth and Teeth.

Reference : Your letter of April 27,2011.

Reference is made to the aforementioned Subject and Reference,

In virtue of the referral Number 15797/3 dated December 1, 2010 Containing the approval to authorize **Mrs. ABIR NASREDDINE** to execute a field study to evaluate the National Campaign for the Health of Mouth and teeth in the public Schools mentioned in this referral,

We inform you of our approval to your request to facilitate the task of **Mrs. ABIR NASREDDINE** to interview the Students Parents' in these schools after the co-ordination with the Administrations of these schools in order to implement what is required and to assure the good functioning Of the school activities .

- Attached: A copy of the Approval Number 15797/3/2010

The General Director of Education

FADI YARAK
Signature and Seal

True and correct translation of the Arabic attached document.
The Sworn Translator Boulos Joseph Misk Tel/Fax 01/561995-

APPENDIX L1: Participant Information sheet for the participants in the quantitative study (English form)

A theory based exploration of the adding sugar behaviour among Lebanese children in public school

Researchers: Abir Abdel Rahman- University of Balamand, The University of Starthclyde, school of psychological sciences and health.(primary investigator), Nutritional Sciences Program, University of Balamand, and Co-Academic Program, University of Balamand.

Introduction

You are being invited to participate in a study on:

"A theory based exploration of the adding sugar behaviour among Lebanese children in public school"

Before you decide whether to participate, you need to know why the research is being carried out. Please take the time to read all information below. Should you require further clarifications, please do not hesitate to contact the main researcher as outlined below. Should you wish to participate, kindly complete the consent form once you have read the information. A copy of this information sheet and the consent form will be provided to you.

What is the purpose of this study? The aim of this study is to collect information from mothers of Lebanese children in public schools concerning the drinking habits of their children as well as how the children look after their teeth. The information will be assessed and the results used to make recommendations, which could improve on the outcomes of the National Oral Health campaign, and contribute to the curriculum of the School Health Program. Findings will be shared with the Ministry of Education and Higher Education. The results of the study will be communicated to participants in a letter distributed through participating schools.

Why have I been chosen and what is required from me?

You are being chosen because it is expected that you are offering milk and other beverages such as tea and fresh juice to your children. If you are willing to participate, you are asked to fill in a questionnaire with the researcher on a date and time that is convenient for you. You will be asked questions about the beverages your child drinks, if sugar or other sweeteners are added to these beverages and the amounts, and the extent to which your child brushes his or her teeth.

Procedure

If you are willing to participate in our study, you will be asked to meet the researcher to fill out the questionnaire with her help. The researcher would telephone you to make an appointment for this, which would take place at the school in an empty office or classroom designated by the school authorities. The meeting would take

place in private with no one else present. Transportation costs and refreshments would be provided by the researcher for travel between the home or workplace of the participant, to the school and return.

Risk to you

Involvement in this study will not have any risk to the wellbeing of you or your children. You will be free to withdraw from the study at any time without penalty. None of the information you provide would be shared with the school of your child or anyone else in a way that could identify you as it will be anonymised.

Confidentiality

The answers you give will be known only to the researcher who interviewed you. All information will be kept strictly confidential. Questionnaires will not be identified by your name but by numerical code. Access to the code will be strictly limited to the Principal Investigator(s) of the research. The information collected will only be used by the research team in order to serve the objective of the study, and not for any other purpose. Analysis of the data will be done by members of the research team using the coded data. Access to the electronic data will be by password, and limited to the research team only. The analyzed information could be used in written reports and published articles on the topic of the research; however it would not contain any material that could identify you. All questionnaires will be stored in a secure and locked office of the researcher at the Faculty of Health Sciences, University of Balamand, and will be destroyed after a period of 8years. The consent forms will also be stored securely and locked in the central administrative office of the Faculty, separately from the questionnaires. +.

Withdrawal

It is your right to withdraw from the study at any point of time without any obligation or liability on your part. Your participation in this study is on voluntary basis. You may withdraw your consent at any time without any prejudice or repercussions. You may refuse to answer any questions you are free to request that information from your completed interview not be used in the analysis of the results. Information from the questionnaires and interviews of each participant would not be shared with anyone. Participation will not affect in any way the status of your child in his school.

APPENDIX L2: Participant information sheet for the participants in the quantitative study (Arabic form)

ملحق ت ١

معلومات مفيدة للمشترك

الباحثون: عبير عبد الرحمن جامعة البلمند، وجامعة سلفورد في بريطانيا، كلية الصحة والعلوم الإجتماعية، برنامج التغذية، جامعة البلمند، وبرنامج النشاطات اللاأكاديمية بجامعة البلمند.

مقدمة:

إنك مدعو للمشاركة في بحثٍ عن "Exploring the adding sugar behavior" "الإستكشاف والبحث عن اتخاذ السكر عند الأطفال اللبنانيين في المدارس الرسمية".

قبل أن تتخذ القرار في المشاركة عليك أن تعرف أوّلاً لماذا هذا البحث سيتم ولماذا نحن مهتمين به. من فضلك خذ كامل وقتك لقراءة المعلومات وإذا كنت تريد توضيحات أكثر، الرّجاء لا تتردد في الإتصال بأحد الباحثين كما هو مذكور أعلاه.

النتائج المرّجوة منّ هذا البحث ستساعد لتغيير عادة إتخاذ المشروبات الغير الصحية وتحسين نتائج "الحملة الوطنية لصحة الفم والأسنان". سوف نتواصل معكم ونعلمكم بالنتائج من خلال مكتب الصحة المدرسية التابع لوزارة التربية والتعليم العالي.

ما هو الهدف من الدراسة؟

الهدف من هذه الدراسة هو جمع معلومات من خلال تعبئة إستمارة وسوف نستعمل تقنيات لتحليل المعلومات.

لماذا أنا اخترت وما هو المطلوب من المشارك؟

إنك اخترت لأنّه من المتوقع أن تكون تعطي الحليب ومشروبات أخرى لأطفالك ومن المحتمل أن هذه العادة هي موجودة عندك كأهل. النتائج سوف ترسل إلى وزارة التربية والمعلومات ستكون مساعدة لبرنامج الصحة المدرسية وذلك لتخطيط إلى برامج أكثر إيجابية.

خطة العمل:

إذا كانت لديك نية المشاركة، سوف يطلب منك تعبئة الإستمارة وذلك لمدّة ٦٠ دقيقة في مكانٍ ملائم أو في المدرسة أو في أي مكانٍ آخر. الباحث سوف يحتفظ بالإستمارات لمدة ٨ سنين.

١

ضرر على الباحث:

المشاركة في هذا البحث لن تؤدي ولن تسبب أي نوعٍ من الضرر علـى المـشارك. لديك الحرية أن تنسحب من المشاركة في أي وقتٍ ودون أن يكون لها أية ردّة فعـلٍ سـلبيةٍ عليك.

السرّية التامة:

كلّ المعلومات سوف تحفظ ويُتداول بها في سرّيةٍ كاملة. المعلومات سوف تـستعمل فقط من فريق البحث لهدف البحث. أوراق الموافقة سوف تخزّن في مكانٍ آمن في مبنى الكلية وفي خزانةٍ مقفلة المعلومات والإستمارة مجهولة الأسماء والباحث سوف يستعمل معلومـات مشفرة. سوف تحصل على نسخة من هذه الإستمارة ونسخة موّقعة من الموافقة.

الإنسحاب:

إنّ من حقك الإنسحاب من هذا البحث في أي وقتٍ كان دون أي ضـرر عليـك. إن مشاركتك هي طوعية. يمكن الإنسحاب فـي أي وقـتٍ ودون إنـذارٍ مـسبق. وإن قـررت الإنسحاب، لن يكون لهذا أي تأثير عليك أو على أطفالك. المعلومات التي تخصك والمجموعة قبل إنسحابك تستعمل فقط إن وافقت على ذلك.

APPENDIX M1: Consent form of the participants in the quantitative study

(English form)

A theory based exploration of the adding sugar behaviour among Lebanese children in public school using theory of planned behaviour

Abir Abdel Rahman- University of Balamand, The University of Salford-College of Health and Social Care (Primary Investigator), University of Balamand, and Co-Academic Program, University of Balamand

Consent Date:

I have read all the information related in the study stated in the information sheet and, agree to participate in this research: Yes ☐ No ☐
I, ----------, mother of the student----------have been given the opportunity to ask any questions concerning this procedure and all such questions have been answered to my complete satisfaction.
Yes ☐ No ☐

*I understand that my participation in this study is voluntary and can be terminated at any time upon my request without prejudice. Yes ☐ No ☐

*I was assured that all information that I will provide will be strictly confidential.
Yes ☐ No ☐

*I was assured that all data and the consent forms would be stored in a locked place.
Yes ☐ No ☐

*I was assured that the questionnaires would be destroyed after eight years.
Yes ☐ No ☐

*I also understand that if I have any further problems or questions I can contact at any time the below named researcher of the study.
Yes ☐ No ☐

Contact details
If you would like further information about the research, please contact:

Abir Abdel Rahman: 01-562108 / 03-515857 Or Habbouba Aoun: 01-562108/ ext 200

Signature of the researcher: **Signature of the participant:**

APPENDIX M2: Consent form of the participants in the quantitative study (Arabic form)

ملحق ت ٢

موافقة خطية

الباحث: عبير عبد الرحمن، جامعة البلمند، برنامج التغذية والبرامج اللاصفية، بالتعاون مع جامعة سالفورد، مانشستر، بريطانيا.

موافقة: **تاريخ:**

لقد قرأت كلّ المعلومات المتعلّقة بالدراسة وأوافق على المشاركة بالبحث:

☐ نعم ☐ كلا

أنا الموقع أدناه ..... والدة التلميذ / ة .....
أعطيت الفرصة للإستيضاح عن كلّ ما يتعلّق بأي تفصيل عن البحث وطريقة جمع المعلومات. وإني راضية عن كل الأجوبة المعطاة إليّ. إنني أعرف أن مشاركتي بهذا البحث هي طوعية وبإرادتي الكاملة وأستطيع أن أنسحب بأي وقتٍ دون أي عواقب علي أو على دراسة إبني / إبنتي... لقد أُكد إلي أن سوف يتم التعاطي بهذه المعلومات بسريةٍ كاملة ولقد وضح إلي أنّه إذا كان لدي أي سؤال، أستطيع أن أسأل البحث المذكور إسمه أعلاه دون أي تردد وبالوقت الحالي.

معلومات إضافية:

إذا أردت أي معلومة إضافية عن البحث الرّجاء الإتصال بـ:

عبير عبد الرحمن، ت: ٠١/٥٦٢١٠٨ – ٠٣/٥١٥٨٥٧

أو حبوبة عون، ت: ٠١/٥٦٢١٠٨ – مقسم ٢٠٠

إمضاء وتوقيع المشترك:

إمضاء الباحث:

٣

APPENDIX N1: Self administered questionnaire (English version)

A theory based exploration of the adding sugar behaviour in Lebanese public school children using the theory of planned behaviour

Parent No: ☐ ☐ ☐

Questionnaire for parents

Name of respondent ,Mrs:
_____

Area of
Residence:_____
_____

Tel no:
Landline:_____Cell:_____
_____

Date of Interview:____/____/2013

Hello, we are from the University of Balamand, and we are conducting a study regarding children's sugar habits and oral hygiene practices in Lebanese public schools. Please help us by answering the questions.

Kindly be assured that all information provided will be kept confidential.

