STUDY OF CARBONATED SOFT DRINK CONSUMPTION AMONG SELECTED PRIMARY SCHOOL CHILDREN IN MALAYSIA

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FACULTY OF SCIENCE
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ABSTRACT

According to a report by Euromonitor International in 2014, total sales volume of all soft drinks increased by 11% from 1574.2 million litre in 2011 to 11748.3 million litre in 2013. In 2012, World Health Organization (WHO) reported that 23.2% of Malaysian children and adolescents consumed soft drinks once or more than once per day. Several studies have provided scientific evidence on the association between soft drink consumption and increased risk of health issues such as obesity, chronic disease and others. The main purpose of this research is to identify the pattern of soft drink consumption among primary school children in selected areas, and to determine the factors influencing children's soft drink intake based on the Theory of Planned Behaviour (TPB). In this study, survey was conducted as the research methodology and a total of 454 respondents were recruited from urban areas (Petaling Jaya and Cheras, Selangor) and rural areas (Parit Ya'ani, Yong Peng and Batu Pahat, Johor) of Malaysia. The results showed that about 94.9% of respondents consume soft drinks at least once a week and only 5.1% of respondents reported that they rarely consume soft drinks. About 27.5% of respondents reflected that they consume soft drinks more than 500 ml per day. Results also showed that 47% consumed soft drinks at home, followed by 30% who had it in school. The results showed that there was no significant difference between amount of daily soft drink consumption and age ($p=0.942$), living area ($p=0.063$), but there was significant difference between gender ($p=0.001$), ethnic group ($p=0.018$) and family income ($p<0.001$). Multiple linear regression has been used to analyse the data and find out the factors influencing soft drink intake behaviour among the school children. The results showed that intention to consume soft drinks ($t=16.18$, $p< 0.001$) was significantly influencing the soft drink intake but perceived behavioural control was not ($t= 0.183$, $p=0.854$). Attitude towards the soft drink consumption ($t=8.916$, $p<0.001$), subjective

norm ($t=5.924$, $p<0.001$) and perceived behavioural control ($t=2.272$, $p<0.001$) had significant influence on the intention. Being healthy ($\beta=0.114$; $t=2.479$, $p<0.05$)), family members ($R^2=0.026$, $p<0.05$) and soft drink availability at home ($R^2=0.539$; $\beta=0.109$; $t=10.884$, $p<0.0001$) had the most significant effects on attitude towards soft drink consumption, subjective norm and perceived behavioural control respectively. This study provides a valuable insight into children's soft drinks consumption behaviour in selected areas and identifies the factors that influence it. A better planning and implementing nutrition intervention should be developed based on this finding to improve the health of Malaysian children.

ABSTRAK

Menurut laporan dari Euromonitor International pada tahun 2014, jumlah jualan minuman ringan meningkat sebanyak 11% daripada 1574.2 juta liter pada tahun 2011 kepada 11748.3 juta liter pada tahun 2013. Pada tahun 2012, Pertubuhan Kesihatan Sedunia (WHO) telah melaporkan bahawa 23.2% daripada kanak-kanak dan remaja Malaysia minum satu atau lebih daripada satu tin minuman ringan sehari. Beberapa kajian sebelum ini juga telah menunjukkan hubungan antara pengambilan minuman ringan dan peningkatan risiko menghidapi beberapa masalah kesihatan seperti obesiti, penyakit kronik, dan sebagainya. Tujuan utama kajian ini adalah untuk mengenal pasti corak pengambilan minuman ringan di kalangan kanak-kanak sekolah rendah di kawasan-kawasan yang terpilih dan menentukan faktor-faktor yang mempengaruhi pengambilan minuman ringan kanak-kanak berdasarkan "Theory Planned Behaviour" (TPB). Metodologi yang digunakan dalam kajian ini ialah soal selidik di mana seramai 454 orang responden dari kawasan bandar (Petaling Jaya dan Cheras, Selangor) dan luar bandar (Parit Ya'ani, Yong Peng dan Batu Pahat, Johor) Malaysia telah terlibat dalam kajian ini. Hasil kajian menunjukkan bahawa 94.9% daripada responden meminum minuman ringan sekurang-kurangnya sekali seminggu dan hanya 5.1% daripada responden melaporkan bahawa mereka jarang mengambil minuman ringan. Kira-kira 27.5% responden memberitahu bahawa mereka meminum minuman ringan lebih daripada 500 ml sehari. Keputusan juga menunjukkan bahawa 47% responden meminum minuman ringan di rumah manakala, 30% daripada responden meminum minuman ringan di sekolah. Hasil kajian menunjukkan bahawa tiada perbezaan yang signifikan antara jumlah pengambilan minuman ringan harian dengan umur ($P = 0.942$), tempat tinggal ($P = 0.063$) tetapi terdapat perbezaan pengambilan minuman ringan yang signifikan antara jantina ($p = 0.001$), kumpulan etnik ($P = 0.018$) dan pendapatan keluarga ($P < 0.001$). Multiple linear

regression telah digunakan untuk menganalisa data kajian bagi memperolehi dan memahami faktor-faktor yang mempengaruhi perlakuan pengambilan minuman ringan di kalangan pelajar sekolah. Hasil kajian menunjukkan "hasrat untuk pengambilan minuman ringan" ($t = 16.18$, $p < 0.001$) mempengaruhi pengambilan minuman ringan secara signifikan tetapi "kawalan tingkahlaku" didapati tidak mempengaruhi pengambilan minuman ringan ($t = 0.183$, $p = 0.854$). "Sikap terhadap tingkah laku" ($t = 8.916$, $p < 0.001$), subjective norm ($t = 5.924$, $p < 0.001$) dan "kawalan tingkahlaku dilihat" ($t = 2.272$, $p < 0.001$) mempengaruhi "hasrat untuk mengambil minuman ringan" secara signifikan. "Menjadi sihat" ($\beta=0.114$; $t=2.479$, $p<0.05$), "ahli keluarga" ($R^2=0.026$, $p<0.05$), and "kebolehdapatan minuman ringan di rumah" ($R^2=0.539$; $\beta=0.109$; $t=10.884$, $p<0.0001$) merupakan faktor yang paling signifikan terhadap sikap untuk mengambil minuman ringan, subjective norm dan kawalan tingkah laku masing-masing. Kajian ini dapat mendalami pengetahuan tentang pengambilan minuman ringan di kalangan kanak-kanak dari kawasan Malaysia yang terpilih dan mengenal pasti faktor-faktor yang mempengaruhinya. Cadangan dan intervensi pemakanan yang lebih sesuai perlu dicadangkan berdasarkan hasil kajian ini untuk meningkatkan kesihatan kanak-kanak Malaysia.

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LIST OF SYMBOLS AND ABBREVIATIONS

ATT	Attitude
BMI	Body Mass Index
CAP	Consumers Association of Penang
CDC	Centers for Disease Control and Prevention
CSFII	Continuing Survey of Food Intakes by Individuals
CAOBISCO	Chocolate, Biscuits & Confectionery of Europe
DRIs	Dietary Reference Intake
F	Female
FFQ	Food Frequency Questionnaire
g	Gram
GI	Glycemic Index
HDL	High-density lipoprotein
HFCS	High- fructose corn syrup
INT	Intention
kcal	Kilocalories
LDL	Low-density lipoprotein
M	Male
MDG	Malaysian Dietary Guidelines
ml	Millilitre
PBC	Perceived behavioural control
SD	Soft drinks
SN	Subjective Norm
SSBs	Sugar-sweetened beverages
TPB	Theory of Planned Behaviour
VLDL	Very-low-density-lipoprotein
WHO	World Health Organisation

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CHAPTER 1: INTRODUCTION

Healthy lifestyles especially in terms of food and nutrition are now widely pursued by the public. St-Onge et al. (2003) showed that food and beverage consumption patterns had changed over the past few decades. There is an increase in awareness among the public on the importance of healthy dietary habits, based on the increasing scientific evidence which reported significant relationship between daily dietary habits and health issues (Greenwood & Stanford, 2008; World Health Organization, 2013). Brown (2008) believed that health and nutrition are the key driving forces that lead to changes in food and beverage consumption pattern.

Beverage intake is a major part of daily dietary habits. In the year 1996, the director of New York Cornell's Nutrition Information Center, Barbara Levine, argued that daily liquid intake had a serious impact on the overall children's dietary intake in the United States (New York Hospital-Cornell Medical Center Nutrition Information Center, 1998). Due to its increasing importance, many researchers are becoming highly interested in investigating the relationship between beverage intake behaviour and human health. Among the studies on beverages and nutrition, Vartanian et al. (2007) found that the consumption of sugar-sweetened soft drinks was positively associated with obesity, type 2 diabetes, dental cavities, and lower nutritional benefits.

Soft drinks are a category of beverages which are non-alcoholic, sweetened, acidified, flavoured, carbonated, and with added artificial colouring agents (Saniah & Samsiah, 2012;

U.S. National Soft Drink Association, 2004). The main ingredients of soft drinks are carbonated water, added sugar, caloric sweeteners, artificial colouring and flavours (Bleich et al., 2009). However, according to Johnson et al. (2010), soft drinks could be further classified into two groups: carbonated and non-carbonated ones. Carbonated soft drinks include soda, cola, energy drinks or isotonic drinks, lemonade, squash, and fruit punch. Examples of non-carbonated soft drinks included chocolate, tea, coffee, malt drinks, and soy drinks. In this context, pure fruit juice, milk and milk-based beverages were not categorised as soft drinks.

Soft drinks with high sugar content will increase total calorie intake of an individual, which consequently contribute to increasing risk of obesity occurence (Giammattei et al., 2003). Interestingly, despite the publicly known potential risks, soft drink consumption in the United States had steadily increased over the past 50 years according to statistics by the National Soft Drink Association (Bray et al., 2004). Data from the 1977-1979 and 1994 Continuing Survey of Food Intakes by Individuals (CSFII) showed that the proportion of adolescent boys and girls drinking soft drinks increased by 74% and 65% respectively (Borrud et al., 1997). The change in beverage consumption pattern was highly related to change in food consumption pattern. Denney-Wilson et al. (2009) reported that soft drink consumption among adolescents was positively associated with fast food consumption. In fact, high level of soft drink consumption was related to the increasing prevalence of overweight and obesity among children and adolescents (Berkey et al., 2004; Denney-Wilson et al., 2009).

The risk of several non-communicable diseases, such as obesity and chronic disease, can be predicted as early as an individual's childhood phase. Hence, children and teenagers are often the research target groups to understand their food consumption behaviour and health status aiming to prevent the onset of the non-communicable diseases (Berkey et al., 2004; Brug et al., 2010; Ogden & Carroll, 2010; St-Onge et al., 2003). For example, Washi and Ageib (2010) stated that poor dietary habits had led to an increase in the number of overweight and obese children around the world. Morena et al. (2005) found that nutrition-related risk factors for chronic diseases generally occurred in the early childhood and teenage periods. It is evident that the food intake and dietary behaviour of children and teenager will heavily influence their growth and health.

The Malaysian National Health and Morbidity Survey in 2006 showed that 38% of Malaysian children were overweight. Childhood obesity is believed to be a contributing factor to the rising rate of serious health complications in the adulthood (Ahmad et al., 2010), hence prevention should start at an earlier stage of life. There is an urgent need to study and understand the current trend of Malaysian children's dietary behaviour to help future planning and projection. In this study, Malaysian children's soft drink consumption habit was studied by applying the Theory of Planned Behavior (TPB) (Ajzen, 1988) to identify factors that influence their soft drink intake.

1.1 Problem Statement:

Over the last few decades, Malaysia has been no different from other countries which are undergoing a rapid phase of industrialization and urbanization. Social development has led to drastic changes in lifestyles and dietary habits which directly influence population health status and disease pattern of many countries. In Malaysia, occurrence rate of obesity and type 2 diabetes cases have increased over the years. The findings from Ng et al. (2014), a British medical journal, reported that 49% of Malaysian women and 44% of Malaysian men were either obese or overweight, ranking the highest among all ASEAN countries. Overweight and obesity in adulthood were believed to be predicted by childhood and adolescent overweight (Brug et al., 2010). World Health Organisation had found that those children who were obese were more likely to remain obese in adulthood and the risk to develop non-communicable diseases was higher than children with normal weight (Brug et al., 2010). Morena et al. (2005) and Joseph and Kramer (1996) also pointed out that the nutrition-related risk factors for chronic diseases were occurring in early childhood and adolescence. Hence, understanding the nutritional needs of children is crucial to prevent the progression of increasing prevalence of overweight and related comorbid conditions in adults.

Vartanian et al. (2007) stated that soft drinks are one of the key contributors to the risk of non-communicable diseases such as obesity. There are many studies which investigated the relationship between sugar-sweetened beverage consumption and obesity or body mass index (BMI) in children and adolescent populations (Berkey et al., 2004; Dubois et al., 2007; Ludwig et al., 2001; Mrdjenovic & Levitsky, 2003; Phillips et al, 2004; Striegel-Moore et al., 2006; Tam et al, 2006). The results from these studies generally suggested an association between intake of sugar-sweetened beverages and weight gain in the subjects.

Soft drink intake pattern of children and adolescents in several Western countries such as Austria (Jensen et al., 2012; French et al, 2013), other parts of Europe (Duffey et al., 2012) and the United States (Lasater, Piernas, & Popkin, 2011; Terry-McElrath et al., 2014) had been reported. Duffey et al. (2012) also stated that pattern of soft drink consumption varied among countries.