Section I : Demographic Characteristics

1. What is your highest educational qualifications:

Primary	☐**1**		
Intermediate	☐ **2**	Secondary	☐**3**
Technical	☐**4**	University	☐**5**

2. What is your profession:

Employed	☐**1**		
Full time housewife	☐**2**	Self-employed	☐**3**
Unemployed	☐**4**	Retired	☐**5**

3. The monthly income of the family is:

Below 400 $	☐**1**	400$-600 $	☐**2**
700 $-900 $	☐**3**	No fixed income	☐**4**
There is no income at all			☐**5**

4. What is your religion as a mother?

Christian	☐**1**	Armenian	☐**2**
Duruz	☐**3**	Muslim Shiia	☐**4**
Muslim Sunni	☐**5**		
Others	☐**6** please specify:		

5. What is your age?

Under 20	☐**1**	20-30	☐**2**
31-40	☐**3**	Over 40	☐**4**

6. What is your marital status?

Married	☐**1**	Single	☐**2**
Divorce/Separated	☐**3**	Widowed	☐**4**

Section II: The next set of questions are general information about your child

7. How many children do you have?

One	☐**1**	Two	☐**2**
Three	☐**3**	Four	☐**4**
Five	☐**5**		
More than 5	☐ **6**	please specify----------	

8. What is the child's gender? (The one concerned in the age group)

Male ☐**1** Female ☐**2**

(If you have more than one child please choose the gender of the youngest one)

9. What is the child's age?

Three	☐**1**	Four	☐**2**
Five	☐**3**	Six	☐**4**

10. What is the child number?

First	☐**1**	second	☐**2**
Third	☐**3**	fourth	☐**4**
Five	☐**5**	More than 5	☐**6** please specify----------

---

11. Who looks after your child most of the time?

Myself	☐**1**	Spouse (husband/wife)	☐**2**
Grandparents	☐**3**	Childcare	☐**4**
Others	☐**5**	please specify: _	

12. Is your child lactose intolerance?

Yes ☐ No ☐

13. What is your child's approximate height and weight, please?

(Rough estimate is acceptable. Please ask for a rough estimate if respondent Is unable to remember)

…….. Ht in meters

…….. Wt .in Kilograms

☐**1** I have never taken my child height or weight

14. On a scale 1 to 5, where 1 is very short and 5 very tall, how would you rate your child's height compared to other children of his/her age?

Well below average (very small)	Below average	Average height (i.e. same as other children his/her age)	Above average	Well above average (very tall)
1	2	3	4	5

15. On a scale 1 to 5, where 1 underweight and 5 overweight, how would you rate your child's weight compared to other children of his/her age?

Well below average (underweight)	Below average	Average weight (i.e. same as other children his/her age)	Above average	Well above average (overweight)
1	2	3	4	5

***Section III**: The next sets of questions are about beverage intake type, frequency of intake and approximate amount that you offer to your child. Please tick one box on each line.*

16. If you sweeten your child's drinks, what do you add?

Sugar ☐**1** Honey ☐**2**
Water roses ☐**3** Never sweeten child's drink ☐**4**
Other ☐**5** Please specify……

17. Which drinks do you sweeten (You can tick more than one box)?

Milk ☐**1** Tea ☐**2**
Water ☐**3** Juice ☐**4**
Other: ☐**5** Please specify……

18. How often do you offer powder milk with sugar to your child? *Show i.e. NIDO*

1 time per week	☐**1**	2 to 3 times per week	☐**2**
4 to 6 times per week	☐**3**	1 time per day	☐**4**
2+ times per day	☐**5**		

Don't offer to them powder milk with sugar ☐**6** (if this is your choice, skip Q19 and Q20).

19. How much do you offer powdered milk with sugar for him each time? *Show then the cup*

Less than 1 cup	☐**1**	1 cup	☐**2**
1 and ½ cup	☐**3**	2 cups	☐**4**
More than 2 cups	☐**5**		

20. How much do you add sugar for each cup of powdered milk? *Show them the tsp*

Half tsp per cup	☐**1**	1 tsp per cup	☐**2**
1 and ½ tsp per cup	☐**3**	2 tsp per cup	☐**4**
2 and ½ tsp per cup	☐**5**		

21. How often do you offer fresh milk with sugar to your child? *Show i.e. CANDIA*

1 time per week	☐**1**	2 to 3 time per week	☐**2**
4 to 6 time per week	☐**3**	1 time per day	☐**4**
2+ time per day	☐**5**		

Don't offer to them fresh milk with sugar ☐6 (if this is your choice, skip Q22 andQ23)

22. How much do you offer fresh milk for him each time? *Show them the cup*

Less than 1 cup	☐**1**	1 cup	☐**2**
1 and ½ cups	☐**3**	2 cups	☐**4**
More than 2 cups	☐**5**		

23. How much do you add sugar for each cup of fresh milk? *Show them the tsp*

Half tsp per cup	☐**1**	1 tsp per cup	☐**2**
1 and ½ tsp per cup	☐**3**	2 tsp per cup	☐**4**
2 and ½ tsp per cup	☐**5**		

24. How often do you offer hot beverages (such as tea) with sugar to your child?

1 time per week	☐**1**	2 to 3 times per week	☐**2**

4 to 6 times per week	☐**3**	1 time per day	☐**4**
2+ times per day	☐**5**		

Don't offer to them hot beverages with sugar ☐**6** (if this is your choice, skip Q25 and Q26).

25.How much do you offer hot beverages with sugar for him each time? ***Show them the cup***

Less than 1 cup	☐**1**	1 cup	☐**2**
1 and ½ cups	☐**3**	2 cups	☐**4**
More than 2 cups	☐**5**		

26.How much do you add sugar per cup of hot beverages? ***Show them the tsp***

Half tsp per cup	☐**1**	1 tsp per cup	☐**2**
1 and ½ tsp per cup	☐**3**	2 tsp per cup	☐**4**
2 and ½ tsp per cup	☐**5**		

27. How often do you offer fresh juice (such as orange, lemonade) with sugar to your child?

1 time per week	☐**1**	2 to 3 times per week	☐**2**
4 to 6 times per week	☐**3**	1 time per day	☐**4**
2+ times per day	☐**5**		

Don't offer to them juice with sugar, ☐**6** (if this is your choice, skip Q28 and Q29).

28. How much do you offer juice with sugar for him each time? ***Show then the glass***

Less than 1 cup	☐**1**	1 cup	☐**2**
1 and ½ cups	☐**3**	2 cups	☐**4**
More than 2 cups	☐**5**		

29. How much do you add sugar per glass of juice? ***Show them the tsp***

Half tsp per cup	☐**1**	1 tsp per cup	☐**2**
1 and ½ tsp per cup	☐**3**	2 tsp per cup	☐**4**
2 and ½ tsp per cup	☐**5**		

30. How often does your child drink soft drinks containing sugar? (Including fizzy drinks, juices, etc; not diet type)

Every day	☐**1**	Most days	☐**2**
Once a week	☐**3**	occasionally	☐4
Never	☐5		

Section IV: Theory of Planned Behaviour /The questions that follow are about the attitude, intention, perceived behavioural control and subjective norms of ASB Behavior

Subjective Norm:

Instruction:

Please put a check mark (✓) in the box closest to your answer. For example if you completely disagree you need to put the ✓in the first box (from right to left), and if you strongly agree you need to put the ✓in the last box (from right to left).If your position is neutral, you add the ✓in the box in the middle.

31. Most family members who are important to me expected me to add sugar to my child's drinks:

Strongly Disagree								Strongly agree

32.I feel under social pressure from my family members to add sugar to my child's drink

Strongly Disagree								Strongly agree

33. Most Family members who are important to me think that I should add sugar to my child's drinks

Strongly Disagree								Strongly agree

34. Most friends who are important to me expected me to add sugar to my child's drinks

Strongly Disagree								Strongly agree

35. Most friends who are important think that I should add sugar to my child's drinks

Strongly Disagree								Strongly agree

36. I am under social pressure from my friends who are important to me to add sugar to my child's drink:

Strongly Disagree								Strongly agree

Attitude:

Please put a check mark (✓) in the space which is closest to your answer

37. For me adding sugar to my child drink is:

useful -_____:_____:_____:_____:_____:_____:____ useless

harmful _____:_____:_____:_____:_____:_____:____ beneficial

valuable _____:_____:_____:_____:_____:_____:____ Worthless

bad _____:_____:_____:_____:_____:_____:____ good

38. For me adding sugar to my child drink is:

Enjoyable _____:_____:_____:_____:_____:_____:____ unenjoyable

boring _____:_____:_____:_____:_____:_____:____ interesting

pleasant _____:_____:_____:_____:_____:_____:____ unpleasant

Intention:

39. I plan to stop adding sugar to my children's drinksin the coming three months

Strongly Disagree								Strongly agree

40.I will try to reduce the amount of sugar added to my children's drink in the coming three months

s

Strongly Disagree								Strongly agree

41.I intend to stop adding sugar to my children's drinks in the coming three months

Strongly Disagree								Strongly agree

42.I intend to reduce the amount of sugar added to my children's drinks in the coming three months

Strongly Disagree								Strongly agree

43.I will try to stop adding sugar to my children's drinks in the coming three months

Strongly Disagree								Strongly agree

44. My goal is to reduce the amount of sugar added to my children's drink in the coming three months:

Strongly Disagree								Strongly agree

45. I plan to reduce the amount of sugar added to my children's drinks in the coming three months:

Strongly Disagree								Strongly agree

Perceived behavioural control:

46. I feel able to give my child healthier alternatives to sugar sweetened beverages
(such as milk instead of sweetened milk) :

Extremely easy _____:_____:_____:_____:_____:_____:____Extremely difficult

47. I am confident that I can limit the number of times per day my child can have sweetened beverages (e.g sweetened milk -powder or fresh-,sweetened juice, or sweetened hot beverages):

Extremely _____:_____:_____:_____:_____:_____:____not at all confident
confident

48. For me to stop my child drinking sweetened drinks is beyond my control:

Extremely difficult _____:_____:_____:_____:_____:_____:____extremely easy

49. How confident are you that you can stop adding sugar to your child's drink:
Not at all _____:_____:_____:_____:_____:_____:____ extremely confident
confident

50. I can control how often my child drinks sweetened beverages

Strongly Disagree								Strongly agree

Automaticity:

51. Giving my child sweet drinks during the day is something I do without thinking:

Strongly Disagree								Strongly agree

52.Adding sugar to my child's drinks is something I start doing before I realize I 'm doing it:

Strongly Disagree								Strongly agree

53.Making sure that my child does not have sweet drinks at bed time is something I do automatically

Strongly Disagree								Strongly agree

We are thankful for your time, transparency and honesty. We hope the best for you and your families and always

APPENDIX N2: Self-administered questionnaire (Arabic version)

A theory based exploration of the adding sugar behaviour in Lebanese public school children using the theory of planned behaviour

رقم ملف الأهل

إستمـارة للأهل

إسم الشخص الذي يجاوب: .....

محلّ الإقامة: .....

رقم الهاتف الأرضي: ..... رقم الجوّال: .....

الشخص المسؤول عن ملء الإستمارة: .....

تاريخ ملء الإستمارة: .....

فريق البحث العلمي من جامعة البلمند، مؤسسة وجامعة أكاديمية يقوم
في الوقت الحاضر بدراسة ميدانية عن تناول المشروبات عند الأطفال وصحة الفم والأسنان في المدارس الرسمية في لبنان . نشكر مساعدتكم بالإجابة عن الأسئلة التالية.

ملاحظة: كلّ المعلومات الموجودة في هذه الإستمارة سوف تبقى طيّ الكتمان.

أ- معلومات ديموغرافية:

1- ما هو أعلى مستوى علمي توّصلت إليه:

1- ☐ ابتدائي
2- ☐ متوسطي
3- ☐ ثانوي
4- ☐ تقني
5- ☐ جامعي

2- ما هي مهنتك؟

1- ☐ وظيفة رسمية: .....
2- ☐ ربة منزل
3- ☐ عمل حر
4- ☐ لا أعمل
5- ☐ متقاعد

3- ما هو المدخول الشهري للعائلة؟

1- ☐ تحت 400$
2- ☐ بين 400$ و600$
3- ☐ ما بين 700$ و900$
4- ☐ لا يوجد مدخول محدد
5- ☐ لا يوجد مدخول محدد

4- ما هي ديانتك(طائفتك) كأم:

1- ☐ مسيحية
2- ☐ مسلمة سنية
3- ☐ درزية
4- ☐ مسلمة شيعية
5- ☐ أرمنية
6- ☐ غير ذلك: حدد .....