Although this issue has raised awareness and gained attention worldwide, there have been limited similar studies conducted locally in Malaysia. In fact, only one related study (Hendijani & AbKarim, 2010) have been conducted to determine ways to increase milk consumption among children, identify relationship between personal and environmental factors and beverage consumption preferences of primary school children in Malaysia. In their study, they found that children preferred flavoured milk rather than plain milk and personal factors played a more important role in influencing children's consumption preferences compare to environmental factor. To answer the research questions, Riebl et al. (2015) stated that the theoretical – based frameworks are more effective on understanding human behaviour than those lacking of a comprehensive theoretical basis. However, most of the previous studies (van der Horst et al., 2007; Grimm et al., 2004; Vereecken et al., 2005; van der Horst et al., 2008; Bere et al., 2007; Townsend et al., 2012, Gebremariam et al., 2012; and Lien et al., 2014) were not theory-based interventions. Taken together, it is crucial to study and understand the factors influencing soft drink consumption among Malaysian children based on the Theory of Planned Behaviour (TPB).

The Theory of Planned Behaviour (TPB) is applied because the social influence on childhood eating behaviour can be investigated based on parents' and peers' influence on

their food choice and preferences (Birch & Fisher, 1998). Besides that, TPB can help in further understanding the factors underlying attitudes, subjective norms and perceived behavioural control that influence the children's soft drink consumption. This understanding will provide valuable information and assist in better planning and nutritional intervention to improve children's health (Grimm et al., 2004).

1.2 Research Questions

First question: What kind of beverage does Malaysian children prefer?

Second question: How much soft drinks do Malaysian children consume?

Third question: What are the factors influencing the children's soft drink consumption?

1.3 Research Objective:

Most of the unhealthy daily habits and eating behaviour have been associated with increased risk of chronic diseases (Joseph and Kramer, 1996). The prevalence of obesity among Malaysian children and increased soft drink intake in Malaysia is currently lack of adequate theoretical literature – based studies on factors influencing soft drink consumption. The purposes of this study were as follows:

1. To identify the pattern of carbonated soft drink intake among 9 to 12 years old children.

2. To investigate outcome beliefs, referent and resource as factors which influence on the children's soft drink consumption by using the Theory of Planned Behaviour (TPB).

1.4 Research Scope

In order to study children's soft drink consumption, a self-reported questionnaire was used in this study to collect the required data. A survey was conducted in primary schools in urban and rural areas in Malaysia to investigate the difference between the two groups. According to Woodward et al (2002), location and living area of respondents contribute to variation in health and dietary behaviour, with those from rural area being more likely to have poor health and poor dietary habit compared to those from urban area. In this research, respondents were recruited from two large states of Malaysia – Selangor and Johor (Department of Information, 2015). For urban areas, the survey was conducted in Petaling Jaya, Selangor. For rural areas, the survey was conducted in Yong Peng, Johor.

According to Central Intelligence Agency (2013), Malaysia had about 8.565 million children under 14 years old in year 2013 which was about 28.8% of Malaysia's total population. Our target respondents were children aged from 9 to 12 years old. Children who below 9 years old were excluded in this study because previous research had stated that young respondents were more prone to face difficulty in understanding the questionnaire and the collected data might be inaccurate (Malik et al., 2006).

According to Malaysian Standards 601: 1994, soft drinks can be classified as carbonated and non-carbonated beverages. Johnson et al. (2010) and Harris et al. (2011) have used the term "soft drinks" to include pure fruit drinks, cordial, malt drinks, sport drinks,

energy drinks, iced tea, Milo, and other non-alcoholic beverages. However, this study only included carbonated and non-alcoholic carbonated drinks.

1.5 Theoretical Framework

Since 1969, numerous studies were carried out by social psychologists to understand social behaviour. "Attitude" was found to be one of the important elements to predict individual behaviour (Wicker, 1969). Many different types of models have been introduced and applied to predict social behaviour, such as Health Belief Model (Becker, 1974), Theory of Reasoned Action (Ajzen & Fishbein, 1980), Social Cognitive Theory (Bandura, 1989), and the Transtheoretical Model (Prochaska & DiClemente, 1983). Among the different models proposed and used, one of the most widely-studied ones is Theory of Planned Behaviour (Ajzen, 1991). TPB is an extension from the Theory of Reasoned Action (TRA) which was first introduced by Fishbein (1967) to understand the relationship between attitudes and behaviour. TPB is an individual-level health behaviour theory that can be applied to explaining and predicting human's behaviour including eating behaviour (Ajzen, 1991, Armitage, 2001, Hardemana et al., 2002). Generally, the TPB holds that human behaviour can be predicted directly by one's perceived behavioural control and intention, while behaviour is influenced indirectly by subjective norms, attitude and perceived behavioural control through intention (Ajzen, 1991). Figure 1.1 presents the structure of TPB.

Attitude represents one's positive or negative evaluation towards certain behavioural performance (Ajzen, 1991). Subjective norms refer to one's evaluation on whether a behaviour should be performed based on social expectations (Ajzen, 1991). Perceived

behavioural control represents an individual's belief related to the difficulty of conducting certain behaviour (Ajzen, 1991). The TPB has been used widely to study health behaviour such as food choices (Berg, Jonsson & Conner, 2000), breastfeeding (Swanson & Power, 2005), and physical activities (Trost, Sauners, & Ward, 2002). Based on the TPB theory, one's intention to consume soft drinks will become stronger when one has a positive attitude towards the behaviour, perceiving social pressures of consumer is less and easy for them to access the soft drinks.

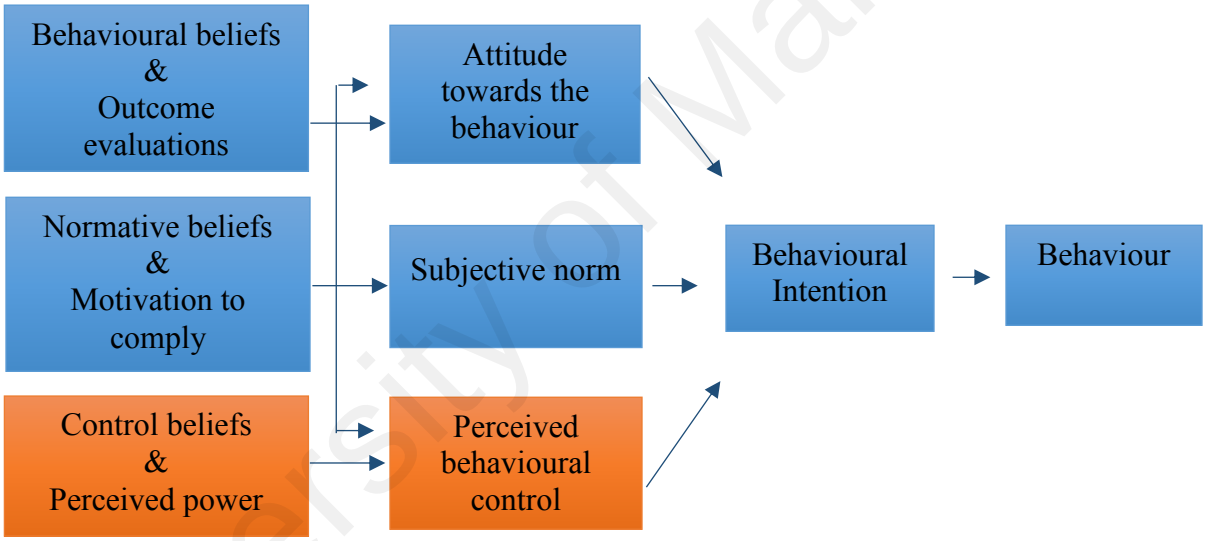


Figure 1.1 Model of the Theory of Planned Behaviour

Source: Ajzan (1991)

1.5.1 Definition of Terms

The factors influencing soft drink consumption will be investigated based on the theoretical framework discussed above. The definition of each concept will be explained briefly below:

Behaviour

Behaviour is defined as actions conducted by an individual (Ajzen, 1991). Soft drink consumption behaviour discussed in this study refers to the intake of sugar-sweetened carbonated beverages on a daily basis.

Soft drinks

Soft drinks in this study refer to sugar-sweetened carbonated beverages (Ajzen, 1991). Fruit juices, soya, coffee and teas were excluded.

Intention

Intention is the idea before wanting or planning to act (Ajzen, 1991). In this study, the "intention to consume soft drinks" refers to an individual's perceived likelihood of consuming carbonated soft drinks on a daily basis.

Attitude

Attitude towards a behaviour is a favourable or unfavourable evaluative reaction towards a certain object, situation or people that will further be exhibited on an individual's action and stimulus (Ajzen, 1991). In this research, attitude towards soft drink consumption refers to the respondent's positive or negative feeling about consuming soft drinks.

Behavioural beliefs

Behavioural beliefs are the linkage between belief and behaviour by believing an object has a certain attribute (Fishbein & Ajzen, 2010). In this study, behavioural beliefs refer to a respondent's belief regarding daily soft drink consumption would be associated with certain positive or negative outcome. Evaluation on this aspect was based on this outcome.

Subjective norms

Subjective norms refer to an individual's perception of social pressure to engage or not to engage in a particular behaviour (Ajzen, 1991). Here, subjective norm refers to respondent's perception of social pressure to consume soft drinks daily.

Normative beliefs

Normative beliefs refer to an individual's perception on social normative pressure on the relevancy of others' expectation to them and consequently affecting if they should or should not engage in a particular behaviour (Fishbein & Ajzen, 2010). In this research,

normative beliefs refer to certain people who are important and influential to the respondents, subsequently encouraging or discouraging the respondents to consume soft drinks on a daily basis.

Perceived behavioural control

Perceived behavioural control is an individual's perception on the ease or difficulty on performing a particular behaviour (Ajzen, 1991). In this study, perceived behavioural control refers to a respondent's perception on how easy or difficult for them to consume soft drinks daily.

Control beliefs

Control beliefs are beliefs about the presence of a certain factor that facilitates or encourages them to perform a particular behaviour (Fishbein & Ajzen, 2010). In this research, control beliefs refer to a particular factor that determine the easiness or difficulty for a respondent to consume soft drinks.

1.6 Significance of the study

According to previous studies, there is a close relationship between the consumption of soft drinks with an increased energy intake and body weight; with lower appetite, food intake, calcium, and other nutrients, accompanied by an increased risk of several medical problems, such as the prevalence of childhood overweight and obesity (Bere et al., 2007; Gebremariam et al., 2012; Grimm et al., 2004; Lien et al., 2014; van der Horst et al., 2007; van der Horst et al., 2008; Vereecken et al., 2005; and Townsend et al., 2012). Over the past two decades, the sugar-sweetened beverage consumption rate had increased in many countries around the world, it is particularly important to better understand the trend.

The significance of this study is to provide valuable insights into children's eating and soft drink consumption behaviour to contribute in generation of knowledge. The TPB is efficient in understanding the reasons behind a particular behaviour (Ajzen, 1985) via the behavioural beliefs, normative beliefs and control beliefs underlying attitude towards soft drink consumption, subjective norms and perceived behavioural control. This theoretical based study will add value to the limited knowledge on children's eating and soft drink consumption behaviour in the country. By understanding the pattern of children's soft drink consumption and the factors associated, crucial interventions and policies at the individual and community level can be developed to promote healthy eating behaviour for future behavioural change initiatives.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides brief introduction and definition, covering topics on soft drinks, soft drink consumption, soft drink consumption and health consequences, Theory of Planned Behaviour, Theory of Planned Behaviour's measurement indicators and other factors influencing children's soft drink consumption. In this chapter, Theory of Planned Behaviour (TPB) were used as the basis for the research framework.

2.2 Soft Drinks

According to the Malaysia Food Regulations 1985, 'soft drinks' refers to flavoured drinks composed of potable water and permitted flavouring substances, with or without sugar, glucose, high fructose glucose syrup or edible portions of fruit extract or other plant substance. It may contain carbon dioxide, permitted preservatives, permitted colouring substances, permitted food conditioners, caffeine-containing plant extracts as permitted flavouring substances and preservatives (sulphur dioxide, benzoic acid, and sorbic acid).

According to Malaysian Standards 601:1994, soft drinks can be further classified into two groups: carbonated and non-carbonated beverages. Non-carbonated soft drinks include fruit drinks and flavoured drinks. Fruit drinks and flavoured drinks are prepared from comminuted fruit or fruit juices or concentrates and/or fruit or plant extracts, permitted sweeteners, potable water with or without permitted food conditioners; permitted flavouring substances; permitted preservatives; permitted colouring substances; and permitted nutrient

supplements such as vitamin C. Pure fruit juice, milk and milk-based drinks are not considered as soft drinks.

Carbonated soft drinks are non-alcoholic beverages saturated with carbon dioxide. They may also contain acidity regulators; permitted food conditioners; permitted flavouring substances; permitted preservatives; permitted colouring substances; permitted nutrient supplements like vitamin C; and salts. In this research, the term 'soft drinks' refers to carbonated beverages. If no adjective is used, the term refers to regular carbonated soft drinks. **Table 2.1** shows the different types of commonly consumed carbonated soft drinks.

Table 2.1: Types of carbonated soft drinks.

Type	Description
Regular soda or soft drinks	• Known as "pop" • Any liquid intended for sale for human consumption, either without or after dilution • *E.g.* Coca-Cola, Sprite, Pepsi
Isotonic drinks	• Carry the label "sports drink" or explicitly convey that the beverage should be consumed around physical activities, with phrases such as "for athletes", "pre-game fuel", and "post-game replenishment" for rehydration • *E.g.* 100Plus, Gatorade, Isomax
Clear lemonade	• Made from lemon, water and sugar • Colourless, carbonated, sweet soft drinks containing either natural or artificial lemon flavour • *E.g.* Kickapoo, 7 UP Revive Lemon Lime, Schweppes Bitter Lemon

Cont. Table 2.1

Carbonated squash	• Known as cordial • Non-alcoholic concentrated syrup, fruit-flavoured and made from fruit juice, water, and sugar or sugar substitute • *E.g.* KIRKS Lemon Squash
Non-alcoholic fruit punch	• Non-alcoholic drinks • Containing fruit or fruit juice • *E.g.* Cheers Fruit Punch, Vege Fruit Punch

Sources: Varnam & Sutberland (1994); Robert Wood Johnson Foundation (2009); Johnson et al. (2010); Harris et al. (2011)

One can of regular soft drink (240ml) contains 25 grams of added sugar and approximately 100 calories (Ministry of Health Malaysia, 2010). The Center for Science in the Public Interest described soft drinks as "liquid candy" (Jacobson, 2005). Sweeteners added in soft drinks could be sugar, high-fructose corn syrup, or sugar substitutes which are commonly used in diet drinks. In Malaysia, sugar types that are commonly added in soft drinks are glucose, high fructose glucose syrup or sucrose (Malaysia Food Regulations, 1985; Saniah & Samsiah, 2012). Throughout this research, the amount of soft drinks is expressed in millilitres.

Table 2.2: Sugar content in several sugar-sweetened drinks.

Types	Volume per pack/tin/bottle (ml)	Sugar content per pack/tin/bottle (g)	Estimated calories
Carbonated drink	240	25	100
Energy drink	330	59	236
Isotonic drink	240	16	64
Lychee drink	300	33	132
Flower tea	300	21	84
Cincau drink	300	27	108
Soy beverage	300	28	112
Tea	240	28	112
Blackcurrant drink	300	35	140

Source: Ministry of Health Malaysia (2010)

2.3 Soft Drink Consumption

Soft drinks have become increasingly popular and commonly consumed beverages in human daily life. Research has shown that annual soft drink consumption per person had increased globally from 36 litres in 1997 to 43 litres in 2010 (Basu et al., 2013). Similarly, the amount of annual Coca-Cola consumed worldwide also showed a remarkable increase from about 44 servings of finished 8 – fluid ounce (equivalent to 237 ml) in 1991 to 92 servings in 2011 (Coca-Cola company annual report, 2012). A news article reported that the Malaysians consumed about an average number of 1000 cans of soft drinks per minute (Bernama, 2007). Another report in 2010 stated that on average, a Malaysian consumed 17 litres of soft drinks every year (Euromonitor International, 2011). According to a recent research in Euromonitor International (2014), the total volume of sales of all soft drinks increased by 13.4% from 1.57 billion litres in 2011 to 1.17 billion litres in 2013 and this increase was due to an increase in the sales of non-carbonated drinks. The volume share of carbonated compared to non-carbonated soft drinks changed from 22:78 in 2011 to 21: 9 in 2013.

2.3.1 Consumption among Children

Over the past decades, the consumption rate of soft drinks among children had increased. According to French et al. (2003), the soft drink consumption rate among American children increased from 48% in 1977/1978 to 123% in 1994/1998. The percentage of energy intake from soft drinks increased from 2.9% (1977/1978) to 5.9% (1994/1998) and a larger increase was found in boys than girls (+133% vs +78%). Similarly, Nielsen and Popkin (2004) conducted a national survey to the changes in US beverage intake between

1977 and 2001. The results showed that the proportion of total energy obtained from soft drinks among the American children (2 to 18 years old) had increased from 3.0% (1977) to 6.9% (2011). Data from Australian Bureau of Statistics 1998 (Hector et al., 2009) also showed that per-capita intake of soft drinks increased with age among children, from 53 ml for 2–3 years old to 364 ml for 16–18 year olds. The average per-capita consumption among boys aged 16–18 years (480 ml per day) was twice the volume of girls (240 ml per day). Harnack et al. (1999) also reported that more than one third of school-aged children consumed at least 266 ml of soft drinks daily. Similar situation happened in Malaysia, WHO reported that in year 2012 about 23.2% of children and adolescents consumed soft drinks one or more times per day (Nur Nadirah et al, 2016). High soft drink intake may lead to excessive energy intake and subsequently contribute to childhood obesity (Troiano et al., 2000).

2.4 Soft Drink Consumption and Health Consequences

Several studies have provided scientific evidence on the association between soft drink consumption and increased risk of certain health issues such as obesity, enamel erosion, bone fractures and chronic disease. The detailed relationship between soft drink consumption and effects on health will be discussed in the following section.

2.4.1 Relationship between Soft Drinks and Calories, Weight Gain, BMI

The main sources of sugar in soft drinks are sucrose and high-fructose corn syrups (HFCS). Sucrose is a carbohydrate sweetener found in fruits and vegetables, honey, glucose syrup, and invert sugar syrup. High-fructose corn syrup is classified as a complex carbohydrate produced from corn syrup through an enzymatic process to increase its fructose

content together with the addition of glucose (Anderson, 1997; Chocolate, Biscuits & Confectionery of Europe, 1995).

Sugar sweetened soft drinks contain various amounts of added sugars and calories from sugar (**Table 2.3**). A glass of regular Mountain Dew (240 ml) has 31 g of sugars and 124 calories from sugar while a glass of pure apple juice (240 ml) only contains 26 g of sugars and 104 calories from sugar. In comparison, one cup of plain soy milk (240ml) contains only 6 g of sugar and 24 calories, while the calories of a can of Coca-Cola and Mountain Dew are slightly higher.

Table 2.3: Sugar content in different beverages.

Types	Volume per can/glass (ml)	Sugar content per can/glass (g)	Estimated calories from sugar
Coca-Cola	240	26	104
Mountain Dew	240	31	124
Minute Maid Orange juice	240	24	96
Apple juice	240	26	104
Lemonade	240	27	108
Milk	240	12	48
Low fat milk	240	12.5	50
Soy milk	240	6	24

Source: Beverages (2011)

Sugar-sweetened beverages are the largest contributors of added sugars as they have become a necessary component in daily diet of children (Swinburn et al., 2004). As sugar is a crucial source of energy and calories for the body, sugar-sweetened beverages have thus become the greatest single source of calories in children diet. According to the Dietary

Reference Intake (DRIs), the maximal intake of added sugar for children is 15 teaspoons or 60 g per day. One teaspoon is equivalent to 4 grams (**Table 2.4**).

Table 2.4: Maximal Intake of Added Sugar Suggested by Dietary Reference Intake (DRIs)

	Daily amount in grams (g)
Children	60
Adolescent	100
Female Adults	116
Male Adults	128

Source: Capital Health Edmonton Area (2007)

Several studies have attempted to explain the linkage between the intake of sugar-sweetened beverages and overweight as well as obesity (Bachmen et al., 2006; Foster-Powell et al., 2002). World Health Organization (WHO) has defined obesity as "a medical condition characterized by the excessive accumulation of body fat due to energy imbalance between calorie intake and calorie expenditure" (Balian, 2009). As direct measurement of body fat is difficult, body mass index (BMI), a simple index of weight-for-height, is used to determine overweight and obesity (Balian, 2009). U.S. Centers for Disease Control and Prevention (CDC) defined childhood overweight as a child or teenager whose BMI is equivalent or above the 85th percentile (BMI of 25kg/m^2) and below the 95th percentile (BMI of 30 kg/m^2) for people of the same age and sex; childhood obesity was defined as the group of children or teenager whose BMI are at least or above 95th percentile (BMI of 30kg/m^2) for people of the same age and sex (Centers for Disease Control and Prevention, 2006).

Several biological mechanisms were proposed to explain the association between the sugar-sweetened beverage consumption and obesity. Bachmen et al. (2006) suggested a simple biological mechanism: increased total calories consumed from sugar-sweetened beverages disrupts energy balance, as energy expenditure would be lower than the energy intake which would eventually lead to weight gain. However, this could not explain the direct linkage between soft drink consumption, its specific metabolic effects and weight gain. Foster-Powell et al. (2002) found that after consuming food and beverage with high glycaemic index (GI), blood glucose increased and led to a higher glycaemic load. High glycaemic load could lead to insulin resistance and obesity. Bachman et al. (2006) performed tests to prove this hypothesis but their results were inconsistent; hence, until today the cause and effects of soft drinks on weight gain remain unclear.

Inside the biological system, HFCS can induce high amount of fructose and glucose which enter into the blood stream and lead to an increase in fatty acid synthesis and esterification in liver. A large number of very-low-density-lipoproteins (VLDLs) will be synthesised and hence increase the concentrations of triacylglycerol and LDL cholesterol (Murray et al., 2003). Some studies pointed out that the digestion, absorption, and metabolism of fructose differ from those of glucose (Bray et al., 2004; Melanson et al., 2008). Fructose does not stimulate insulin secretion or leptin production but does help to synthesize fatty acids efficiently inside the cells (Bray et al., 2004). Leptin is a hormone involved in creating a feeling of fullness in the stomach. Fructose, as it does not stimulate the secretion of this hormone, might lead to emptiness in the stomach and a hungry sensation. However, there is limited evidence to prove that HFCS disrupts energy balance more than other types of sugars (Melanson et al., 2008).

Many studies have been conducted to investigate the relationship between sugar-sweetened beverage consumption and obesity by body composition among children and adolescent populations (**Table 2.5**). The literature search resulted in the identification of 22 studies in which, ten of the studies were cross-sectional (Andersen et al., 2005; Berkey et al., 2004; Collison et al., 2010; Forshee, Anderson & Storey, 2004; Forshee & Storey, 2003; Giammattei et al., 2003; Gillis & Bar-Or, 2003; Nicklas et al., 2003; Overby et al., 2004; Rodriguez – Artalejo et al., 2003), ten of them were prospective studies (Blum et al., 2005; Dubois et al., 2007; Jared, 2005; Ludwig et al., 2001; Mrdjenovic & Levitsky, 2003; Mundt et al., 2006; Newby et al., 2004; Phillips et al., 2004; Striegel-Moore et al., 2006; Tam et al., 2006) and two were experimental studies (Ebbeling et al., 2006; James et al.; 2004).

In total, 14 out of 22 studies showed significant positive associations between the consumption of sugar sweetened beverage and weight gain (Berkey et al., 2004; Collison et al., 2010; Giammattei et al., 2003; Gillis & Bar-Or, 2003; Nicklas et al., 2003; Dubois et al., 2007; Jared, 2005; Ludwig et al., 2001; Mrdjenovic & Levitsky, 2003; Phillips et al., 2004; Striegel-Moore et al., 2006; Tam et al., 2006; James et a., 2004; Ebbeling et al., 2006). Only one study showed a negative association between the consumption of sugar sweetened beverage and weight gain (Overby et al., 2004). As the methodological strength of the studies increases from cross-sectional to prospective and then to experimental study, the proportion of studies show a positive association between sugar sweetened beverage and weight gain which indicating the strength of effect (Hector et al., 2009).

Table 2.5: Number of studies linking soft drinks, to obesity based on their strength of evidence.

Increasing strength of evidence →

Association	Cross-sectional studies	Prospective studies	Experimental studies	Total number of studies
Positive	5	7	2	14
Non/not-significant	4	3	0	7
Negative	1	0	0	1

Cross-sectional Studies

Cross-sectional studies aim to investigate the relationship between different variables at one point in time (Center for Disease Control and Prevention, 2006) such as beverage consumption and weight gain. However, the direct connection between beverage consumption and the cause of weight gain would still remain unknown. Furthermore, variables in cross-sectional studies (like beverage consumption) should not be manipulated over time if they cannot be listed in longitudinal studies. Cross-sectional studies can use large national data and also make the results more generalizable as a more diverse population can be included. Five out of ten cross-sectional studies showed a significant positive association between the intake of sweetened beverages and weight gain (Berkey et al., 2004; Collison et al., 2010; Giammattei et al., 2003; Gillis & Bar-Or, 2003; Nicklas et al., 2003). There are another two studies suggested positive association but the association between consumption of sweetened beverages and weight gain was not significant (Forshee, Anderson & Storey, 2004; Forshee & Storey, 2003). Two other studies (Andersen et al., 2005; Rodriguez – Artalejo et al., 2003) showed no significant associations and one study (Overby et al., 2004)

showed inconsistent results and reported a negative association between added sugar and BMI in 13 years old girls (P = 0.013) but a positive association in 4 years old boys (P = 0.055). Some noteworthy findings were reported in two studies (Berkey et al., 2004; Collison et al., 2010) involving very large sample sizes, both of which included > 9000 children and adolescents. Berkey et al. (2004) found that the girls who consumed more sugar-added beverages were heavier and their BMI increased 0.06 per serving; P = 0.04. However, Collison et al. (2010) found that the overall prevalence of overweight and obesity was 12.2% and 27.0% respectively, with boys having higher obesity rates than girls ($P \leqslant 0.001$). Waist circumference and BMI were positively correlated with sugar-sweetened carbonated beverage intake in boys only. The association between male BMI and consumption of sugar-sweetened carbonated beverage was significant in a multivariate regression model ($P < 0.0001$).

Prospective Observational Studies

Prospective observational studies can be categorized as longitudinal prospective studies which investigated beverage consumption and weight gain over time. Observational studies follow a cohort of participants over time but do not attempt to change the respondents' beverage consumption behaviour. With observational studies, it is possible to make repeated assessments of expose and outcome, allowing researchers to assess the temporal relationship between exposure and outcome (Pereira, 2006). However, many biases still cannot be avoided in observational studies.

There are ten prospective observational studies included in this study. Seven out of the ten studies showed significant positive associations between intake of sugar sweetened beverages and greater weight gain (Dubois et al., 2007; Jared, 2005; Ludwig et al., 2001; Mrdjenovic & Levitsky, 2003; Phillips et al., 2004; Striegel-Moore et al., 2006; Tam et al., 2006) and another three studies reported non-significant associations between the intakes of sugar sweetened beverages and BMI (Blum et al., 2005; Mundt et al., 2006; Newby et al., 2004). Ludwig et al. (2001) not only examined on the positive association but also the changes in beverage consumption and BMI.

In a 19-month observational study of 548 school children (11-12 years old), Ludwig et al. (2001) found that changes in soft drinks intake were associated with overweight. Each additional 1.22 to 1.44 serving of sugar-sweetened beverage per day was associated with 1.4 times increase in the risk of overweight, and this risk increased to 1.6 when the total energy intake was controlled. Jared (2005) also found that sugar-sweetened soft drinks intake increased the risk of weight gain significantly compared to respondents who consumed diet soft drinks or did not consume soft drinks over a 4-year period.