5- ما هو عمرك؟

1- ☐ ما دون 20 عام
2- ☐ بين 20 و30 عام
3- ☐ بين 31 و40 عام
4- ☐ أكثر من 40 عام

6- ما هو وضعك العائلي؟

1- ☐ متزوجة
2- ☐ مطلقة
3- ☐ أرملة
4- ☐ مفترقين

ب- الأسئلة التالية هي عن معلومات عامة عن الطفل المعني:

7- كم طفل لديك؟

1- ☐ واحد 2- ☐ اثنين

3- ☐ ثلاثة 4- ☐ أربعة

5- ☐ خمسة 6- ☐ أكثر من خمسة، حدّد .....

8- ما هو جنس الطفل المعني في هذا البحث؟(إذا كان لديك أكثر من طفل بين ثلاثة سنوات أو سبع سنوات الرجاء إعطاء المعلومات عن الأصغر سنا خلال ملئك للإستمارة)

1- ☐ ذكر 2- ☐ أنثى

9- ما هو عمر الطفل المعني؟

1- ☐ بين 3 سنوات و 4 سنوات 2- ☐ بين 4 سنوات و 5 سنوات

3- ☐ بين 5 سنوات و 6 سنوات 4- ☐ بين6 سنوات و 7 سنوات

10- ما هو ترتيب طفلك نسبة لبقية أطفالك؟

1- ☐ الأوّل 2- ☐ الثاني

3- ☐ الثالث 4- ☐ الرابع

5- ☐ الخامس 6- ☐ أكثر من خمسة، حدّد .....

11- من الذي يهتم بطفلك معظم الوقت؟

1- ☐ أنا نفسي 2- ☐ زوجي

3- ☐ جدّته / جدّه 4- ☐ مربية أطفال

5- ☐ غير ذلك، حدّد .....

12- هل طفلك المعني في هذه الإستمارة لا يتحمل الحليب؟

(عدّة أطفال يعانون من وجع في المعدّة، غازات، إسهال عندما يشربون الحليب لأنهم لا يستطيعون هضم السكر الموجود في الحليب).

1- ☐ نعم 2- ☐ كلا

إذا كان الجواب نعم الرجاء عدم الإجابة عن الأسئلة المتعلقة عن إتخاذ الحليب.

13- **ما هو طول و وزن طفلك التقريبي؟**

(أعطي من فضلك جواباً تقديرياً إذا لا كنت تستطيعين أن تتذكري بالضبط الجواب الأكيد).

طول في الأمتار : .....

وزن في الـ Kg : .....

1- ☐ لم آخذ أبدا طول طفلي أو وزنه.

14- **من معدّل 1 إلى 5، عندما 1 تعني قصير جداً و5 تعني طويل جداً، كيف تجدين طول ابنك بالنسبة إلى عمره؟**

تحت المعدل (قصير جداً)	تحت المعدل	متوسط الطول	أعلى من المعدل	أعلى من المعدل (طويل جداً)
1	2	3	4	5

15- **من معدّل 1 إلى 5، عندما 1 تعني ما دون الوزن بكثير و5 وزن زائد جدا، كيف تصف إبنك نسبة للأطفال من عمره؟**

تحت المعدل (ضعيف جداً)	تحت المعدل	متوسط الوزن	أعلى من المعدل	أعلى من المعدل (سمين جداً)
1	2	3	4	5

ت- **المجموعة التالية من الأسئلة هي عن نوع المشروب، عدد المرات التي يُتخذ فيها المشروب والكمية التقريبية التي تُعطى للطفل. الرجاء اختيار مربع واحد.**

16- **إذا كنت تحلين المشروب (أي مشروب على سبيل المثال حليب،شاي، عصير، ماء أو غيرذلك....) الذي تعطيه لطفلك، ماذا تضعين؟(يمكنك وضع عدة إحتمالات)**

1- ☐ سكر 2- ☐ عسل

3- ☐ ماء ورد 4- ☐ لا أحلّ أي مشروب أعطيه لطفلي

5- ☐ احتمال آخر، الرجاء التحديد: .....

إذا جوابك رقم 4 الرجاء عدم الإجابة عن السؤال رقم 17.

17- **ما هو المشروب الذي تحليه غالبا (الرجاء إختيار عدة مربعات إن آحتاج الأمر؟**

1- ☐ حليب 2- ☐ شاي

3- ☐ مياه الشرب 4- ☐ العصير الطبيعي

5- ☐ غير ذلك ،الرجاء التحديد: .....

18- **كم مرة تعطين لطفلك حليب ناشف مذوب مع ماء بالإضافة للسكر أو أي محلى آخر ؟ (نيدو على سبيل المثال)؟**

1- ☐ مرة في الأسبوع
2- ☐ 2 إلى 3 مرات في الأسبوع
3- ☐ 4 – 6 مرات في الأسبوع
4- ☐ مرة في اليوم
5- ☐ مرتين أو أكثر في اليوم
6- ☐ لا أعطِ طفلي حليب محلى أبدا (إذا كان هذا الجواب، الرجاء عدم الإجابة عن رقم 19 و20).

19-**في كل مرة يأخذ فيها طفلك الحليب ، كم كوب من الحليب الناشف المذوب بالماء مع سكر أو أي محلى آخر تعطين له؟(نيدو على سبيل المثال)**

1- ☐ أقلّ من كوب
2- ☐ كوب واحد
3- ☐ كوب ونصف الكوب
4- ☐ كوبين
5- ☐أكثر من كوبين

20- **عادة، كم ملعقة سكر أو أي محلى آخر تضعين لكلّ كوب من هذا الحليب؟(ملعقة الشاي العادية 5 ملل)**

1- ☐ نصف ملعقة للكوب الواحد
2- ☐ ملعقة للكوب الواحد
3- ☐ ملعقة ونصف للكوب الواحد
4- ☐ ملعقتين للكوب الواحد
5- ☐ ملعقتين أوأكثر للكوب الواحد

21- **كم مرة تعطين لطفلك حليب سائل بالإضافة للسكر أو أي محلى آخر ؟ (كانديا على سبيل المثال)؟**

1- ☐ مرة في الأسبوع
2- ☐ 2 إلى 3 مرات في الأسبوع
3- ☐ 4 – 6 مرات في الأسبوع
4- ☐ مرة في اليوم
5- ☐ مرتين أو أكثر في اليوم الواحد
6- ☐ لا أعطِ طفلي حليب سائل محلى أبدا (إذا كان هذا الجواب، الرجاء عدم الإجابة عن رقم 22 و23)

22- **في كل مرة يأخذ فيها طفلك الحليب السائل،كم كوب من الحليب السائل مع سكر أو أي محلى آخر تعطين له؟(كانديا على سبيل المثال)**

1- ☐ أقلّ من كوب
2- ☐ كوب واحد
3- ☐ كوب ونصف الكوب
4- ☐ كوبين
5- ☐أكثر من كوبين

23-عادة، كم ملعقة سكر أو أي محلى آخر تضعين لكلّ كوب من هذا الحليب؟(ملعقة الشاي العادية 5 ملل)

1- ☐ نصف ملعقة للكوب الواحد 2- ☐ ملعقة للكوب الواحد

3- ☐ ملعقة ونصف للكوب الواحد 4- ☐ ملعقتين للكوب الواحد

5- ☐ ملعقتين أوأكثرفي للكوب الواحد

24- كم مرة تعطين لطفلك شرابا ساخنا كالشاي مع سكر أو أي محلى آخر ؟ (قد يكون أي شرابا ساخنا)؟

1- ☐ مرة في الأسبوع 2- ☐ 2 إلى 3 مرات في الأسبوع

3- ☐ 4 – 6 مرات في الأسبوع 4- ☐ مرة في اليوم

5- ☐ مرتين أو أكثر في اليوم الواحد

6- ☐ لا أعطِ طفلي حليب سائل محلى أبدا (إذا كان هذا الجواب، الرجاء عدم الإجابة عن رقم 25 و26)

25- في كل مرة يأخذ فيها طفلك الشراب الساخن، كم كوب من الشراب الساخن بالإضافة للسكر أو أي محلى آخر تعطين له؟

1- ☐ أقلّ من كوب 2- ☐ كوب واحد

3- ☐ كوب ونصف الكوب 4- ☐ كوبين

5- ☐أكثر من كوبين

26- عادة، كم ملعقة سكر أو أي محلى آخر تضعين لكلّ كوب من هذا الشراب الساخن؟(ملعقة الشاي العادية 5 ملل)

1- ☐ نصف ملعقة للكوب الواحد 2- ☐ ملعقة للكوب الواحد

3- ☐ ملعقة ونصف للكوب الواحد 4- ☐ ملعقتين للكوب الواحد

5- ☐ ملعقتين أوأكثر للكوب الواحد

27-كم مرة تعطين لطفلك عصيرا مع سكر أو أي محلى آخر ؟(عصير ليمون،ليموناضة،عصير تفاح، عصير جزر على سبيل المثال)؟

1- ☐ مرة في الأسبوع 2- ☐ 2 إلى 3 مرات في الأسبوع

3- ☐ 4 – 6 مرات في الأسبوع 4- ☐ مرة في اليوم

5- ☐ مرتين أو أكثر في اليوم الواحد

6- ☐ لا أعطِ طفلي حليب سائل محلى أبدا (إذا كان هذا الجواب، الرجاء عدم الإجابة عن رقم 28 و29)

28- في كل مرة يأخذ فيها طفلك العصير الطازج، كم كوب من العصير مع سكر أو أي محلى آخر تعطين له؟

1- ☐ أقلّ من كوب 2- ☐ كوب واحد

3- ☐ كوب ونصف الكوب 4- ☐ كوبين

5- ☐أكثر من كوبين

29- عادة، كم ملعقة سكر أو أي محلى آخر تضعين لكلّ كوب من العصير المحضر في المنزل؟(ملعقة الشاي العادية 5 ملل)

1- ☐ نصف ملعقة للكوب الواحد 2- ☐ ملعقة للكوب الواحد

3- ☐ ملعقة ونصف للكوب الواحد 4- ☐ ملعقتين للكوب الواحد

5- ☐ ملعقتين أوأكثر للكوب الواحد

30- كم مرة يشرب طفلك شراب غازي يحتوي على سكر؟ (البيبسي، الميرندا.أو ما شابه.. كلّ الأنواع التي ليست Diet).