However, the results in another study by Mundt et al. (2006) that involved 108 children aged 8-19 to examined the relationship between fat mass development and physical activity or sugar-sweetened beverage consumption was inconsistent. They found that there was no relation between soft drink consumption and fat mass development of males or females and there was also no interactive effect between sweetened beverage consumption and physical activity for fat mass development.

Experimental Studies

Randomized controlled trials are also known as experimental studies. Normally, experimental studies are used as a definitive test of causality while controlling for bias. However, as high costs are involved in order to conduct a clinical trial, limited number of this study type have been conducted to establish the association between sugar-sweetened beverages and BMI. In addition to clinical trials, findings from short-term feeding trials could provide valuable insight especially the possible linkage between sugar-sweetened beverage consumption and weight gain. An experimental study was conducted in schools and it involved 644 school children aged 7-11 (James et al., 2004). Researchers divided the school children into two groups and found a decrease in carbonated drink consumption of 0.6 glasses/3 day (50 mL/day) in the intervention group and an increase in carbonated drink consumption of 0.2 glasses/3 day (17 mL/day) in the control group. Reducing intake of carbonated drinks could successfully help to reduce the prevalence of overweight and obesity. Within 12 months, the mean percentage of overweight and obese children decreased by 0.2% in the intervention group and increased by 7.5% in the control group.

In another experimental study by Ebbeling et al. (2006), 103 adolescents aged 13-18 consumed at least 1 serving (250 ml) per day of sugar beverages for 25 weeks. This study aimed to evaluate the effect of decreasing consumption of sugar sweetened beverage on body weight. Participants were randomly assigned to an intervention group (intake of non-caloric beverages for 25 weeks) or control group (usual beverage consumption habit). The results showed that 82% of sugar-sweetened beverages intake was reduced in the intervention group while no change was observed in the control group. Decreasing intake of sugar-sweetened beverages was associated with baseline BMI among the subjects. Both the experimental

studies above found that reducing sugar-sweetened beverage consumption in children and adolescents had a beneficial effect on body weight and showed a strong association between sugar-sweetened beverage consumption and the baseline BMI.

2.4.2 Soft Drinks and Other Health Threats

(a) Dental Health

Enamel is the visible white layer which covers the tooth surface and is made from crystalline calcium phosphate (Jarvinen, Rytomaa & Heinonen, 1991). Enamel erosion is the loss of dental hard tissue from tooth surface caused by acid without involving any bacterial activities. As a result, the sensitive dentine underneath losses the protection by the enamel layer and is exposed to external stimulus (Cheng et al., 2009). Acid in dietary intake is generally believed to be one of the main factors of dental erosion (Jarvinen, Rytomaa & Heinonen, 1991).

The high sugar amount and acidic properties of soft drinks are two notorious characteristics which increase the risk of tooth decay in consumers. A recent review (Tahmassebi et al., 2006) pointed out that the acidic properties of soft drinks may lead to dental erosion particularly on the enamel surface. Micro-organisms on the dental plaque metabolise the sugar of soft drinks and generate organic acids which contribute to dental caries (Tahmassebi et al., 2006).

Jarvinen, Rytomaa and Heinonen (1991) found a considerable risk of dental erosion in consumers who drank soft drinks daily. A study involving 418 British school children aged 14 (Al-Dlaigan et al., 2001) also found that dental erosion had significant correlation with the intake of carbonated beverages, sport drinks and fruit juices. A similar result was shown by Marshall et al. (2003), in which 396 of American children (4-7 years old) who consumed soft drinks regularly had higher risk of suffering from dental caries compared to the non-consumers.

(b) Bone health

Osteoporosis is a bone disease where the bones become brittle and fragile due to decreasing bone mass (Tucker et al., 2006). This leads to bone structural changes and weakening, subsequently increasing the risk for bone fractures (Tucken et al., 2006). Poor nutrition and unhealthy lifestyle such as smoking are among the factors which lead to bone mass degradation (Astrom, 2004).

Evidence from previous studies suggested that soft drink consumption may be a risk factor to osteoporosis. Wyshak and Frisch (1994) found a strong association between carbonated soft drink consumption and bone fractures in 76 American girl of 8–16 years old. According to Petridou et al. (1997), carbonated beverages were significantly associated with risk of bone fractures among 100 Greek school children aged 7–14 years old. Wyshak (2000) also found similar result in terms of the association between carbonated beverage consumption and bone fractures among 460 American girls aged 14-15 years old.

Overall, the aforementioned studies suggested that high amount of phosphorus relative to calcium in the diet may increase bone loss from the skeleton and contribute to low bone mass which subsequently increase the risk of osteoporotic fractures. As 50% of total bone mineral in females is accumulated between 9 and 18 years of age, their adolescent years are very important in achieving maximal bone mass. To maintain skeletal integrity during adulthood, the best protection is to prevent bone fractures (Fassler & Bonjour, 1995; Johnston & Longcope, 1990; Matkovic et al., 1990; Lindsay et al., 1993; Weaver et al., 1995). Caffeine in soft drinks could increase the excretion of calcium in urine which might subsequently lead to an increase in the risk of osteoporosis (Kynast-Gales & Massey, 1994; Tucker et al., 2006).

(c) Chronic disease

The U. S. National Center for Health Statistics defined chronic disease as an illness or a human health condition that persists for a long time (more than 3 months) (Bortsov et al., 2011). Chronic diseases normally couldn't be prevented or cured by medication (Curhan & Forman, 2010). Diseases such as cardiovascular disease, obesity, stroke, cancer, arthritis, chronic respiratory diseases and diabetes were classified under chronic diseases (Bortsov et al., 2011).

Bortsov et al. *(*2011) argued that beverage intake is one of the key contributing factors to human health as it is associated with poor metabolic control and increased risk of cardiovascular diseases among the youths. High sugar-sweetened beverage intake might have an adverse effect on cardiovascular disease in youths with type 1 diabetes. High intake of sugar-sweetened beverage leads to the rise of blood sugar level. Individuals are exposed to

high risk of diabetes as our pancreas fail to produce enough insulin to absorb the excessive sugar in the blood into body cells. Youths with diabetes are strongly advised to avoid sugar-sweetened beverages.

Besides that, Curhan and Forman (2010) argued that sugar-sweetened beverages are associated with the increased serum uric acid levels and the risk of gout. Evidence showed that high fructose intake will increase the serum uric acid level which in turn leads to higher risk of hypertension and gout. However, this study failed to prove that hypertension was directly caused by sugar-sweetened beverage intake and its consequences on the diagnosis of diabetes, even though hypertension is a common problem in patients with both type 1 and type 2 diabetes.

2. 5 Theory of Planned Behaviour (TPB)

There is an increasing concern about food choices and dietary habits of children. Many research projects were performed to investigate the critical factors that influence the eating habits of children and adolescent. Several descriptive theoretical-based studies have been conducted to identify factors influencing soft drink consumption behaviour of children (Reibl et al., 2015; McDermott et al., 2015). Some atheoretical studies used questionnaires, survey or interviews to investigate the factors that influence the soft drink consumption behaviour in general (Gedrich, 2003; Groeneveld et al, 2007; Kotler & Keller, 2009; Vereeken et al., 2005b). However, some scholars pointed out that theoretical-based frameworks are effective to address health problems than research that are not based on theory (Riebl et al., 2015; McDermott et al., 2015).

Theory of Planned Behaviour is a theory explaining human behaviour by linking humans' belief and intention (Ajzen, 1991). The concept was proposed by Ajzen (1991) and its usefulness in the prediction of intention has been recognized and supported by many researchers (Armitage & Conner, 2001; McEachan et al., 2011). TPB can be extended for specific behaviours and target group (Ajzen, 1991; Ajzen, 2011). It has been widely used to understand various health-related behaviours such as alcohol consumption (Schlegel et al., 1992), breastfeeding (Swanson & Power, 2005), milk consumption (Berg, Jonsson & Conner, 2000; Gummeson, Jonsson & Conner, 1997), healthy food consumption such as fruits and vegetable (Branscum & Sharma, 2012) and physical activity (Hagger et al., 2001; Trost, Sauners, & Ward, 2002).

Several studies had applied TPB to determine the factors influencing the soft drink consumption among adolescent and children. **Table 2.6** summarizes nine previous studies; including six cross-sectional studies (Hewitt & Stephen, 2007; Kassem et al., 2003; Kassem & Lee, 2004; Kida & Åstrøm, 1998; Tak et al., 2011; van der Horst et al., 2008) and three prospective observational studies (Astrom, 2004; Astrom & Okullo, 2004; de Bruijn et al., 2007). The follow-up duration range of prospective observational studies was from three to six months. The youngest respondents were 10 years old (Hewitt & Stephens, 2007) while the eldest was 22 years old (Kida & Astrom, 1998). Most studies were conducted among children who were over 12 years old; only one out of ten studies were conducted among 10 years old children (Hewitt & Stephen, 2007). All nine studies were conducted overseas, three in Europe (de Bruijn et al., 2007; Tak et al., 2011; van der Horst et al., 2008), three in Africa (Astrom, 2004; Astom & Okullo, 2004; Kida & Åstrøm, 1998), two in the USA (Kassem et al., 2003; Kassem & Lee, 2004), one in New Zealand (Hewitt & Stephen, 2007) and none conducted in Malaysia. In this study, 9 to 12 years old Malaysian children were recruited to identify the factors influence their soft drink consumption behaviour based on TPB to contribute to the limited body of knowledge.

Table 2.6 Summary of previous studies about factors that influences soft drink consumption in children

Reference (year) Location Follow-up period	Participant Gender Age	Instrument Used	Theory/ Additional Constructs	Statistical Analysis	Main Finding
Cross-sectional Studies					
Hewitt and Stephens (2007) Australia, New Zealand	N=261 M,F 10-13 yrs	Self-report questionnaire	TPB; Behavioural beliefs; Parents' perceived responsibility; Parents' concern about child's weight; Parents' restriction of child's intake	Pearson's r correlations; Multiple regression	INT was significantly associated with SD intake ATT, SN, PBC significantly associated with INT Behavioural beliefs and Parents' restriction of child's intake was significant predictor as well
Kassem et al. (2003) USA, California	N=707 F 13-18 yrs	FFQ	TPB	Multiple regression	INT, PBC significantly associated with SD intake ATT was a strong predictor ATT, SN, PBC significant associated with INT
Kassem and Lee (2004) USA, California	N=564 M 13-18 yrs	FFQ	TPB	Multiple regression	INT, PBC significantly associated with SD intake ATT was a strong predictor ATT, SN, PBC significantly associated with INT
Kida and Astrom (1998) Africa, Tanzania	N=312 M,F 13-22 yrs	Self-report sugary snack and drinks intake questionnaire	TPB; Past behaviour; Perceived risk of tooth decay	Multiple regression	ATT, SN, PBC significant associated with INT Behavioural beliefs and Perceived risk of tooth decay was significant predictor as well Past behaviour was not significant

Cont. Table 2.6

Tak et al. (2011) Europe, Netherlands	N=1361 M,F 12-15 yrs	FFQ	TPB; Home environmental factor; Habit strength; Availability; Accessibility; Parental modelling; Parental rules;	Regression	INT ATT, SN, PBC was significantly associated with SD intake Habit strength was a predictor as well
van der Horst et al. (2008) Europe, Netherlands	N=1139 M,F 12-15	FFQ	TPB; Environmental factor; School food availability; Food stores in school; Neighbourhood; Parental norm; Parental modelling; Friend modelling		INT, ATT, SN, Parental norm, Parental modelling, friend modelling had significant associate with SD intake PBC was not significant
Prospective Observational Studies					
Astrom (2004) Africa, Uganda 3 months	N=372 M,F 13-19 yrs	Self-report sugary snack and drinks intake questionnaire	TPB; Past behaviour	SEM	INT, PBC were significant predictor ATT, SN, PBC significantly associated with INT
Astrom and Okullo (2004) Africa, Uganda 3 Months	N=1518 M,F 13-19 yrs	Self-report sugary snack and drinks intake questionnaire	TPB; Past behaviour	SEM	ATT, PBC significantly associated with INT

Cont. Table 2.1

de Bruijn et al. (2007) Europe, Netherlands 6 months	N=208 M,F 12-18 yrs	Soft drink consumption FFQ	TPB; Parenting practices; Big Five personality dimensions	Linear regression	INT was significantly associated with SD intake ATT was a strong predictor ATT, SN, PBC significantly associated with INT

Note: M=Male; F=Female; yrs=years; TPB=Theory of Planned Behaviour; INT=Intention; ATT=Attitude; SN=Subjective Norm; PBC= Perceived behavioural control; SD=Soft Drinks; FFQ=Food Frequency Questionnaire; SEM= Structural Equation Modelling

2.5.1 Definition of Measurement Indicator of Theory of Planned Behaviour

a) Attitude

Attitude is a kind of mental process that can determine one's actual response (Eagly & Chaiken, 1993). Social psychologists (Thomes and Znaniecki, 1918; Eagly & Chaiken, 1993; Ajzen, 1991) believe that attitudes are causally related to human behaviour. Human action could be explained and predicted by understanding one's attitude and thought (Eagly & Chaiken, 1993). TPB is one of the most common model used for examining the relationship between the attitude of respondents and soft drink consumption (Hewitt & Stephen, 2007; Kassem et al., 2003; Kassem & Lee, 2004; Kida & Astrom, 1998; Tak et al., 2011; van der Horst et al., 2008). Some previous studies have reflected that attitude was the strong predictor of intention to consume soft drinks (Kida & Astrom, 1998; Kassem et al., 2003; Kassem & Lee, 2004; de Bruijin et al., 2007).