1-☐ كل يوم 2- ☐ معظم الأيام

3-☐ مرة في الأسبوع 4- ☐ في المناسبات

5-☐ أبدا

ث- المجموعة الآتية من الأسئلة هي عن عادة إضافة السكر للمشروبات:

31- معظم أفراد عائلتي المهمين بالنسبة إلي يدعمون فكرة إضافة سكر لمشروب طفلي:

أرفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

32- معظم أفراد عائلتي المهمين بالنسبة إلي هم يشجعونني عندما أضيف سكر لمشروب طفلي:

أرفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

33- معظم أفراد عائلتي المهمين بالنسبة إليّ يعتقدون أنه يجب أن أضيف سكر للمشروبات المعطاة لطفلي:

رفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

34- معظم أصدقائي المهمين بالنسبة إليّ يعتقدون أنه يجب أن أضيف سكر للمشروبات المعطاة لطفلي:

رفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

35-معظم أصدقائي المهمين بالنسبة إلي يشجعونني على إضافة سكر للمشروب المعطى لطفلي:

أرفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

36- معظم الأصدقاء المهمين بالنسبة إلي يدعمون فكرة إضافة سكر لمشروب طفلي:

رفض بشدّة----:----:----:----:----:----:---- أوافق بشدّة

37- بالنسبة إليّ: إضافة سكر لحليب طفلي هو:

عادة مفيدة ----:----:----:----:----:----:---- عادة غير مفيد

عادة مؤذية ----:----:----:----:----:----:---- عادة لها حسنات

عادة حكيمة ----:----:----:----:----:----:---- عادة متهورة

عادة سيئة ----:----:----:----:----:----:----عادة جيدة

38- بالنسبة إليّ إضافة السكر لمشروب طفلي

عادة ممتعة----:----:----:----:----:----:---- عادة غير ممتعة أبداً

عادة مملة ----:----:----:----:----:----:---- عادة مَحمسةٍ

عادة تسرني----:----:----:----:----:----:---- عادة لا يسرّني

عادة لها حسنات----:----:----:----:----:----:---- عادة مريحة

39-إنني أخطط لأتوقف عن عادة إضافة سكر للمشروبات المعطاة لطفلي:

أرفض بشدّة----:----:----:----:----:----:---- أوافق بشدّة

40-إنني أحاول أن أقلل كمية السكر المضافة إلى المشروبات المعطاة لطفلي:

أرفض بشدّة----:----:----:----:----:----:---- أوافق بشدّة

41- إنني أنوي التوقف عن عادة إضافة سكر للمشروبات المعطاة لطفلي:

رفض بشدّة----:----:----:----:----:----:---- أوافق بشدّة

42- إنني أنوي أن أقلل كمية السكر المضافة إلى المشروبات المعطاة لطفلي:

رفض بشدّة----:----:----:----:----:----:---- أوافق بشدّة

43- إنني أحاول التوقف عن إضافة سكر للمشروبات المعطاة لطفلي:

رفض بشدّة----:----:----:----:----:----:---- أوافق بشدّة

44- هدفي هو أن أتوّصل إلى مرحلة أستطيع فيها تقليل كمية السكر المضافة إلى المشروبات المعطاة لطفلي

رفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

45- إنني أخطط أن أقلل كمية السكر المضافة إلى المشروبات المعطاة لطفلي:

رفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

46-أشعر أن بآستطاعتي تقديم خيارات صحية أكثر لطفلي كتقديم له مشروبات غير محلاة على سبيل المثال: الحليب من دون إضافة سكر أو محلي.

سهل جداً ----:----:----:----:----:----:----:---- صعب جداً

47- إنني واثقة أنّه بوسعي أنّ أحصر عدد المرات التي يشرب فيها طفلي مشروب محلّى: حليب محلّى(بودرة أو سائل)، أو عصير محلّى، أو مشروبات ساخنة بالإضافة إلى سكر...).

واثقة جداً ----:----:----:----:----:----:----:---- غير واثقة

48-بالنسبة إليّ التوقف عن تقديم المشروب المحلّى لطفلي هو :

صعب جداً----:----:----:----:----:----:----:---- سهل جداً

49- كم أنت واثقة أنه باستطاعتك التوقف عن عادة إضافة سكر للمشروبات المعطاة لطفلك:

غير واثقة ابداً----:----:----:----:----:----:----:----واثقة جداً

50- أستطيع السيطرة على عدد المرات التي أعطي فيها طفلي مشروبات محلاة:

أرفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

51-إضافة سكر لمشروب طفلي (أي مشروب كان)، هي عادة بدأت أن أقوم بها دون أن ألحظ أنني أقوم بها
أرفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

52-التقديم لطفلي أي مشروب محلّى خلال النهار، شيء أفعله دون أن أفكر به

53- التأكد من أنّ طفلي لن يأخذ أي مشروب محلّى في وقت النوم شيء أفعله بطريقة أتوماتيكية
:
أرفض بشدّة----:----:----:----:----:----:----:---- أوافق بشدّة

Appendix O: Examples of a teaspoon used to add sugar, a cup for milk , or juices and a cup for teas (these photos were shwon to participants during the collection of data using the self administered questionnaire)

Appendix P: Ethical approval from the University of Salford (Quantitative study)

University of Salford MANCHESTER

Research, Innovation and Academic Engagement Ethical Approval Panel

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22 March 2013

Dear Abir,

RE: ETHICS APPLICATION HSCR12/91 – Exploring the 'Adding Sugar Behaviour' and the oral hygiene practices among the primary caregivers of Lebanese children in public schools using the Theory of Planned Behaviour

Following your responses to the Panel's queries, based on the information you provided, I am pleased to inform you that application HSCR12/91 has now been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible.

Yours sincerely,

Rachel Shuttleworth

Rachel Shuttleworth
College Support Officer (R&I)

Appendix Q: Explaining the differentials in the ASB behaviour score (Time 2)

Variables	M	SD	Sum of squares	df	F	P
Education			0.33	2	0.13	0.87
Intermediate and below	1.11	1.41				
Secondary or technology	0.86	1.23				
University or above	0.86	0.98				
Employment status			0.50	1	0.40	0.52
Employed	0.85	1.04				
Housewives	1.00	1.34				
Age of the mother			0.49	2	0.19	0.82
<30 yrs.	1.23	1.68				
bt 30 & 40	0.89	1.07				
>40 yrs.	0.73	0.74				
Religion of the mother			0.39	3	0.13	0.95
Christian	0.88	1.48				
Sunni	0.99	0.97				
Druze	1.05	1.08				
Shia	0.92	0.98				
Number of children			1.18	2	0.48	0.62
Two children or less	0.84	0.80				
bt 3 and 4	1.05	1.60				
more than 4	1.21	1.21				
Child order			1.44	2	0.59	0.55
First or second	0.97	1.42				
Third or fourth	1.00	1.19				
Fifth or above	0.87	0.75				
Family income			0.90	3	0.23	0.86
<600$	1.07	1.50				
bt 600 && 900&	1.03	1.51				
above 900$	0.58	0.74				
No fixed income	0.96	0.86				
Child gender			0.01	1	0.01	0.90
Male	0.97	1.22				
Female	0.99	1.37				
Age of the child			2.50	3	0.66	0.57
bt 3 & 4	0.79	1.06				
bt 4 & 5	1.09	1.44				
bt 5 & 6	1.00	0.88				
bt 6& 7	1.00	1.76				
Perception of Child Height			1.19	2	0.48	0.61
Below average	1.07	1.38				
Average	1.06	1.46				
Above average	0.80	0.75				
Perception of child weight			1..44	2	0.58	0.55
Below average weight	0.91	1.07				
Average weight	0.92	1.09				
Above weight	1.68	2.46				

APPENDIX R: Full search strategies for the electronic databases

ASSIA	
Interface:	
Database:	ASSIA
Date of Search:	1987 to December 2013
Study Types:	Randomized Controlled trials
Limits:	None

Search Strategy: search terms (number of results)

((((((SU.EXACT("Drinks") OR SU.EXACT("Carbonated beverages")) OR (SU.EXACT("Fruit punch") OR SU.EXACT("Coffee") OR SU.EXACT("Carbonated beverages"))) AND la.exact("English")) AND la.exact("English")) AND la.exact("English")) AND ((((SU.EXACT("Children") OR child OR (SU.EXACT("Children") OR SU.EXACT("Adolescents")) OR (teenager OR teenage) OR SU.EXACT("Students") OR "school aged children") AND la.exact("English")) AND la.exact("English")) AND la.exact("English"))) AND stype.exact("Scholarly Journals")

Records Retrieved: 1417

CINAHL	
Interface:	
Database:	CINAHL
Date of Search:	1960 to December 2013
Study Types:	Randomized Controlled trials
Limits:	None

Search Strategy: search terms (number of results)

S29 S7 AND S22 AND S28
S28 S23 OR S24 OR S25 OR S26 OR S27
S27 (MH "Early Intervention") OR "intervention*" OR (MH "Early Childhood Intervention")
S26 (MH "Health Education") OR "health education"
S25 (MH "Behavior, Addictive") OR (MH "Behavioral Changes") OR (MH "Health Behavior") OR (MH "Habits") OR (MH "Eating Behavior+")
S24 "behavio?r*modification*" OR (MH "Behavior Modification")
S23 (MH "Behavior") OR "behavio?r*intervention*"
S22 S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S15 OR S17 OR S18 OR S19 OR S20 OR S21
S21 "juice*"
S20 "beverage*"
S19 "sugar-sweetened beverage*"
S18 "sugar sweetened beverage*"
S17 "sweetened beverage*"
S16 ""sweetened juice*""
S15 (MH "Fruit Juices")
S14 ""sweetened drink*""
S13 "fizzy drink*"
S12 "carbonated drink*"
S11 "sugary drink*"
S10 "Soda Pop*"
S9 "soft drink*"
S8 (MH "Carbonated Beverages")

S7	S1 OR S2 OR S3 OR S4 OR S5 OR S6
S6	"school aged child*"
S5	"teen*" OR (MH "Adolescent Fathers") OR (MH "Adolescent Mothers")
S4	"youth*"
S3	(MH "Students, Elementary")
S2	(MH "Adolescence+")
S1	(MH "Child, Preschool") OR "Child*" OR (MH "Child Behavior+")

Records Retrieved: 867

COCHRANE LIBRARY

Interface:	
Database:	Cochrane Library (CENTRAL)
Date of Search:	1988 to November 2013
Study Types:	Randomized Controlled trials
Limits:	None

Search Strategy: search terms (number of results)

#1	"Child":ti,ab,kw in Trials
#2	"adolescent":ti,ab,kw in Trials
#3	"student":ti,ab,kw in Trials
#4	"teenager":ti,ab,kw in Trials
#5	"youth":ti,ab,kw in Trials
#6	"school age":ti,ab,kw in Trials
#7	"carbonated beverage":ti,ab,kw in Trials
#8	"soda":ti,ab,kw in Trials
#9	"soda pop":ti,ab,kw in Trials
#10	"fruit juice":ti,ab,kw in Trials
#11	"beverage":ti,ab,kw in Trials
#12	juice:ti,ab,kw in Trials
#13	"behavior modification":ti,ab,kw in Trials
#14	"behavior change theory":ti,ab,kw in Trials
#15	"behavioral change":ti,ab,kw in Trials
#16	"intervention":ti,ab,kw in Trials
#17	health education*:ti,ab,kw in Trials
#18	carbonated* drink*:ti,ab,kw in Trials
#19	sugary drink*:ti,ab,kw in Trials
#20	sweetened* drink*:ti,ab,kw in Trials
#21	fruit drink*:ti,ab,kw in Trials
#22	sweetened* juice*:ti,ab,kw in Trials
#23	sweetened* beverage*:ti,ab,kw in Trials
#24	dietary* intervention*:ti,ab,kw in Trials
#25	nutrition* education* intervention*:ti,ab,kw in Trials
#26	behavior* intervention*:ti,ab,kw in Trials
#27	behaviour* intervention*:ti,ab,kw in Trials
#28	school* aged* children*:ti,ab,kw in Trials
#29	#1 or #2 or #3 or #4 or #5 or #6 or #28
#30	#7 or #8 or #9 or #10 or #11 or #12 or #18 or #19 or 20 or #21 or #22 or #23
#31	#13 or #14 or #15 or #16 or #17 or #24 or #25 or #26 or #27
#32	#29 and #30 and #31

Records Retrieved: 2931

EMBASE	
Interface:	
Database:	Embase
Date of Search:	1947 to October 2013
Study Types:	Randomized Controlled trials
Limits:	None

Search Strategy: search terms (number of results)