(b) Subjective norm

Subjective norm explains how social environment influence human intention and behaviour (Ajzen, 1991). In TPB, subjective norm refers to one's perception on how others or social expectation on performing or not performing certain behaviour (Ajzen, 1991). However, this perception may or may not be congruent with other expectations or desires (Ajzen & Fishbein, 1980). According to Armitage and Conner (2001), subjective norm is the weakest predictor in TPB construct and had the least contribution in explaining intention if compared with attitude and perceived behavioural control. However, subjective norm was a significant predictor of intention (Astrom, 2004; de Bruijin et al., 2007; Hewitt & Stephens,

2007; Kassem et al., 2003; Kassem & Lee, 2004; Kida & Astrom, 1998; Tek et al., 2001; van der Horst et al.; 2008).

(c) Perceived behavioural control

Perceived behavioural control refers to external factors such as availability, accessibility, time and money consumed, and internal factors such as ability, skills and ease to get information (Ajzen, 1991). Perceived behavioural control is also believed to be the same as self-efficacy and if considered along with the TPB will address human behaviour that is not under one's willingness. Self-efficacy refers to one's beliefs in one's ability to achieve the expectation or targeted achievement and this belief can influence one's decision making and action (Bandura, 1977). According to Ajzen (2002), self-efficacy and controllability item should be included to measure one's perceived behavioural control. The self-efficacy item can be used to access someone's ability to cope with a variety of difficulties in life to perform certain behaviour; controllability items can be used to find out one's ability to control oneself in performing a certain behaviour (Ajzen, 2002). Previous studies have shown that perceived behavioural control was a significant predictor of intention in TPB construct (Astrom, 2004; Astrom & Okullo, 2004; de Bruijn et al., 2007; Hewitt & Stephens, 2007; Kassem & Lee, 2004; Kassem et al., 2003; Kida & Astrom, 1998; Tak et al., 2011).

(d) Intention

Intention is an expression expected to predict a corresponding action accurately, and it acts closely and correlates strongly with behaviour (Ajzen, 1988). Intention was one of the most important predictor beside perceived behavioural control (Godin & Kok, 1996). However, some researchers argued that the influence of intention varies by food type (Balian, 2009), age group (Baranowski et al., 1999), and gender (Kassem & Lee, 2004; Kassem et al., 2003). Previous studies found that females (28%) explained more of the variance in soft drink consumption compared to males (15%) (Kassem & Lee, 2004; Kassem et al., 2003) while the predictive values of children's intention is lower than adults and adolescents (Baranowski et al., 1999). In previous studies, intention was a significant predictor of soft drink intake among the children and adolescents (Astrom, 2004; de Bruijn et al., 2007; Hewitt & Stephens, 2007; Kassem & Lee, 2004; Kassem et al., 2003; Tak et al., 2011; van der Horst et al., 2008).

2.6 Other Factors Influencing Soft Drink Consumption

There are many other factors that influence children's soft drink consumption such as gender, race, BMI, parents and friends, availability, taste, concerns about health, cost, and marketing of soft drinks which are defined in following statements.

(a) Gender

Gender is one of the key factors influencing children's eating behaviour and taste preference (McGinnis, et al., 2006). In a cross-national study with large number of respondents carried out to study health behaviour among the European school children by Vereecken et al. (2005b), they found that girls generally consume lesser soft drinks than boys. Several studies found that the factors influencing soft drink consumption were different for both genders and interestingly some factors appeared to induce no effect in girls (Haerens et al., 2007; Kassem & Lee, 2004; Kassem et al., 2003). According to Haerens et al. (2007), there was no association between social or family-related factor with soft drinks intake among the girls. According to previous studies done in the United States, although there were many similar predictors found in both genders, girls were more likely to believe that consuming soft drinks will cause weight gain and consumption of too much caffeine. Girls were also found to be more likely to try to avoid it, especially the group of girls with negative attitudes towards regular soft drink consumption (Kassem & Lee, 2004; Kassem et al., 2003).

(b) Ethnic Race

The effect of ethnic race on the influence on soft drink intake among the children was less investigated in Malaysia. Two studies done in America showed that white children were more likely to consume soft drinks than black children (Harnack et al., 1999; Rajeshwari et al., 2005). Another research study was carried out in Australia among children of 6 to 10 years old. The soft drink consumption of Asian students was lower than those from the Middle East, while the consumption rate of students from Southern Europe was the highest among the respondents (Booth et al., 2006). Previous studies also showed that Asian children consumed less milk and calcium compared to Caucasians (Novotny et al., 2003).

(c) BMI

Previous studies noted that there was a significant association between BMI and beverage preference (LaRowe et al., 2007; Rajeshwari et al., 2005). Rajeshwari, et al. (2005) found that American children especially those who loved to consume soft drinks, their BMI had significantly increased within ten years of the study compared to those who did not love to consume soft drinks. Similar results were reported by LaRowe, et al. (2007), who found that American children who consumed soft drinks had higher BMI compared to those that consumed other beverages. Besides that, children's BMI was also found to be positively related to attitude and their body weight (Baker et al., 2000).

(d) Parents and Friends

Previous research found that parents' eating behaviour will influence their children's eating habit and preferences by acting as their role models (Birch & Fisher, 1998). Parents' soft drink consumption behaviour was also associated with children's soft drink consumption (Grimm et al., 2004; Orlet-Fisher et al., 2000). Grimm, et al. (2004) found that when parents consume soft drinks regularly their child were 2.8 times more likely to consume soft drinks 5 or more than 5 times per week compared to those children whose parents did not consume soft drinks regularly. A similar finding was also reported by Tak et al. (2011) who found that the type of soft drinks consumed by adolescents was highly dependent on the parents' choice.

Permission from parents to consume soft drinks is claimed to be one of the key factors shaping the beverage consumption trend among children especially middle school students as reported by previous studies. Nickelson, Roseman and Forthofer (2010) found that family factor had high influence over children's behaviour in the school environment. Students with strict parental limits to soft drink purchases were less likely to purchase soft drinks from school vending machines and consume soft drinks. In other words, restriction from parents not only could limit soft drink consumption of children at home but also influenced children's decision regarding soft drink purchases at school.

Parents are the central agents influencing children's food habit. Some studies had even pointed out that parents play a more important role in influencing and shaping of soft drink consumption behaviour among the children compared to friends (Berg, Jonsson & Conner, 2000; Grimm et al., 2004; Kassem & Lee, 2004; Kassem et al., 2003). However,

Vereecken et al. (2005b) found that children with friends who had frequent soft drink consumption behaviour had higher intention to consume soft drinks. Friends had posed impact on children's soft drink intake and predicted subjective norm (Kassem & Lee, 2004; Kassem et al., 2003).

(e) Availability

A number of studies highlighted that soft drink consumption was related to soft drink availability and accessibility. (Balian, 2009, Grimm et al., 2004; Kassem & Lee, 2004; Kassem et al., 2003; Tak et al.; 2011). Previous studies found that availability of soft drinks at home, living area and school were associated with soft drink intake (Grimm et al., 2004; Kassem & Lee, 2004; Kassem et al., 2003). A previous study done in the United States showed that the "soft drinks available at home" variable was an important predictor of soft drink consumption among the 8 to 13-year-old children (Grimm et al., 2004). Tak et al. (2011) carried out research to examine the relationship between home environment variables including soft drink availability and accessibility with adolescents' soft drink consumption. The consumption rates were also found to be proportional to availability and accessibility of soft drinks. However, Balian (2009) argued that school-aged children were less likely to be influenced by the "availability" variable.

(f) Taste

Some previous studies pointed out that taste is one of the factors which plays an important role in influencing children's food choices (Birch & Fisher, 1998; Nicklas et at., 2003; Grimm et al., 2004). A study carried out to investigate the factors influencing soft drink consumption among 560 children aged 8 to 13 years old showed that children who had strong taste preference were 4.5 times more likely to consume soft drinks 5 or more than 5 times per week than those who did not have strong taste preference (Grimm et al., 2004). Besides this, the taste of drinks also play an important role in children's beverage choice especially soft drinks (Grimm et al., 2004) and milk (Berg, Jonsson & Conner, 2000). Taste has also a direct relationship with attitude towards soft drink intake (Kassem & Lee, 2004; Kassem et al., 2003).

(g) Health

Three previous studies that used "health" as a predictor of attitude toward soft drink intake in TPB construct (Berg, Jonsson & Conner, 2000; Kassem & Lee, 2004; Kassem et al., 2003). Berg, Jonsson & Conner (2000) reported that the most of Swedish children had moderate knowledge about the risk of consuming soft drinks and aware with the effects of soft drink consumption to health. Another two studies (Kassem et al., 2003; Kassem & Lee, 2004) were conducted in United Stated also found that most of their respondents knew the potential health risks of soft drinks.

(h) Cost

Some studies pointed out that cost is one of the main factors that influence non-healthy food and beverage consumption (Drewnowski & Bellisle, 2007; Kassem & Lee, 2004; Kassem et al., 2003; Buchanan & Coulson, 2006). Drewnowski and Bellisle (2007) reported that low price is one of the main factors affecting obesity-promoting capacity of soft drinks besides taste. In another study of 13 to 14 years old British, Buchanan and Coulson (2006) also found that cost is an important determinant which influenced respondents' decision on beverage consumption. Besides that, Kassem and Lee (2004) and Kassem et al. (2003) also found that cost is one of the main factors influencing soft drink consumption among the adolescents.

(i) Marketing

Soft drink companies use various types of marketing strategies to increase their sales through channels such as media advertising, sponsoring events, tie-in with movies and entertainment group, promoting in schools through vending machines and using pop culture (Austin & Rich, 2001; Jacobson, 2005, Nestle, 2000). In Europe, researchers had found that advertisements and television commercials, the availability of vending machines in schools and the promotion of healthy food items were identified as factors leading to soft drink consumption behaviour among children and adolescents (Vereecken et al., 2005b). Similarly, Grimm et al. (2004) also found that media advertisement was one of the main factors influencing soft drink consumption rate among children and adolescents who consumed soft drink regularly. Besides that, previous studies also found that advertisement influenced American adolescents' ability to control themselves from consuming soft drinks (Kassem &

Lee, 2004). Kelly et al. (2008) pointed out that soft drinks were the most common food products advertised in Australian primary and secondary school. However, New South Wales Schools Physical Activity and Nutrition Survey (2004) reported that children aged 6 to 10 bought soft drinks not because of advertisements' influence (Booth et al., 2006).

2.7 Summary for The Factors Influence Soft Drink Consumption

A number of previous studies pointed out that soft drink consumption rate among the children had increased over the years (French et al., 2003; Nielsen & Popkin, 2004; Hector et al., 2009). A few researchers used theoretical-based frameworks to study and identify factors influencing the soft drink consumption behaviour (Gedrich, 2003; Groeneveld et al, 2007; Vereeken et al., 2005b). They believed that theoretical-based studies could identify the main factors that influence the soft drink consumption effectively and it is useful in addressing health problem compared to studies that were not theoretical-based. Based on previous studies, we found that TPB was effective in determining the factors influencing soft drink consumption; all main indicators of TPB (intention to consume soft drink, attitude towards soft drink consumption, subjective norm and perceived behavioural control) predicted the soft drink consumption behaviour significantly. Besides that, there are a number of other factors that influences on children's soft drink consumption such as gender, ethnic race, BMI, parents and friends, availability of soft drinks, taste of soft drinks, concerns about health, cost, and marketing of soft drinks. Some factors have been selected and added into TPB construct such as concerns about health, parents and friends, availability of soft drinks, taste of soft drinks, and marketing of soft drinks. The factors were selected and classified into three main groups: behavioural belief, normative belief and control belief based on suggestions by previous studies (Balian, 2009; Kassem et al., 2003).

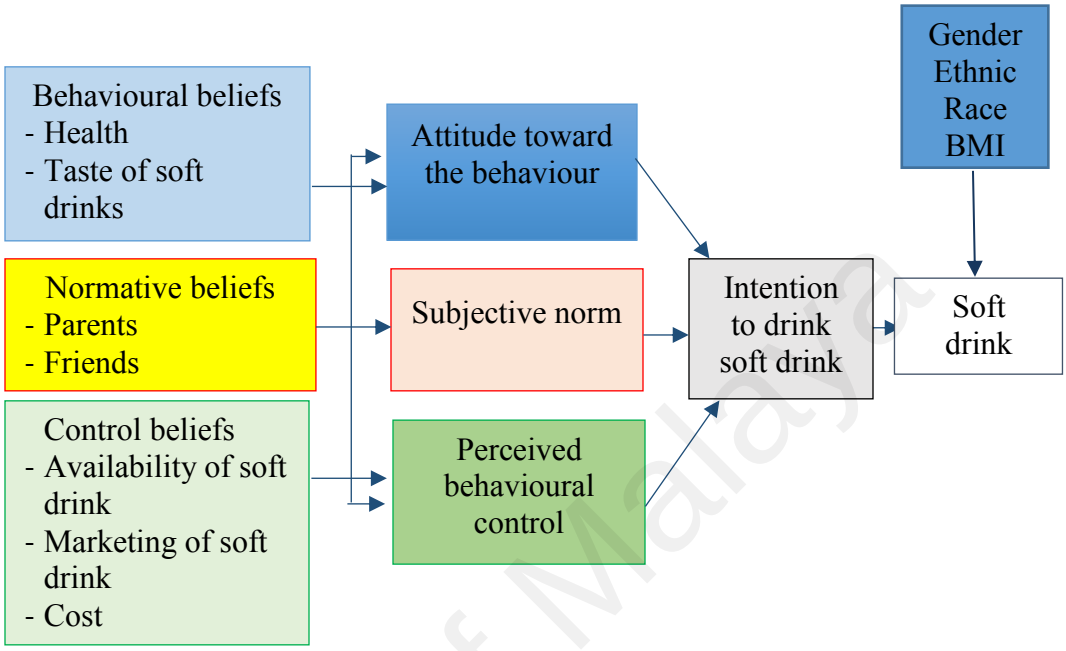


Figure 2.1 Theoretical Model of the Theory of Planned Behaviour

Sources: Ajzan (1991); Kassem (2003) & Balian (2009)

CHAPTER 3: RESEARCH METHODOLOGY

This chapter provides the methods used by the researcher to conduct this study. The main focus was to identify the patterns of soft drink intake among children. The secondary objective is to investigate the factors influencing children's soft drink consumption using Theory of Planned Behaviour (TPB). Quantitative investigation was conducted to achieve the objectives of this study.