#1	child health/ or child*.mp. or child behavior/ or child nutrition/
#2	adolescent behavior/ or adolescent health/ or adolescent*.mp.
#3	student*.mp.
#4	teenager*.mp.
#5	youth*.mp.
#6	teen*.mp.
#7	school aged child*.mp.
#8	carbonated beverage*.mp.
#9	soft drink*.mp.
#10	soda pop*.mp.
#11	sugary drink*.mp. or sugar intake/
#12	carbonated drink*.mp.
#13	fizzy drink*.mp.
#14	sweetened drink*.mp.
#15	fruit drink*.mp.
#16	fruit juice*.mp.
#17	sweetened juice*.mp.
#18	sugar sweetened beverage*.mp.
#19	sugar-sweetened beverage*.mp.
#20	beverage*.mp.
#21	juice*.mp.
#22	sweetened beverage*.mp.
#23	health behavior/ or behavio?r* intervention*.mp.
#24	behavior/ or behavio?r* modification*.mp.
#25	behaviour* change*.mp.
#26	intervention*.mp. or intervention study/ or early intervention/
#27	health education.mp.
#28	1 or 2 or 3 or 4 or 5 or 6 or 7
#29	8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
#30	23 or 24 or 25 or 26 or 27
#31	28 and 29 and 30

Records Retrieved: 1803

MEDLINE

Interface:	Ovid
Database:	MEDLINE
Date of Search:	1947 to October 2013
Study Types:	Randomized Controlled trials
Limits:	None

Search Strategy: search terms (number of results)

#1	child health/ or child*.mp. or child behavior/ or child nutrition/
#2	adolescent behavior/ or adolescent health/ or adolescent*.mp.
#3	student*.mp.
#4	teenager*.mp.
#5	youth*.mp.
#6	teen*.mp.
#7	school aged child*.mp.
#8	carbonated beverage*.mp.
#9	soft drink*.mp.
#10	soda pop*.mp.
#11	sugary drink*.mp. or sugar intake/
#12	carbonated drink*.mp.
#13	fizzy drink*.mp.
#14	sweetened drink*.mp.
#15	fruit drink*.mp.
#16	fruit juice*.mp.
#17	sweetened juice*.mp.
#18	sugar sweetened beverage*.mp.
#19	sugar-sweetened beverage*.mp.
#20	beverage*.mp.
#21	juice*.mp.
#22	sweetened beverage*.mp.
#23	health behavior/ or behavio?r* intervention*.mp.
#24	behavior/ or behavio?r* modification*.mp.
#25	behaviour* change*.mp.
#26	intervention*.mp. or intervention study/ or early intervention/
#27	health education.mp.
#28	1 or 2 or 3 or 4 or 5 or 6 or 7
#29	8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
#30	23 or 24 or 25 or 26 or 27
#31	28 and 29 and 30
#32	remove duplicates from 31
#33	instruct*.mp.
#34	advise*.mp.
#35	advice*.mp.
#36	train*.mp.
#37	educat*.mp.
#38	teach*.mp.
#39	33 or 34 or 35 or 36 or 37 or 38
#40	30 or 39
#41	28 and 29 and 40

Records Retrieved: 1419

PSYCHINFO	
Interface:	
Database:	PSYCHINFO
Date of Search:	1967 to October 2013
Study Types:	Randomized Controlled trials
Limits:	None

Search Strategy: search terms (number of results)

S17	S12 AND S13 AND S16
S16	S14 OR S15
S15	TX sugar sweetened beverage* OR TX sugar-sweetened beverage* OR TX beverage* OR TX juice*
S14	TX carbonated beverage* OR TX soft drink* OR TX Soda Pop* OR TX sugary drink* OR TX carbonated drink* OR TX fizzy drink* OR TX sweetened drink* OR TX fruit drink* OR TX fruit juice* OR sweetened juice* OR sweetened beverage*
S13	SU child* OR SU adolescent* OR SU student* OR SU Teen* OR Youth* OR school aged child*
S12	(TX behaviour*intervention* OR TX behavior*intervention* OR TX behaviour*modification* OR TX behavior*modification* OR TX behaviour*change* OR TX behavior*change* OR TX intervention* OR TX health education*) AND (S7 AND S10 AND S11)
S11	TX behaviour*intervention* OR TX behavior*intervention* OR TX behaviour*modification* OR TX behavior*modification* OR TX behaviour*change* OR TX behavior*change* OR TX intervention* OR TX health education*
S10	S8 OR S9
S9	KW sugar sweetened beverage* OR KW sugar-sweetened beverage* OR KW beverage* OR KW juice*
S8	KW Carbonated beverage* OR KW soft drink* OR KW soda pop* OR KW sugary drink* OR KW carbonated drink* OR KW fizzy drink* OR KW sweetened drink* OR KW fruit drink* OR KW fruit juice* OR KW sweetened juice* OR KW sweetened beverage*
S7	KW child* OR KW adolescent* OR KW student* OR KW teen* OR KW youth* OR school aged child*
S6	S1 AND S4 AND S5
S5	S2 OR S3
S4	behaviour*intention* OR behavior*intention* OR behaviour*modification* OR behavior*modification* OR behaviour*change* OR behavior*change* OR intervention* OR health education
S3	sweetened beverage* OR sugar sweetened beverage* OR sugar-sweetened beverage* OR beverage* OR juice*
S2	carbonated beverage* OR soft drink* OR soda pop* OR sugary drink* OR carbonated drink* OR fizzy drink* OR sweetened drink* OR fruit drink* OR fruit juice* OR sweetened juice*
S1	child* OR adolescent* OR student* OR youth* OR teen* OR school aged

Records Retrieved: 551

MEDLINE	
Interface:	Pubmed
Database:	MEDLINE
Date of Search:	1947 to October 2013
Study Types:	Randomized Controlled trials
Limits:	None
Search Strategy: search terms (number of results)	
(((((((((behaviour*intervention*) OR behavior*intervention*) OR behaviour*modification*) OR behavior*modification*) OR behaviour*change*) OR behavior*change*) OR Health education)) OR ("Early Intervention (Education)"[Mesh] OR "Intervention Studies"[Mesh] OR intervention*)) AND ((((("Child"[Mesh] OR "Child, Preschool"[Mesh]) OR ("Adolescent"[Mesh] OR "Adolescent Behavior"[Mesh])))) OR ((((student*) OR youth*) OR teen*) OR school aged child*)) AND ((((("Carbonated Beverages"[Mesh] OR Beverage, Carbonated OR Beverages, Carbonated OR Carbonated Beverage OR Carbonated Drinks OR Carbonated Drink OR Drink, Carbonated OR Drinks, Carbonated OR Soft Drinks OR Drink, Soft OR Drinks, Soft OR Soft Drink OR Soda Pop OR Pop, Soda OR Pops, Soda OR Soda Pops)) OR (((((((((fizzy drink*) OR sweetened drink*) OR fruit drink*) OR fruit juice*) OR sweetened juice*) OR sweetened beverage*) OR sugar sweetened beverage*) OR sugar-sweetened beverage*) OR beverage*)) OR ((sugary drink*) OR juice*)) #41 28 and 29 and 40	
Records Retrieved: 1314	

Web of Science	
Interface:	
Database:	Web of Science
Date of Search:	1900 to November 2013
Study Types:	Randomized Controlled trials
Limits:	None
Search Strategy: search terms (number of results)	
#6 #5 AND #4 AND #3 #5 TS=("behavior* intervention" OR behaviour* intervention* OR intervention OR behavior* modification* OR behaviour modification* OR "behavior change" OR "behaviour change" OR "health education" OR "health change") #4 (TS=(beverage* OR "carbonated beverage" OR "soft drink" OR "Soda pop" OR "sugary drink" OR "carbonated drink" OR "fizzy drink" OR "sweetened drink" OR seetened drink* OR "fruit drink" OR "fruit juice" OR "sweetened juice" OR "sweetened beverage" oR "sugar-sweetened beverage" OR Juice*)) AND Language=(English) AND Document Types=(Article) #3 (TS = (child* OR adol* oR student* OR teen* OR youth OR "school aged child")) AND Language=(English) AND Document Types=(Article) #2 Topic=(child*) OR Topic=(adol*) OR Topic=(teen*) OR Topic=(youth*) OR Topic=(student*) AND Topic=("school aged child") Refined by: Document Types=(ARTICLE) #1 Topic=(child*) OR Topic=(adol*) OR Topic=(teen*) OR Topic=(youth*) OR Topic=(student*) AND Topic=("school aged child")	
Records Retrieved: 691	

Summary of Searches:

Total No. Retrieved: 10953
ASSIA: 1417 CINAHL: 867 Cochrane Library: 2931 EMBASE: 1803 MEDLINE (OVID): 1419 MEDLINE (pubmed): 1314 PsycINFO: 511 Web of Science: 691
Duplicates: 4090
No. Total without duplicates**:** 6863
Screening (Title and Abstract Review)
No. Excluded: 6790
Included for Full Text review: 73
Selection (Full Text Review)
No. Excluded: 58
Reasons for exclusions: full texts not identified, outcomes not published, design or population, or intervention not of interest. Language not in English

APPENDIX S: Full-text screening form

Title	
First Author	
Year	
Screener Initials	

1. Is study design*: Randomized controlled trials?*
   - ☐ No → Exclude
   - ☐ Yes → go to the next question

2. Is study population: children or/ & adolescent *(at least as a subgroup)?*
   - ☐ No → **Exclude**
   - ☐ Yes → go to the next question

3. Is intervention: behavioral or educational intervention targeting SSBs consumption?
   - ☐ No → Exclude
   - ☐ Yes → go to the next question

Reason for exclusion (please check):

- ☐ Design not RCTs
- ☐ Population not children or/ & adolescent
- ☐ Intervention behavioral or educational intervention targeting SSBs consumption

APPENDIX T: Data Extracted from included studies

First author (year) Country Source of funding	Participants	Intervention	Setting Length of intervention Timing of follow up	Main outcome: Change In SSB consumption	Other related health outcomes	Overall conclusion
1-Albala 2008 Chile Funded by Fogarty international Center, NIH	98 children aged 8-10 yrs (52 boys & 46 girls) Evaluated: N=92 Intervention= N 47 Control= N=45	- A nutrionist delivered milk at home and they provide 1 serving /d for each sibling in the household. -Provision of educational instructions to the family about consuming the delivered beverages-Encouragement ofparents to remove SSBs from home	Home based 4 months intervention Measurement at the end of the intervention	The intake of SSB decreased by a mean of -711.0 +/- 37.7 g/d for the intervention group and increase by 71.9+/- 33.6 g/d among the control group. The intake of milk increased by a mean of 450 g/d for the intervention group and didn't change for the control.	Lean body mass was greater in the intervention group (0.92+/- 0.1 kg) than in the control group (0.62 +/- 0.11 kg)	The change in beverage consumption didn't significantly affect fat mass but increased the accretion of lean mass, showed by linear growth for boys but not for girls
2-Bayer 2009 Germany Funded by:Bavarian Ministry of Environment, Health and Consumer protection and the charitable Stiftung Kindergesundheit.	Children aged 3 -6 years After 6 months Intervention= 1049 Control= 560 After 18 months	Educational intervention Including the following components:: -Physical activity -Modifying habits of foods and drinks -CD with songs	School based intervention 18 months intervention Measurements were taken after 6	After 6 months: 60.4% of intervention group and 47.7 % of control reported low consumption of high caloric drinks (p<0.0001)	Prevalence of overweight and obesity was not statistically significant between intervention and control	This intervention had an effect on fruit and vegetable consumption. The effect on the intake of energy rich drinks was seen in the

	Intervention = 1040 Control= 565 Evaluated After 6 months Intervention= 850 (838 with BMI measures) Control= 468 (466 with BMI measures) After 18 months Intervention= 872 (866 with BMI measures) After 18 months Control= 468 (463 with BMI measures)	-Tippcards providing simple messages -Internet platform with supporting information	months and after 18 months	After 18 months, the low consumption of high caloric drinks increased among intervention and control groups		lower parental education sample. A trend of less overweigh and obesity in the intervention group
3-Beech 2003 Memphis Tenesse Funded by National Heart Lung and Blood institute	60 American girls aged 8-10 years Parent targeted intervention: 21 girls. Child targeted intervention: 21 girls Control group: 18 girls	Intervention focusing on Physical activity and nutrition. The active intervention focused on increase water and reduces SSBs. It includes messages to decrease SSBs and increase Low sugar drinks.	Community based and schools 12 weeks intervention	The two active intervention groups when averaged showed a 34.1% decrease in servings/d for the intervention group versus the comparison group. . The results showed significance on the effect of serving of sugar sweetened beverages (mean difference =1.57 SE (0.40) and p=0.03	The change in BMI was not considered because 12 weeks is a very short period	Intervention showed showed a decrease on servings/day for the intake of SSBs. Intervention too short for the BMI In the comparion group, the unhealthy behaviour was common among girls. Despite the short duration, the direction of both interventions was encouraging

4-Bjelland 2011 Oslo Norway Funded by Norwegian Research council	2165 children aged 11 years Intervention=553 control =975 After 8 months midway assessment: Intervention: 542 Control: 970 .	Educational and environmental strategies It included: Lessons with student booklet, posters, weekly FV , sports equipment for recess hrs One of the lesson included in the booklet was ab out Sugar rich beverages.	HEIA study School based 16 months	Mid way assessment after 8 months: SSBs were assessed by frequency and amount in dl/d for weekends and weekdays. No significant difference between intervention and control for weekdays. SSB was lower among girls in the intervention vs control(mean 2.1 dl/dvs 1.9 dl/d p=0.04) for weekends.	Not reported	The intervention worked better for girls than boys, subgroup analysis was very important.
5- Cunha 2013 Barzil,Duque do Caxias, Rio de Janeiro Funded by the foundation of support of research of the state of Rio de Janeiro	574 children mean age 11 years Intervention = 293 Control = 281 Evaluated: Intervention=277 Control = 282	It focused on encouraging students to change their eating habits 1 hr monthly session including games , theater sketches, watching movies, puppet shows and writing	School based 9 months	Significant decrease in consumption of sodas (p=0.02) in the intervention (-0.2 , 95% CI : -0.30 to -0.11) vs control (-0.08 , 95% CI: -0.18 to 0.2). Not significant	No statistical difference between intervention and control groups for BMI.	Healthy eating was encouraged in addition to the reduction in the intake of SSBs, replacement of SSBs with sugar-containig juices , that lead to a decrease in SSBs

		and drawing contests		decrease in juices p= 0.66		intake but not in BMI
6-Ezendam 2012 Netherlands Funded:Not stated	883 children aged between 12 and 13 years Intervention = 485 Control = 398	Internet based intervention. Teachers were given 15 minutes to explain the 8 lessons over the 10 weeks.	School based 10 weeks At 4months, and 24 months	In the intervention group, there is lower odds (0.54) of taking >400 ml /day of SSB at 4 months The effect of the intervention disappears and no significance at 24 month follow -up	There is no difference in BMI at 4 months and 12 months those who are at a higher risk showed a difference in BMI change of 1.5 in the intervention vs 3.7 in the control	The effect on SSB was only for short term but concerning BMI the effect was only significant on children who were at higher risk at baseline
7-Grieken (2013, 2014) Netherlands Funded by a grant from the major funding body ZonMw	5 years Baseline:637 intervention n=349 control n=288 **(**2013): Intervention: N=BMI 277, WC N=262 Control: N=BMI=230,WC N=222 (2014):Intervention:N= 154 Control N= 140	Three counseling sessions Three additional counseling sessions are offered to parents with intervals of 1,3 and 6 months One of the behaviours is limiting the drinking of SSB to not more than 2 glasses per day	Home based 6 months 2 years follow up	(2014 report):Higher % of children was drinking less than 2 glass per day (an increase from 32% at baseline to 55% at follow up in the intervention and from 33.3% to 47.9% in the control group.) Difference between intervention and control was not significant	(2013 report): No change in BMI bt intervention and control Intervention (19.53, SD :1.72) and control (19.55, SD: 1.74).	Intervention didn't make any changes in the health behaviour
8-Haerens 2007 Belgium Funded by Flemish	2991 children: 11-15 years and mean	The intervention included a school	School based	No significant intervention effects	Not reported	Intervention had effect on fat-

government and supported by the Policy Research Centre Sport , Physical activity.	age 13.2 Intervention with parental support= 1226 intervention alone = 1006 Control = 759 Evaluated: 2840 children	and a home component focused on 3 behavioural interventions and support with environmental intervention Increase FV Decrease soft drink and increase water Environmental : increase availability of healthy food choices and water and decrease the availability of soft drinks	1 year	were found for SSB consumption among boys or girls at the end of the academic year (after 9 months).		related outcomes among girls with parental support. No effect for soft drinks and water neither in boys nor in girls. Parental support and environmental support are added value to personalized interventions.
9-James (2004,2007) England /Southwest Funded by the scholarship from the Florence Nightingale	644 children aged between 7-11 years, mean age 9 years Intervention=325 control=319 Evaluated: Intervention At baseline N= 361 At 12 months N= 295	Intervention focused on: 1 hr session for each term Teachers reiterate the message Promoting of drinking water, and tasting FV an in addition to giving each class a tooth immersed in carbonated	School based 1 school year intervention Follow up at 36 months	At 12 months the consumption of all carbonated beverages decreased in the intervention compared to the control groups (mean difference =0.7 95% CI =0.1 to1.3 and it increases in the Control group. Concerning	At 12 months there was no significant change in the difference in BMI. At 12 months the mean percentage of overweight students increased in the control by 7.5% with a decrease in the intervention.0.2%	A small reduction in the intake of carbonated drinks related with a reduction in the number of overweight and obese children at 12 months but this modest effect disappears after 36 months and not maintained

	Control:At Baseline N=304 At 12months N=279	beverages to see the bad effects of these drinks		carbonated drinks with sugar no significant reduction At 36 months Due to time limitation no measurement on the intake of SSB	At 36 months Change in BMI from baseline between intervention and control was not statistically significant No difference in the prevalence of overweight and obesity between intervention and control groups	
10-Muckelbauer (2009) Germany Funded by : German Federal Ministry of Food, Agriculture, and Consumer Protection	3190 children with mean age of 8.27 years Evaluated Intervention = 1641 Control = 1309	It included educational and environmental components. Water fountains were installed in intervention schools. Four 45-minute classroom lessons dealing with the water needs of the body and the water circuit in nature.	School based 12 months	No significant effect for juice consumption (0.1 glasses per day , CI: 0.2 to 0.1 glasses per day, P = 0.5). No intervention effect on soft drink consumption was observed (P = .406).	Reduction in overweight intervention schools compared to control schools OR = 0. 69 (0.48–0.98). Change in BMI SDS did not differ between groups .	Intervention with educational and environmental was effective in the prevention of overweight and obesity among deprived and low social classes population
11-Roasario 2013 Portugal Funded by: the Fundação	464 children aged between 6-12	Educational intervention in two parts: training	School based 6 months	The intervention had no effect on SSBs (p=0.79)		Children who received the intervention

para a Ciência e Tecnologia (FCT)	years Evaluated: 294 participants: (intervention=151) (Control=143)	delivered to teacher and education intervention delivered to children promoting healthy diet and active liefstyle Teachers of the intervention attended 12 sessions and 3 hrs session during 6 months.		consumption before and after the intervention. controlling for confounders,there was an increase in SSB after adjustment OR=1.66		showed a reduction in LNED foods and beverages. And the intervention had no effect on SSBs. The intervention delivered by teachers is effective in addressing the LNED food and drinks.
12-Rosenkranz 2010 Kansas State Funded by Sunflower Foundation: Health Care for Kansas	Children aged between 9-13 years Intervention = 34 girls Control = 42 girls Evaluated: Intervention = 33 girls Control = 39 girls	Educational intervention with environmental component and involvement of parents by sending assignments with girls to be done at home It was delivered by troop leaders One of the targeted behaviors was encouraging drinking water instead of SSB at mealtime	Community based 5 months	No significant effect on the intake of SSB .	No significant effect on BMI for girls (p=0.54) or parents (p=0.26)	Troops in the intervention group provided adherence with healthy eating more than troops in control groups. The intervention was not efficient and no evidence was shown for BMI , habitual PA , FV intake eating with TV and SSB consumption
13-Sichieri (2008)						

Brazil Funded by Brazilian National Research Council	1140 children aged 9-12 years Intervention = 526 Control = 608 Evaluated: Intervention = 434 Control = 493	Educational program (10x1 hr session) emphasizing on simple messages that promote water consumption instead of SSBs. Education delivered through classroom activities and banners as well as water bottles Main message; To replace SSB by water	School setting 7 months	SBs : reduced in the intervention group.(ml/day) Intervention: carbonated drinks , 295 ml/day to 228 ml/day, 23% decrease (p=0.03), juice non-significant increase 3% (p=0.08) Control: carbonated drinks 292 ml/day to 280 m/ 4% decrease (p=0.03) juice non-significant increase of 12% (p=0.08)	The change in BMI was not significant between groups Among girls who are overweight at baseline, a statistical significant reduction in BMI	The intake of SSBs was decreased but still there is a need to emphasize on the intake of the overall juices. BMI reduction significantly among overweight girls.
14-Siega-Riz 2011 United States Funded by NIDDK/NIH grant and STOPP T2D collaborative group	Age 10 to 14 years Participants N=4603 Evaluated = 3908 Intervention =1964 Control = 1944	Educational and environmental components emphasizing on different themes and each semester one specific theme Four integrated components: Nutrition, education,behavior and communication	School based HEALTHY Intervention delivered in 5 regular semesters , first semester when students where in grade 6 and 2 semesters when students were in grade 7 and 1 semester when students are in grade 8	No significant difference between intervention and control for mean intake of SSBs	There was no significant effect between baseline and end of study P=0.92	Small effect in dietary change in this intervention. Intake of FV decreased for both groups at the end of the study

15-Singh 2009 Netherlands Funded by: Netherlands Research Program for weight gain prevention	1108 children 12 -14 yrs Intervention: = 632 control = 476 Evaluated 8 months: 1031 anthropometric measures and 980 filled the questionnaires 12 months: 920 anthropometric measures and 937 filled the questionnaires 20 months : 875 anthropometric measures and 913 filled the questionnaire	Behaviors targeted with regard to sugar containing beverages, health promotion intervention included 11 lessons.	School based DOiT intervention 8 months follow up at 12 months and at 20 months	Changes in dietary behaviours 8 months: SSB lower among boys and girls in the intervention. Boys:-287 ml/d (25.5%decrease) Girls: - 249 ml/d (23.9% decrease) 12 months: Boys:- 233 ml/d (20.7% decrease) Girls: -271 ml/d (26% decrease) 20 months: no significant group difference	Thickness in skinfold measurement (difference in change between intervention and control -0.7 mm,95% CI) Lower sum of skin fold among girls in intervention than control (-2.3 mm at 8 months and -2.0 mm at 20 months) WC was lower in the intervention than in the control group (among girls or boys) Significant intervention effect on Triceps biceps and subscapular thickness in girls at 8 and 12 months , but not at 20 months?	Positive effects on the consumption of SSBs in all participants short and long term, and on sum of skinfold thickness in girls)