3.1 Research Design

A cross-sectional descriptive correlational design was employed to determine the relationships between variables through the TPB constructs and respondents of different ages, gender and ethnicity were studied at only one time point. Through the cross-sectional design, the association between variables can be established but not the causation (Centers for Disease Control and Prevention, 2006). Some previous studies pointed out that quantitative research methods as one of the most common and efficient ways to understand factors influencing school age children's eating behaviour (Bendelow et al., 1996; Edwards & Hartwell, 2002; Gummeson, Jonsson & Conner, 1997). Survey was conducted to collect information directly from children about their beverage preferences and soft drink consumption behavior. From the collected information, the factors influencing children consumption of soft drinks can be determined and the data serves as a basis for future research.

3.2 Subject Sampling

Nowadays children will spend most of their time in school, respondents from different background, age, race and gender can be easily recruited in school **(**Balian, 2009). Thus, this study was carried out in selected primary schools in Malaysia. The subject variables were male and female school children aged 9 to 12 years old. The respondents resided in urban areas (Petaling Jaya, Cheras, Selangor) and rural areas (Parit Ya'ani, Yong Peng, Batu Pahat, Johor) of Malaysia. According to the Malaysian population report in year 2015, Selangor has the largest population in Malaysia with a number of 6,073,180 residents while Johor is Malaysia's second-most populated state with a total of 3,553,600 residents (Department of Information, 2015). The age of the respondents was taken into account and adjustments were made because previous research stated that assessing beverage consumption among young children (< 9 years old) can be challenging and young respondents faced difficulty to understand the questionnaire (Malik et al., 2006). According to Kelder, et al. (1994), 11 to 12 years old children will establish their eating patterns based on their food preference, so research should be carried out by targeting this group of children to identify and compare their eating behaviour with other age groups. Selecting this age group as our subject of study allowed us to identify the pattern of soft drink consumption and determining factors leading to soft drink intake among the school children.

A random sampling strategy was used to select sufficient amount of respondents. This strategy is a time-effective and convenient to achieve the desired number of respondents while eliminating sampling bias (Hunt & Tyrrell, 2001). Permission was obtained from school principals to conduct this study. Written informed consent forms with information of

this research were distributed to respondents' parents. Only school children who had obtained parental consent for participation in this research and good in health were selected. According to Balian (2009), healthy children should be without the following health conditions: small for gestational age (SGA), global developmental delays, chronic feeding difficulties caused by neurological or muscular disorders, food allergies, diabetes mellitus, thyroid disease, parathyroid disease, polycystic ovary syndrome, chronic inflammatory diseases, Trisomy, Cri-du-chat, fetal alcohol syndrome and Williams Syndrome. Children with such diseases were excluded. To fulfil the random sampling requirements, all students' details were put in one list based on their age and living area, 137 respondents were randomly selected from each age group by using Microsoft Excel's "Randomize" function.

3.3 Sample Size

Krejcie and Morgan (1970) devised one of the most common methods used in academic research to estimate sample size by using the following formula:

$$S = \frac{\chi^2 Np(1-p)}{d^2(N-1) + \chi^2 p(1-p)}$$

Where:

S = estimated sample size
χ^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level
N = the population size
p = the population proportion (assumed to be .50 since this would provide the maximum sample size)
d = the degree of accuracy expressed as a proportion (.05)

According to the statistics by the Malaysian Ministry of Education, 2.704 millions of children were under 7 to 12 years old in year 2014 (Ministry of Education Malaysia, 2014).

Based on Krejcie and Morgan's (1970) table, 384 respondents would be needed to represent a cross-section of the population. To achieve 384 respondents with the consideration of a 30% drop-out rate, the estimated sample size for this study was 550 children. Invitations were sent to 200 schools in Selangor and Johor but only 10 schools replied. Only six primary schools (two *Sekolah Kebangsaan*, two *Sekolah Jenis Kebangsaan Cina* and two *Sekolah Jenis Kebangsaan Tamil*) were selected and involved in this research. Thus, 275 surveys had been distributed to urban areas (Petaling Jaya, Cheras, Selangor), and another 275 surveys distributed to rural areas (Parit Ya'ani, Yong Peng, Batu Pahat, Johor). The final sample consisted of 454 respondents. Among the respondents, 227 respondents were recruited from urban areas (Petaling Jaya, Cheras, Selangor), and another 227 respondents were from rural areas (Parit Ya'ani, Yong Peng, Batu Pahat, Johor).

3.4 Measurement and Data Collection

A self-administered questionnaire was designed in close-ended questions to avoid dichotomous answer which would minimize the variance. Visual analogue scales (VAS) were used in this research. VAS is a measuring instrument used for characteristic or attitude that cannot be easily and directly measured (Gould et al., 2001). It consists of a statement at each end of a 100 millimeter (mm) line to represent one extreme limits of the parameter being measured. The respondent marked on the line where they felt best representing their answers (Gould et al., 2001). Previous studies reported that school-age children couldn't understand 5-point scales or 9-point scales so some researchers modified the Likert scale to 3-point scales and even 2-point scales (Saunders et al., 1997; Trost, Sauners, & Ward, 2002). VAS had been used in other food intake studies (Barkeling, Rossner, & Sjoberg, 1995; Flint et al.,

2000). Visual analogue scales (VAS) can effectively avoid measurement problems that have been face by previous studies (Balian, 2009).

At the beginning, the questionnaire development was based on four previous studies (Balian, 2009; Chan, 2011; Kassem et al., 2003; Phoon, 2011), its validity was reviewed by two faculty members, who were experts in food and nutrition. The questionnaires were modified based on their professional opinion (**Table 3.1**). Visual analogue scales had been suggested by the experts because they could keep the question items free from numerical labels to minimize bias. To minimize confusion for a questionnaire, all negative answers should stay on the left of the visual analogue scales and positive responses should be on the right side (Balian, 2009). Cronbach's alpha had been test on questionnaire items to evaluate the internal consistency. The Cronbach's alpha for questionnaire items was 0.771.

Table 3.1 Ranges of the items in the questionnaire.

Question item	Response/ Range	Resources	
Personal background			
1. Age	9 -12	Balian (2009), Chan (2011), Phoon (2011)	Adapted
2. Gender	Boy /Girl	Balian (2009), Chan (2011), Phoon (2011)	Adapted
3. Race	Malay/Chinese /India	Balian (2009), Chan (2011), Phoon (2011)	Adapted
4. Living area	Rural/ Urban	Phoon (2011)	Adapted
5. Family income	RM1000 – RM4000	Phoon (2011)	Adapted
6. Do you drink soft drinks?	No/ Yes (0 – 100)	Chan (2011), Phoon (2011)	Adapted
7. How many cans of soft drinks do you consume daily?	Cans/ cups/ bottles (0 – 3000ml)	Phoon (2011)	Adapted and Modified
8. Which type of beverage do you prefer?	1 – 8	Chan (2011), Phoon (2011)	Adapted and Modified
9. Which type of soft drinks do you prefer?	1 – 13	Chan (2011), Phoon (2011)	Adapted and Modified
10. When will you consume soft drinks?	1 – 9	Chan (2011), Phoon (2011)	Adapted and Modified
11. Normally where will you consume soft drinks?	1 – 3	Chan (2011), Phoon (2011)	Adapted and Modified
Intention to drink soft drinks			
12. I plan to drink soft drinks every day.	No/ Yes (0 – 100)	Balian (2009), Chan (2011)	Adapted and Modified
13. How likely is it that you will drink soft drink every day?	Unlikely/ Likely (0 – 100)	Balian (2009),	Adapted and Modified

Cont. Table 3.1

14. I will drink at least 1 can of soft drinks every day.	No/ Yes (0 – 100)	Phoon (2011)	Adapted and Modified
Attitude towards soft drinks			
15. Drinking soft drinks every day is very important to me.	Disagree/ Agree (0 – 100)	Balian (2009), Chan (2011)	Adapted and Modified
16. Drinking soft drinks every day is good for me.	Disagree/ Agree (0 – 100)	Balian (2009), Chan (2011)	Adapted and Modified
17. Drinking soft drinks every day is very enjoyable.	Disagree/ Agree (0 – 100)	Balian (2009),	Adapted and Modified
Behavioral belief about soft drinks intake			
18. Drinking soft drinks makes me healthy.	Disagree/ Agree (0 – 100)	Balian (2009), Chan (2011)	Adapted and Modified
19. Drinking soft drinks will cause tooth decay.	Disagree/ Agree (0 – 100)	Kassem (2003)	Adapted and Modified
20. Drinking soft drink will cause obesity	Disagree/ Agree (0 – 100)	Balian (2009), Chan (2011)	Adapted and Modified
21. For me, the taste of soft drinks must be sweet.	Disagree/ Agree (0 – 100)	Kassem (2003)	Adapted and Modified
Subjective norm to soft drinks			
22. My friends drink soft drinks every day.	Disagree/ Agree (0 – 100)	Balian (2009), Chan (2011), Kassem (2003)	Adapted and Modified
23. My family members drink soft drinks every day.	Disagree/ Agree (0 – 100)	Balian (2009), Chan (2011), Kassem (2003)	Adapted and Modified
Normative beliefs about soft drinks			
24. I will drink soft drinks when my family member thinks I should do so.	Disagree/ Agree (0 – 100)	Balian (2009), Kassem (2003)	Adapted and Modified
25. I will drink soft drinks when my parents think I should do so.	Disagree/ Agree (0 – 100)	Balian (2009), Kassem (2003)	Adapted and Modified

Cont. Table 3.1

26. I will drink soft drinks when my friend encourages me and thinks I should do so.	Disagree/ Agree (0 – 100)	Kassem (2003)	Adapted and Modified
Perceived behavioral control over soft drink intake			
27. I can easily get soft drinks and consume it.	Disagree/ Agree (0 – 100)	Balian (2009)	Adapted and Modified
28. I can decide whether I want to drink soft drinks or not.	Disagree/ Agree (0 – 100)	Balian (2009)	Adapted and Modified
29. Do you control yourself not to drink soft drinks every day?	No control/ Complete control (0 – 100)	Balian (2009)	Adapted and Modified
Control beliefs about soft drink intake			
30. Do you drink soft drinks at home?	No/ Yes (0 – 100)	Balian (2009), Chan (2011), Kassem (2003)	Adapted and Modified
31. Are you allowed to drink soft drinks?	No/ Yes (0 – 100)	Balian (2009), Chan (2011), Kassem (2003)	Adapted and Modified
32. Do you drink soft drinks at school?	No/ Yes (0 – 100)	Balian (2009), Chan (2011), Kassem (2003)	Adapted and Modified
33. When I see advertisement promoting soft drinks on social media, it will encourage me to consume soft drinks.	Disagree/ Agree (0 – 100)	Kassem (2003), Phoon (2011)	Adapted and Modified

3.5 Statistical Analysis

Statistical analysis of the data was performed using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics such as frequency and percentage were used to describe and summarize features of the sample and the dependent variables. T-test was conducted to determine associations of descriptive variables with soft drink consumption. Frequency, means and standard deviations of independent variable were examined as well to describe its features. Missing values and outliers of data were examined before conducting data analysis.

Assumptions of multiple regression were examined to ensure they were not robust against violation. (1) Linearity and additivity of the relationship between dependent and independent variables were assessed by examining scatterplots of residuals (Mertler & Vannatta, 2002). (2) Data were also determined for normality by examining histograms and P-P plots. (3) Homoscedasticity of the variance was also checked by visual examination of residual scatterplots. Residual should randomly scatter around the reference line providing a relatively even distribution (Tabachnick & Fidell, 2001). (4) Multicollinearity were also determined by examining the Tolerance and Variance Inflation Factor (VIF). (5) To determine the constant of equation, zero mean was conducted by checking the mean and standard deviation of the standardized residual. (6) Durbin-Watson statistics were examined to evaluate the independence. Separate multiple regression analyses were conducted to examine how soft drink consumption behaviour coule be predicted from the variables based on TPB model. This data analysis method was proposed by Balian (2009).

CHAPTER 4: RESULTS

The objectives of this study were to determine the patterns of soft drinks intake among children and investigate factors that influence children's soft drinks consumption. This chapter reveals the patterns of soft drinks intake and factors that influence the soft drink consumption of the respondents. The results will be demonstrated in the end of this section.

4.1 Demographics

Data were collected from 227 students from rural areas (117 males and 110 females) and 227 students from urban areas (119 males and 108 females), a total sample size of 454 students (236 males and 218 females). There were 39.4% of the respondents were Malay, 31.5% were Chinese and 29.1% were Indian. Among the respondents, 25.3% were 9 years old; 24.2% were 10 years old; 22.9% were 11 years old; and 27.5% were 12 years old (**Table 4.1**). There were 16.5% of respondents were from a low income family with monthly household incomes of less than RM1500 while about 61.2% of respondents were from families with monthly household income between RM 1501 and RM 3500. Only 22.3% of respondents came from a family with parents' income of more than RM 3500.