APPENDIX U: Data Extracted from excluded studies

ID	Title	Author	year	Are children &adolescents the participants	Is the study an RCT	Intervention is of interest (SSB component)?	Reasons for exclusion
1	Jarrib Baleha * a pilot nutrition intervention to increase water intake and decrease soft drink consumption among school children in Beirut	Abi Haidar et al.	2011	✓	X	✓	Not design of interest (Pilot testing of two weeks interventions)
2	The Healthy Children, Strong Families Intervention: Design and Community Participation	Adams et al.	2012	✓	✓	✓	No published results Based on communication with the author, the results were not published yet
3	Healthy children, strong families: Results of a randomized trial of obesity prevention for preschool American Indian children and their families	Adams et al.	2011	✓	✓	✓	No published results Based on communication with the author, the abstract was published only
4	Educational intervention focusing on health belief model in health beliefs, awareness and behavior of diabetic patients	Asadzandi et al.	2006	✓	✓	✓	Non- English language(Persian)
5	Dietary and oral hygiene intervention in secondary school pupils	Anttonen et al.	2011	✓	✓	x	Not intervention of interest (no specific component related to SSB intake)
6	Dietary intake in a randomized-controlled pilot of NOURISH: A parent intervention for overweight children	Bean et al.	2012	x	✓	✓	Not population of interest (Adults)
7	Change in food consumption among chliean chlidren after the	Bustos et al.	2011	✓	✓	✓	Non-English language: (Spanish)

	implementation of Health Kiosk						
8	Effect of nutrition education on improving the fat and sugar consumption practices of young children.	Chen et al.	2002	✓	✓	✓	Non-English Llanguage (Persian)
9	Reducing Consumption of Sugar-Sweetened Beverages Is Associated with Reduced Blood Pressure: A Prospective Study among U.S. Adults	Chen et al.	2010	X	✓	✓	Not population of interest (Adults 25-79 years)
10	Effectiveness of a multi-disciplinary family-based programme for treating childhood obesity (The Family Project)	Coppins et al.	2011	✓	✓	x	Not intervention of interest (no specific component related to SSB intake)
11	How discretionary can we be with sweetened beverages for children?	Crawford et al.	2008	✓	X	x	Not design of interest (Review Editorial for James & Beech review)
12	Intake of soft drinks, fruit-flavored beverages, and fruits and vegetables by children in grades 4 through 6	Cullen et al.	2002	✓	X	x	Not design of interest (Survey)
13	Goal setting is differentially related to change in fruit, juice, and vegetable consumption among fourth-grade children	Cullen et al.	2004	✓	X	x	Not design of interest (Survey)
14	Effectiveness of carbonated beverage education on dental students' knowledge and behavioral intent	Cunningham et al.	2003	X	x	✓	Not population of interest (dental students) Not design of interest (baseline data compared to post intervention))
15	Preventing excessive weight gain by encouraging healthy eating habits among adolescents in Brazil: A randomized community trial	Cunha et al.	2012	✓	✓	✓	Based on communication with the author, the results were not published yet
16	Exercise and nutrition therapy for	Dai et al.	2006				Non-English language

	simple obesity in children]							(Chinese)
17	Evaluation of an obesity prevention program in adolescents of public schools	Da Silva Vargas et al.	2011	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
18	Schools and the rising rate of overweight children: prevention and intervention strategies	Dalton et al.	2004	✓		X	x	Not design of interest (Report)
19	A staged intervention dental health promotion programme to reduce early childhood caries	Davies et al.	2005	x		✓	x	Not intervention of interest (no specific component related to SSB intake)
20	Positive impact of a pre-school-based nutritional intervention on children's fruit and vegetable intake: results of a cluster-randomized trial	De Bock et al.	2012	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
21	Sugar-sweetened beverage and 100% fruit juice consumption	Davila et al.	2008	✓		✓	✓	Full text article is not available
22	Reduction in added sugar intake and improvement in insulin secretion in overweight Latina adolescents	Davis et al.	2007	✓		✓	✓	No ,measurement of outcome of interest
23	Effect of sugar-sweetened beverages on body weight in children: design and baseline characteristics of the Double-blind, Randomized Intervention study in Kids	De Ruyter	2012	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
24	Rationale and design of the double-blind, randomized intervention study in kids (DRINK) on the effect of sugary drinks on body weight and fat mass	De Ruyter	2010	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
25	Immediate impact of a 10-week middle school intervention to	Eagle et al.	2012	✓		✓	uncertain	Abstract is only available

	improve health behaviors and reduce cardiovascular risk factors-project healthy schools in Michigan							
26	A randomized trial of sugar-sweetened beverages and adolescent body weight	Ebbeling et al.	2012	✓		✓	x	Not intervention of interest (environmental component)
27	Effects of decreasing sweetened beverages consumption on body weight in adolescents: A randomized controlled pilot study	Ebbeling et al.	2006	✓		✓	x	Not intervention of interest (environmental component)
28	A theory-based online health behavior intervention for new university students: study protocol	Epton et al.	2013	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
29	Family-based intervention for controlling childhood obesity: An experience among iranian children	Esferjani et al.	2013	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
30	Reduction in average child consumption of sugar-sweetened beverages without decrease in home inventory	Ferris et al.	2013	✓		x	✓	Full text article is not available (Poster only available)
31	The effects of a school-based intervention programme on dietary intakes and physical activity among primary-school children in Trinidad and Tobago	Francis et al.	2010	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
32	Effectiveness of an oral health education programme in primary schools in Zimbabwe after 3.5 years	Frencken et al.	2001	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
33	Evaluation of the Nutrition Education at Primary School (NEAPS) programme	Friel et al.	1999	✓	X		✓	Not design of interest (Quasi experimental)
34	The Sakado school-based	Fujikura et al.	2008	✓	X		uncertain	Full text article is not

	"shokuiku" food and nutriti education project						available (abstract only available)
35	Influence of intervention on beverage choices: trends in the dietary intervention study in children (DISC)	Friedman et al.	2007	✓	X	✓	Not design of interest
36	Determining the need for a nutritional education curriculum in middle school students	Gonzalez et al.	2013	✓	X	uncertain	Full text article is not available (abstract only available)
37	Prevention and Reduction of overweight in primary school children	Hamelink et al.	2008	✓	✓	✓	Non-English language (Deutch language)
38	Effectiveness of primary school-based oral health education in West Java, Indonesia	Hartono et al.	2002	✓	✓	x	Not intervention of interest (no specific component related to SSB intake)
39	School-based health education programs can be maintained over time: results from the CATCH Institutionalization study	Hoelscher et al.	2004	✓	✓	x	Not intervention of interest (no specific component related to SSB intake)
40	Effectiveness of a primary school-based intervention to reduce overweight	Jansen et al.	2011	✓	✓	x	Not intervention of interest (no specific component related to SSB intake)
41	A school-based intervention to reduce overweight and inactivity in children aged 6-12 years: study design of a randomized controlled trial	Jansen et al.	2008	✓	✓	x	Not intervention of interest (no specific component related to SSB intake)
42	Ensuring Children Eat a Healthy Diet: A Theory-Driven Focus Group Study to Inform Communication Aimed at Parents	Kahlor et al.	2011	✓	X	✓	Not design of interest (qualitative study)
43	Diet outcomes of a pilot school-based randomised controlled obesity prevention study with 9–10 year olds in England	Kipping et al.	2010	✓	X	✓	(pilot intervention)
44	School-based interventions	Kovacs et al.	2011	✓	X	✓	Full text article is not

	against childhood obesity in Hungary							available (abstract only available)
45	A school based obesity prevention programmed in Rosario, Argentina: Impact on Intake changes of healthy and unhealthy foods	Kovalskys et al.	2010	✓		✓	unceratin	Full text article is not available (abstract only available)
46	Development of a Culturally Appropriate, Home-Based Nutrition and Physical Activity Curriculum for Wisconsin American Indian Families	LaRowe et al.	2007	✓		✓	✓	Full text article is not available (abstract only available) Not design of interest
47	The Active for Life 5 school based cluster randomized controlled trial: study protocol for a randomized controlled trial	Lawlor et al.	2011	✓		✓	✓	Full text article is not available (Protocol only available) Author was contacted but no response
48	A school based programme to reduce carbonated drink consumption reduced obesity in children	Pontin et al.	2004	✓		✓	✓	Not design of interest (Commentary on James et al. paper)
49	Dietary habits and effect of two different educational tools on nutrition knowledge of school going adolescent girls in Hyderabad, India	Roa el al.	2007	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
50	Designing effective health education interventions for preventing obesity in South Asian Americans	Sharma et al.	2006	✓	x		✓	Not design of interest (Review article)
51	A randomised controlled trial for overweight andobese parents to prevent childhood obesity - Early STOPP (STockholm Obesity Prevention Program)	Sobko et al.	2011	✓		✓	x	Not intervention of interest (no specific component related to SSB intake)
52	APPLE Project: 2-y findings of a	Taylor et al.	2007	✓		✓	✓	Not intervention of interest

	community-based obesity prevention program in primary school-age children							(no specific component related to SSB intake)
53	Changes in children's oral health-related behavior, knowledge and attitudes during a 3.4-yr randomized clinical trial and oral health-promotion program	Tolvanen et al.	2009	✓		✓	✓	Not intervention of interest (environmental component)
54	A school based community partnership for promoting healthy habits for life	Tucker et al.	2011	✓		x	✓	Not design of interest (quasi experimental design)
55	Reduction in sugar-sweetened beverages is not associated with more water or diet drinks	Veitch et al.	2011	✓		x	✓	Not design of interest (Review article) continuity of analysis of DoIT intervention by Paw et al 2008
56	Rationale, design and methods of the HEALTHY study behavior intervention component	Venditti et al.	2009	✓		✓	✓	Full text article is not available (Protocol only available)
57	Early intervention of multiple home visits to prevent childhood obesity in a disadvantaged population: a home-based randomised controlled trial (Healthy Beginnings Trial)	Wen et al.	2007		X	✓	✓	Not population of interest (Children below 4 years age)
58	intervention effects on kindergraten and first-grade teacher's classroom food practices and food related beliefs in American indain reservatopm schools	Arcan et al.	2013	✓		x	✓	Not design of interest (prospective study)

APPENDIX V: Risk of Bias of included studies

Bias	Authors'Judgement	Support for judgment
Albala 2008		
Random sequence generation (selection bias)	Unclear Risk	Quote: "64 kindergartens in four regions were randomly assigned to receive the intervention or not (control)"
Allocation concealment (selection bias)	Unclear Risk	Comment: Not reported
Blinding of participants and personnel (performance bias)	Low Risk	Comment: blinding of personnel not feasible/applicable; blinding of participants not reported
Blinding of outcome assessment (detection bias)	Unclear Risk	Comment: not reported
Incomplete outcome data (attrition bias)	Low Risk	Quote: "81.0/83.6% and 83.8/82.8% of the parental questionnaires were returned and informative in the intervention/control group of the first and second sample, respectively."
Selective reporting (reporting bias)	Low Risk	Comment: As compared to clinicaltrial.gov information. All outcomes listed in the method section are reported on the result section.
Other bias	Low Risk	Comment: No other sources of bias suspected..
Bayer, 2009		
Random sequence generation (selection bias)	Low Risk	Quote: "64 kindergartens in four regions were randomly assigned to receive the intervention or not (control)"
Allocation concealment (selection bias)	Unclear Risk	Comment: Not reported
Blinding of participants and personnel (performance bias)	Low Risk	Comment: blinding of personnel not feasible/applicable; blinding of participants not reported
Blinding of outcome assessment (detection bias)	Unclear Risk	Comment: not reported
Incomplete outcome data (attrition bias)	Low Risk	Quote: "81.0/83.6% and 83.8/82.8% of the parental questionnaires were returned and informative in the intervention/control group of the first and second sample, respectively."
Selective reporting (reporting bias)	Low Risk	Comment: As compared to clinicaltrial.gov information. All outcomes listed in the method section are reported on the result section.
Other bias	Low Risk	Comment: No other sources of bias suspected..