Table 4.1 Frequencies of demographic characteristics of the study sample

Characteristics	Frequency, n	Percentage, %
Age		
9	115	25.3
10	110	24.2
11	104	22.9
12	125	27.5

Cont. Table 4.1

Gender		
Male	236	52.0
Female	218	48.0
Ethnicity		
Malays	179	39.4
Chinese	143	31.5
India	132	29.1
Living Area		
Rural	227	50.0
Urban	227	50.0
Family Income		
<RM1500	75	16.5
RM1500-3500	278	61.2
RM3501-5500	59	13.0
>RM5500	42	9.3

4.2 Soft Drink Consumption Pattern

Majority of the respondents (94.9%) reported that they consumed soft drinks at least once a week and only 5.1% of them reflected that they seldom consume soft drinks. There were 39% of respondents consumed 251 ml to 500 ml of soft drinks per day and 33.5% consumed less than 250 ml per day. Only 27.5% of respondents stated that they consume soft drinks more than 500 ml per day. Among the respondents who consumed soft drinks more than 1000 ml per day, more than half were male (66.7%). Among the respondents who consumed more than 500 ml of soft drinks per day, the percentage of older age (11-12 years old) school children (56%) was slightly higher than younger age (9-10 years old) school children (44%). **Figure 4.1** showed that among school children who consumed more than 1000 ml of soft drink per day, 50% of them were Malay and 93% of them came from income

family were more than RM3500. Besides that, the results showed that children who consumed more than 1000 ml of soft drinks per day more than half were from an urban area (51.8%) and most of them is male (66.7%).

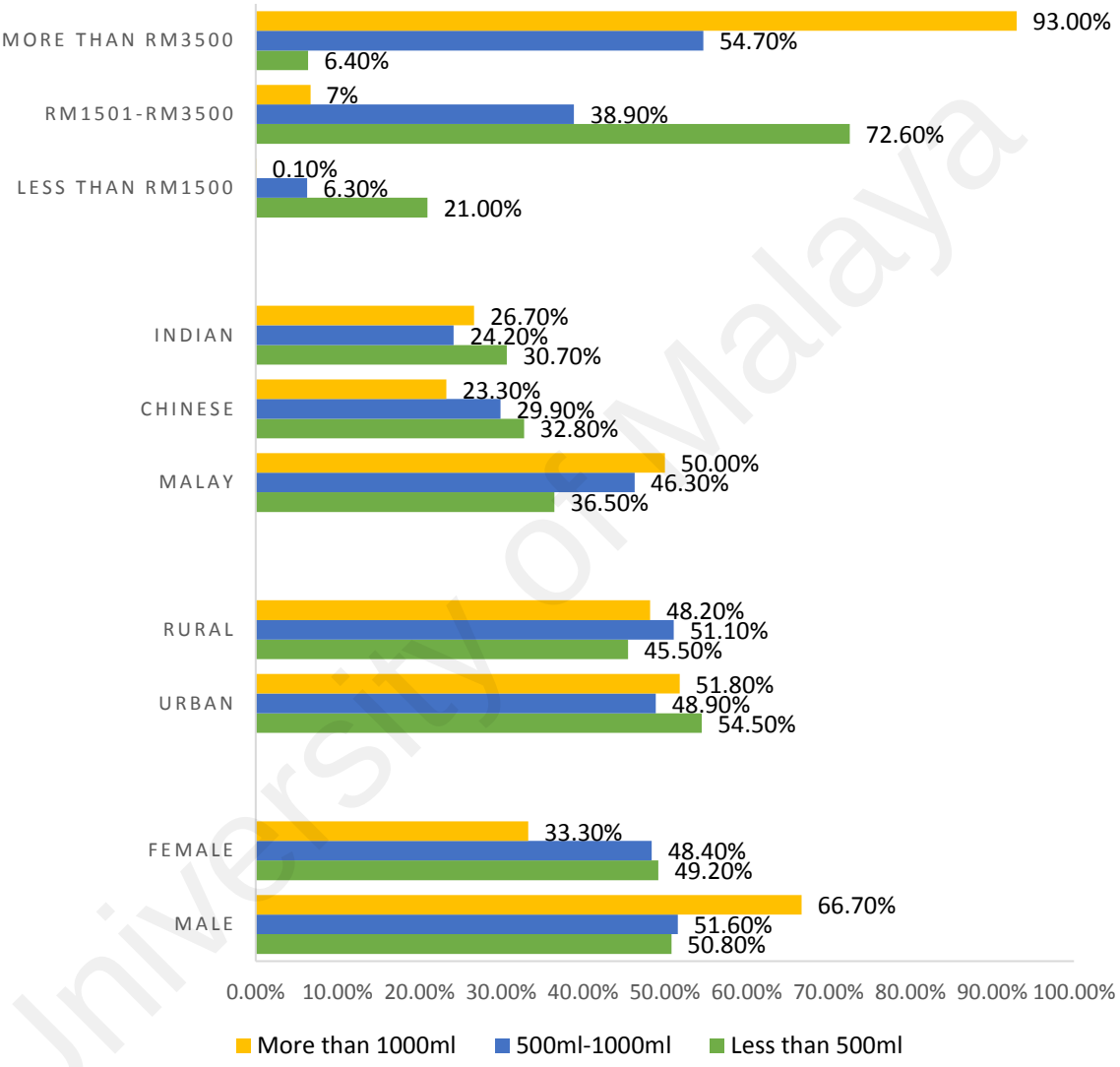


Figure 4.1: Amount of daily soft drinks consumption.

The patterns of soft drinks intake of this study are showed in **Table 4.2**. There were 25.2% of the respondents reported that they normally consumed soft drinks during special occasion or in parties and 10.8% of respondents reported that they prefer to consume soft drinks during weekend or leisure time. There were 15.3% of respondents stated they consumed soft drinks after sport. A considerable number of respondents (15.2%, n=139) just consumed soft drinks when they feeling thirsty. There were 13.1% of respondents consumed soft drinks after meal, 9.3% consumed with snacks, 6.6% consumed with food, 2.7% with others, and only 1.8% consumed before meal. The majority (47%) consumed soft drink at home, followed by 30% who had it at school. About 22.9% of respondents consumed soft drinks in restaurants or fast food restaurant.

Table 4.2 Patterns of soft drinks intake

Variables		Percentage, %
Occasion when soft drinks were consumed	In party/ special occasion	25.2
	After sport	15.3
	When feeling thirsty	15.2
	After meals	13.1
	Leisure time/weekends	10.8
	With snacks	9.3
	With food	6.6
	Other	2.7
	Before meals	1.8
Place where soft drinks were consumed	Home	47.0
	School	30.0
	Restaurants/fast food restaurant	22.9

The most popular beverage among eight different types of common drinks were also identified and demonstrated in **Figure 4.2**. The results clearly shows that fruit juice was the most popular beverage selected by 22.5% of the respondents, followed by soft drinks (15.1%), tea (14.3%), milk (13.9%), soya drinks (13.7%), coffee (10.0%), malt drinks (6.3%) and others (4.2%). When the respondents were asked to make a selection between milk and carbonated drinks based on personal preference, 20.9% of respondents reported that they preferred soft drinks to milk and 14.4% of respondents selected both soft drinks and milk.

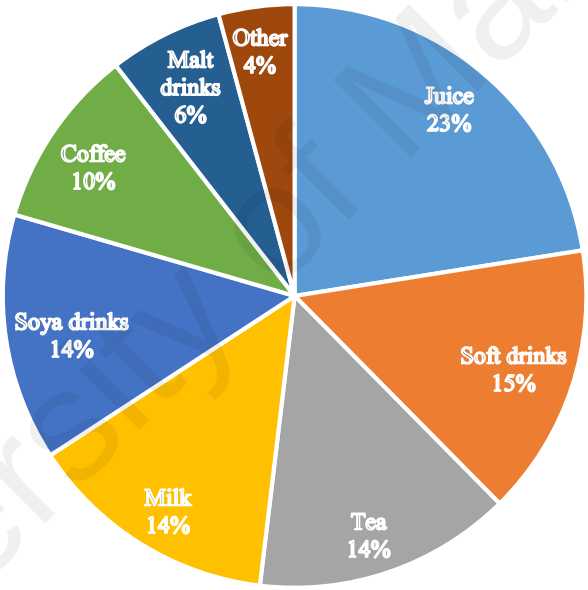


Figure 4.2: Beverages selected by the respondents.

Figure 4.3 shows the popular types of carbonated drinks. The different types of carbonated soft drinks included sugar-sweetened carbonated drinks or soda water, isotonic drinks, energy drinks and fruit punch or fruit flavoured soda. The results show that 100 plus isotonic drinks (12.2%) was the most popular type of carbonated drinks followed by Pepsi (10.4%), Coca-Cola (9.6%), and 7 up (9.6%) respectively.

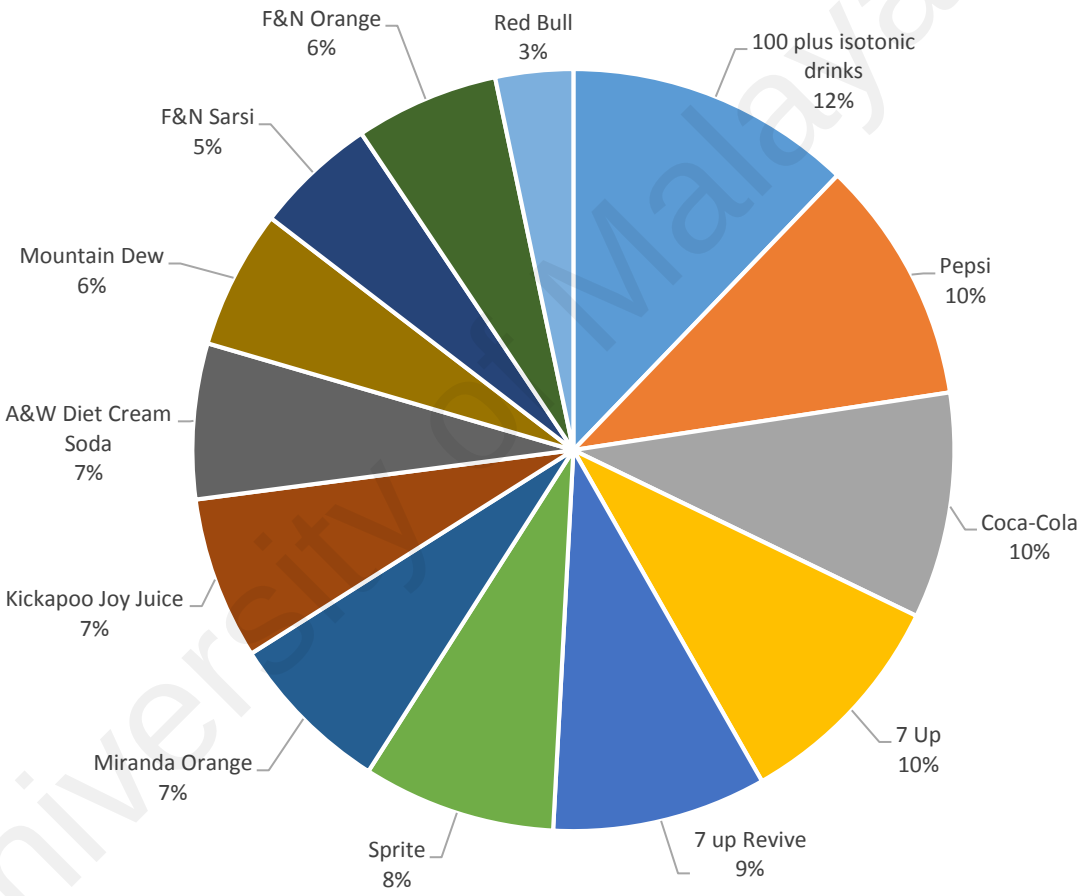


Figure 4.3: Ranking of common types of carbonated drinks based on the preference of the respondents.

4.3 The Factors that Influence Children's Soft Drinks Intake and Behaviour

4.3.1 Comparative Studies

Table 4.3 shows that there was no significant difference between amount of daily soft drink consumption and age (p=0.942), living area (p=0.063) but there was significant difference between gender (p=0.001), ethnicity (p=0.018) and family income (p<0.001).

Table 4.3: Descriptive variable differences in soft drink consumption.

Variable		n	Mean of daily soft drinks intake (ml)	SD	t
Age group	9-10	225	453.44	334.497	-1.235
	11-12	229	492.29	335.790	
Gender	Male	225	491.89	372.88	1.247*
	Female	229	452.64	288.76	
Ethnic	Malay	179	512.29	358.762	2.019*
	Non-Malay	275	447.49	317.245	
Living area	Urban	227	495.86	356.395	1.452
	Rural	227	450.22	312.002	
Family income	<RM3500	353	354.14	202.772	-18.860**
	>RM3500	101	888.61	374.642	

***p<0.05, **<0.001**

4.3.2 Multiple Regression

4.3.2.1 Description of Independent Variable

Frequency, means and standard deviations of independent variable were examined before conducting the multiple regression. **Table 4.4** showed the respondents generally had neutral respond toward intention to consume soft drinks (μ=4.85, SD=1.70), attitude toward soft drink consumption (μ=5.03, SD=1.73), subjective norm to consume soft drinks (μ=4.70, SD=1.72) and perceived behavioural control (μ=4.81, SD=2.10).

Table 4.4: Descriptive statistics of independent variable.

Variable	N	Mean	SD
Intention to consume soft drinks	454	4.85	1.70
Attitude toward soft drinks consumption	454	5.03	1.73
Subjective norm to consume soft drinks	454	4.70	1.72
Perceived behavioural control	454	4.81	2.10

4.3.2.2 Preliminary Analysis

Missing values and outliers of data were examined before conducting the data analysis. The standardized deleted residuals (μ=0.002, SD=1.009) and leverage values (μ=4.85, SD=1.70) were checked and the values of standard deviation were not far from the mean. If the values of standard deviation and means are not far difference, then it means the outliers is absences (Balian, 2009). Cook's Distance of the variables in this study was < 1 (Min=0.00; Max=0.202; μ=0.003), it means the influential data points were absent. Tabachnick and Fidell (2001) reported that if the Cook's Distance of variable is less 1, it means the outliers are not affect the estimation of regression line.

Assumptions of multiple regression were examined to ensure they were not robust to violation.

(1) Linearity and additivity of the relationship between dependent and independent variables were assessed by examining scatterplots. The scatterplots showed a linear relationship between the independent and the dependent variable.