Beech, 2003		
Random sequence generation (selection bias)	Low	Quote: "Randomization was stratified by field center and an urn randomization procedure was used to generate the treatment allocation sequences".
Allocation concealment (selection bias)	Unclear	Comment: not reported
Blinding of participants and personnel (performance bias)	Unclear	Comment: blinding of personnel not feasible/applicable; blinding of participants not reported.
Blinding of outcome assessment (detection bias)	Low Risk	Comment: "Low risk as the Coordinator Center, separate entity, from the site of the Memphis study conducted the analyses and there was a clear protocol/manual of procedures for quality control on how data to be collected and entered into a database and then sent to the CC".
Incomplete outcome data (attrition bias)	Low Risk	Quote: " Complete data were collected at follow up for 100% of the study population".
Selective reporting (reporting bias)	Low Risk	Comment: all outcomes listed in the protocol are reported in the result section.
Other bias	Low Risk	Comment: no other risk of bias was identified.
Bjelland, 2011		
Random sequence generation (selection bias)	Low Risk	Quote: "12 schools were randomly assigned by simple drawing."
Allocation concealment (selection bias)	Unclear Risk	Comment:not reported.
Blinding of participants and personnel (performance bias)	Unclear Risk	Comment: blinding of personnel not feasible/applicable; blinding of participants not reported.
Blinding of outcome assessment (detection bias)	Unclear Risk	Comment: not reported
Incomplete outcome data (attrition bias)	Low Risk	Quote: "Researchers reported no differences in demographic and behavioral variables between those participating in this study "
Selective reporting (reporting bias)	Low Risk	Comment: study not registered. All outcomes stated in the published protocol, were reported in the study.
Other bias	Low Risk	Comment: No other sources of bias suspected
Cunha , 2103		
Random sequence generation (selection bias)	Low Risk	Quote:" paired randomized school based trial , conducted and reported according to CONSORT guidelines"
Allocation concealment (selection bias)	Low Risk	Quote: "using opaque envelopes in the presence of three investigators"
Blinding of participants and personnel (performance bias)	Unclear Risk	Comment: blinding of personnel not feasible/applicable; blinding of

		participants not reported.
Blinding of outcome assessment (detection bias)	Unclear Risk	Comment: not reported.
Incomplete outcome data (attrition bias)	Low Risk	Quote: " A total of 559 students out of 574 students originally enrolled in the study were retained throuhgout the study."
Selective reporting (reporting bias)	High Risk	Comment: one or more outcomes of interest in the review are reported incompletely.The results at 6 months and at 9 months of the intervention were not reported clearly in this study.
Ezendam , 2012		
Random sequence generation (selection bias)	Low Risk	Quote: " using a random -number generator"
Allocation concealment (selection bias)	Low Risk	Quote: :" allocation was concealed until the start of the study"
Blinding of participants and personnel (performance bias)	Low Risk	Comment: The author stated that students in the intervention group were more likely to participate (33% vs 26%), even though allocation was concealed until the start of the intervention.
Blinding of outcome assessment (detection bias)	Unclear Risk	Comment: Not reported
Incomplete outcome data (attrition bias)	Low Risk	Quote: " Folle up at 4 months :0, follow up at 12 months 8.4% attrition rate:"
Selective reporting (reporting bias)	Low Risk	Comment: as compared to study protocol. All outcomes listed in the method section are reported on the result section.
Other bias	Low Risk	Comment: No other source of bias was identified.
Grieken , 2013/2014		
Random sequence generation (selection bias)	Low Risk	Quote: “The randomization code was developed using a computer random number generator."
Allocation concealment (selection bias)	Unclear Risk	Comment: not reported
Blinding of participants and personnel (performance bias)	Unclear Risk	Comment: not reported.
Blinding of outcome assessment (detection bias)	High Risk	Quote: “AG and LV were responsible for data collection, study coordination, data analyses and reporting study results. AG was responsible for performing statistical analyses, drafting and revising the manuscript".
Incomplete outcome data (attrition bias)	Unclear Risk	Comment: not reported
Selective reporting (reporting bias)	Low Risk	Comment: as compared to protocol in ISRCTN 04965410,all outcomes listed in the method section are reported on the result section
Other bias	Low Risk	Comment: no other source or risk of bias was suspected

Haerens , 2007		
Random sequence generation (selection bias)	Low Risk	Quote: "there was random allocation of schools to intervention or control groups."
Allocation concealment (selection bias)	Unclear Risk	Comment: not reported.
Blinding of participants and personnel (performance bias)	Unclear Risk	Comment: blinding of personnel not feasible/applicable; blinding of participants not reported.
Blinding of outcome assessment (detection bias)	Unclear Risk	Comment: not reported.
Incomplete outcome data (attrition bias)	Low Risk	Quote:"approximately 5% of children were not given consent to participate in the study and thus were not reported in the final analyses of the results."
Selective reporting (reporting bias)	Unclear Risk	Comment:The presented outcomes in the article are in alignment with the objectives of the study .The effects of the intervention on adiposity indices and children's physical activity levels were indicated to be submitted else where.
Other bias	Low Risk	Comment: No other source of bias was suspected.
James 2004/2007		
Random sequence generation (selection bias)	Low Risk	Quote: "Clusters were randomised according to a random number table."
Allocation concealment (selection bias)	Unclear Risk	Comment: not reported.
Blinding of participants and personnel (performance bias)	High Risk	Quote:"Some limitations to our study may have occurred due to contamination, as randomisation was according to classes and not schools; transfer of knowledge may have taken place outside the classroom.One investigator (JJ) delivered the programme to all classes and the programme included lessons and educational sessions"
Blinding of outcome assessment (detection bias)	High Risk	Quote:"JJ delivered the education programme, took the anthropometric measurements, and analysed the data."
Incomplete outcome data (attrition bias)	High Risk	Quote: "Overall, 55.0% (338 of 615) of the children returned the first drink diary and 56.0% (321 of 574) returned the second; 36% (235) returned both. "
Selective reporting (reporting bias)	Low Risk	Comment:.study not registered.All outcomes stated in the published protocol were reported in the study.
Other bias	High Risk	Comment: many variables were not considered in this study as covariates. The analyses ran did not include cluster effect.c

Mucklebauer, 2009		
Random sequence generation (selection bias)	High Risk	Quote: "schools from one city in Germany were assigned to receive the intervention and schools from another city with similar SES characteristics were assigned to be control. 20 schools from each of the two identified cities were randomly selected to take part in the study
Allocation concealment (selection bias)	Unclear Risk	Comment: Not reported
Blinding of participants and personnel (performance bias)	Low Risk	Comment: Students will be all subject to the environmental and educational intervention, however, students would not be able to know if they are considered an intervention or control group. Control schools did not receive any intervention and students in these schools are located in a different city than schools where intervention is taking place
Blinding of outcome assessment (detection bias)	Unclear Risk	Comment: not reported
Incomplete outcome data (attrition bias)	Low Risk	Comment: Only few students withdrew at the end of the study
Selective reporting (reporting bias)	Low Risk	Comment: as compared to clinicaltrial.gov information. All outcomes listed in the method section are reported on the result section.
Other bias	High Risk	the school were randomized in two different cities in Germany which can craete the bias that the two schools will not share the same characteritics at baseline.
Rosario, 2013		
Random sequence generation (selection bias)	Low Risk	Quote: " schools from a city from the north of Portugal were selected by a simple random sample."
Allocation concealment (selection bias)	Unclear Risk	Comment: not reported
Blinding of participants and personnel (performance bias)	Low Risk	Comment:Comment: blinding of personnel not feasible/applicable Quote:"Children were blinded to group assignment."
Blinding of outcome assessment (detection bias)	Low Risk	Quote: "children and outcomes assessors were blinded ."
Incomplete outcome data (attrition bias)	High Risk	Comment: Follow up assessment was available for 63.4% of the children
Selective reporting (reporting bias)	Low Risk	Comment: As compared to clinicaltrial.gov information. All outcomes listed in the method section are reported on in the result section.
Other bias	Low Risk	Comment: Not other source for risk of bias was suspected.
Rozenkranz, 2010		
Random sequence generation (selection bias)	Low Risk	Quote:"according to a random number generator scout troops were

		randomized (by first author) within strata to the control or intervention condition. "
Allocation concealment (selection bias)	Unclear Risk	Comment:"randomization was done by the first author but the intervention could not be concealed due to the nature of this behavioral intervention.
Blinding of participants and personnel (performance bias)	Low Risk	Comment:Research assistants were blind to condition of each troop.
Blinding of outcome assessment (detection bias)	Low Risk	Quote:"Research assistants who collected the data of anthropometric measurements and accelerometer (PA data) and reported accessibility and exposure to snacks during troop meetings (observational measures) were blinded to the condition of each troop."
Incomplete outcome data (attrition bias)	Low Risk	Quote:"Very low drop out/lost to follow up rate.".
Selective reporting (reporting bias)	Low Risk	Comment: as compared to clinicaltrial.gov information. All outcomes listed in the method section are reported on the result section.
Other bias	Low Risk	Comment: No other source of risk of bias was suspected.
Sichieri, 2008		
Random sequence generation (selection bias)	Low Risk	Quote: "Randomization was conducted first by ranking schools based on the prevalence of overweight and obesity and then randomization was generated by blocking of 4 schools and allowed for balancing of groups by BMI."
Allocation concealment (selection bias)	Unclear Risk	not applicable for the researchers as it is an educational intervention in schools and cannot be blinded for the researchers. However, students/particiapnts were blinded to their allocation.
Blinding of participants and personnel (performance bias)	Low Risk	Personnel blinding is not applicable in this study, participants were not aware of whether in intervention or control school/class.
Blinding of outcome assessment (detection bias)	Unclear Risk	Not clear.
Incomplete outcome data (attrition bias)	Unclear Risk	Analyses to see if there are differences in BMI between children who agreed to give dietary data at follow up compared with those who did not were conducted and showed no statistical difference. Also loss to follow up and no dietary intake data was reported for less than 20% of participants enrolled in this study. page 5Two analyses were conducted: (i) change in BMI, therefore only data on completers were included; and (ii) modelling the change of BMI using all data(page 4)
Selective reporting (reporting bias)	Low Risk	All outcomes reported were based on the protocol and purpose of the study and the primary and secondary outcomes set were reported as is.
Other bias	Low Risk	None other sources was identified as risk of bias

Siega-Riz 2011		
Random sequence generation (selection bias)	Low Risk	Quote:"Coordinating center developed a stratified randomization scheme."
Allocation concealment (selection bias)	Unclear Risk	Comment: not reported.
Blinding of participants and personnel (performance bias)	Low Risk	Quote:"Treatment assignment was known to both key school officials and to study staff. To minimize staff bias, study staff who delivered the intervention appeared in the intervention schools only and were separate from study staff who administered data collection procedures in both intervention and control schools.The study took measures to keep students and their parents masked to the assignment."
Blinding of outcome assessment (detection bias)	Unclear Risk	Quote: " not reported".
Incomplete outcome data (attrition bias)	Low Risk	Quote:"Authors adjusted for student dropout and withdrawal at the beginning of the study through design and calculation of sample size and power."
Selective reporting (reporting bias)	Low Risk	Comment:
Other bias	Low Risk	Comment: No other source of bias was suspected
Singh 2009		
Random sequence generation (selection bias)	Low Risk	Quote:"Randomisation took place at the school level ".
Allocation concealment (selection bias)	Unclear Risk	Comment:not reported.
Blinding of participants and personnel (performance bias)	Unclear Risk	Comment:blinding of personnel not feasible/applicable; blinding of participants not reported.
Blinding of outcome assessment (detection bias)	High Risk	Quote:"The research assistants were also involved in the organization of the measurements, and were therefore not blinded to group assignment."
Incomplete outcome data (attrition bias)	Low Risk	Quote: "researchers obtained data from 1108 students and at least 1lost follow-up measurement. There more of participants lost to follow up at 8 , 12 , and 20 months. Anthropometrics for example almost lost 17% of participants and their data from baseline to 20 months."
Selective reporting (reporting bias)	High Risk	Comment: Studye not registered .Not all outcomes of all the mediators of behaviors (attitudes, subjective norms, etc) were discussed.
Other bias	High Risk	Comment: many variables were not considered in this study as covariates e.g., cluster effect. The two groups might not share similar baseline characteristics.

Appendix W: example of a ready made juice available in the Lebanese market and its sugar content