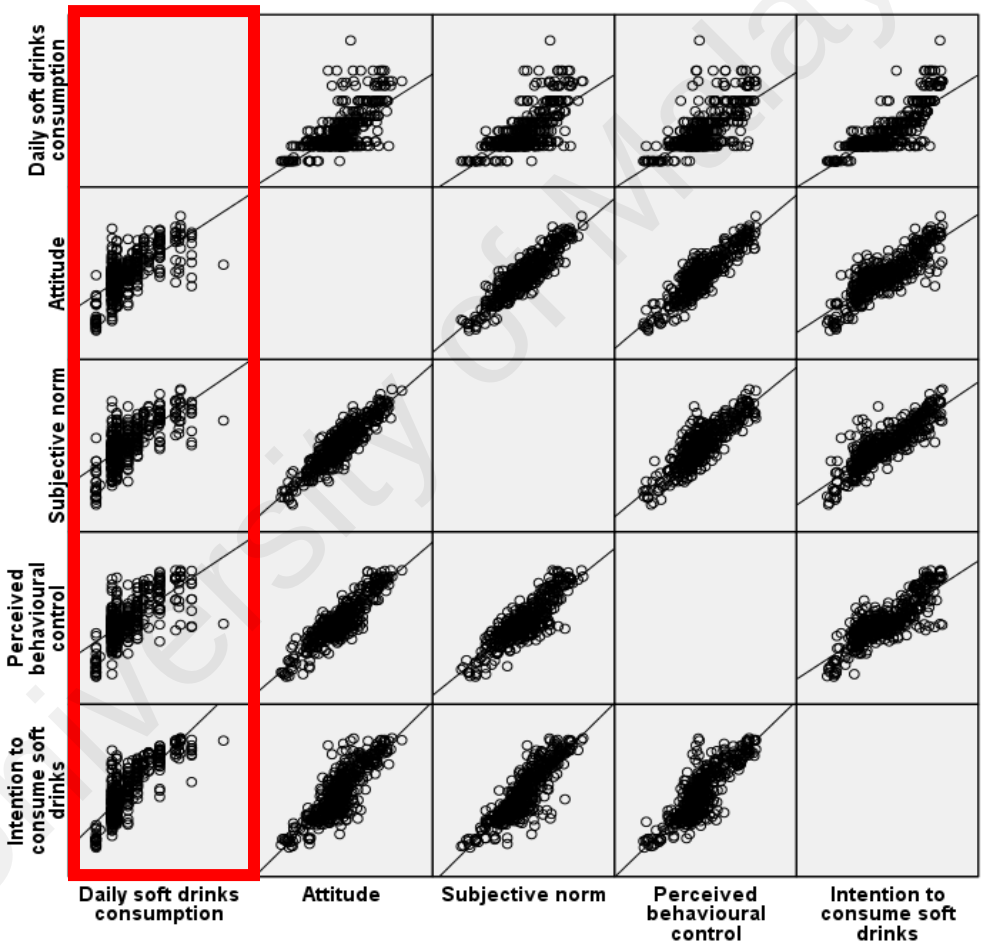


Figure 4.4 Fred's Awesome Matrix Graph for Linearity Diagnostics

(2) Data also were determined for normality by examining histograms, P-P plots of each variable. The shape of the histograms is bell shape and showed a normal distribution (**Figure 4.5**) and P-P plots showed the dots generally following the diagonal line (**Figure 4.6**).

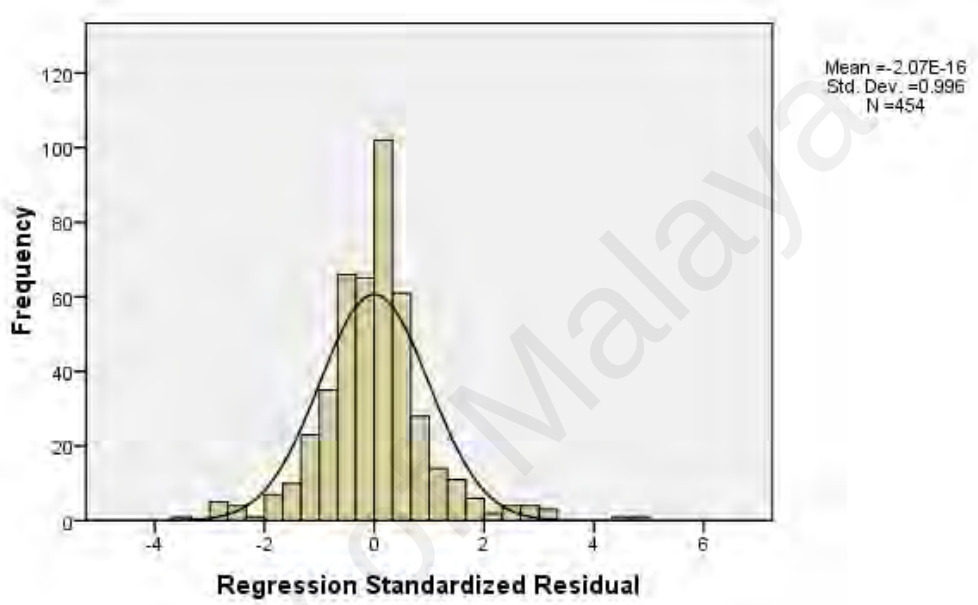


Figure 4.5 Histograms

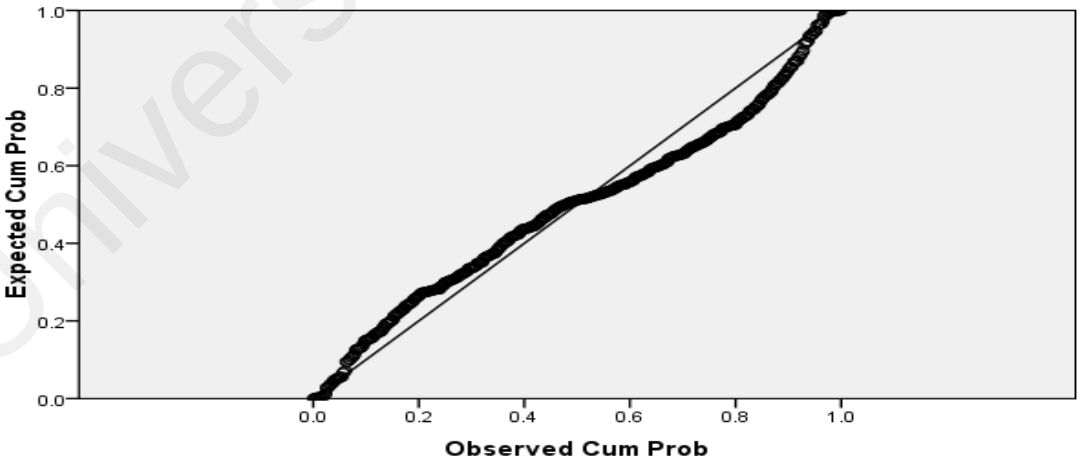


Figure 4.6 Normal P-P Plot

(3) Homoscedasticity of the variance was also checked by visual examination of residual scatterplots. Residual was randomly scattered around the reference line.

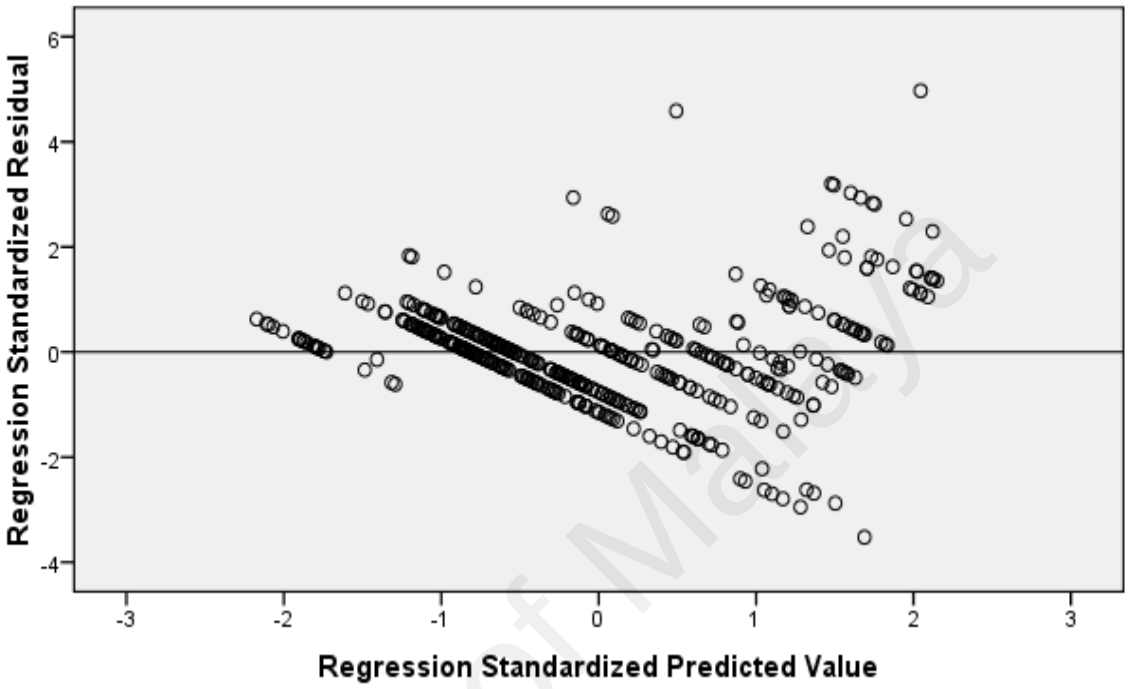


Figure 4.7 Scatterplot

(4) Multicollinearity were also determined by examining the Tolerance and Variance Inflation Factor (VIF). According to Balian (2009), no multicollinearity is indicated when the Tolerance value is more than 0.1 and VIF value is less than 10. In this study, Tolerance values for each independent variable were identified; there were attitude towards soft drink consumption (0.12), Subject norm (0.14), Perceived behavioural control (0.17), Intention to consume soft drinks (0.22) while VIF values were 8.10 for attitude towards soft drinks consumption, 7.05 for Subject norm, 5.85 for Perceived behavioural control, 4.64 for Intention to consume soft drinks.

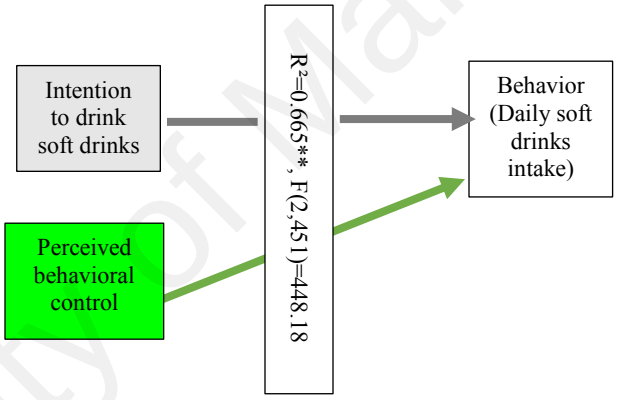
(5) To determine the constant of equation, zero mean was conducted by checking the mean and standard deviation of the standardized residual, which were 0 and 0.99 respectively.

(6) Durbin-Watson statistics were examined to evaluate independence. According to Balian (2009), the Durbin-Watson statistic value should not be more than 2.5 and not less than 1.5 if no violation of this assumption has been claimed. In this study, the Durbin-Watson statistic is 1.6, so no violation of this assumption was indicated.

4.3.2.3 The Theory of Planned Behaviour Constructs

Multiple regressions have been used to find out the factors influenced soft drinks intake behaviour among the school children. Five separate multiple regressions analysis have been done to answer research question 3 (What are the factors influencing the children's soft drink consumption?**).**

(a) Intention and Perceived Behavioural Control toward Soft Drink Consumption



Note: *p≤0.05, **p≤0.001

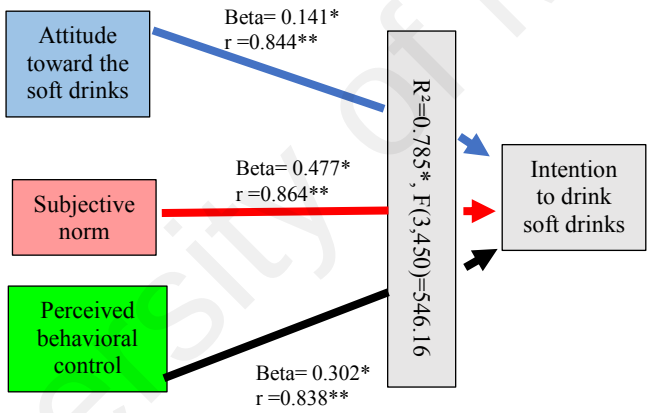
Figure 4.8 Path diagram of explaining the intention and perceived behavioural control toward soft drinks consumption

Multiple linear regression was conducted and a significant regression was found F(2, 451)=448.18, p <0.001). These two independent variables (intension to drink soft drinks and perceived behavioural control) together explained 65.5% of the variability. Intention (t=16.18, p < 0.001) was statistically significant to predict soft drink intake but perceived behavioural control was not (t= 0.183, p=0.854) (Appendix B: 1st Regression).

.

(b) The Relationship between Attitude, Subjective Norm, Perceived Behavioural with Intention to Consume Soft Drinks

Attitude, subjective norm, and perceived behavioural control were positively related to soft drink intake (r= 0.844, p<0.001, r=0.864, p<0.001, r=0.838, p<0.001 respectively); a significant regression was found (F(3,450)=546.16). These three independent variables, attitude toward the behaviour, subjective norm, and perceived behavioural control, together explained 78.5% of the variability (**Figure 4.9**). Attitude toward the behaviour (t=8.916, p<0.001), subjective norm (t=5.924, p<0.001), and perceived behavioural control (t=2.272, p<0.001) were statistically significant to predict intention (Appendix B: 2nd Regression).

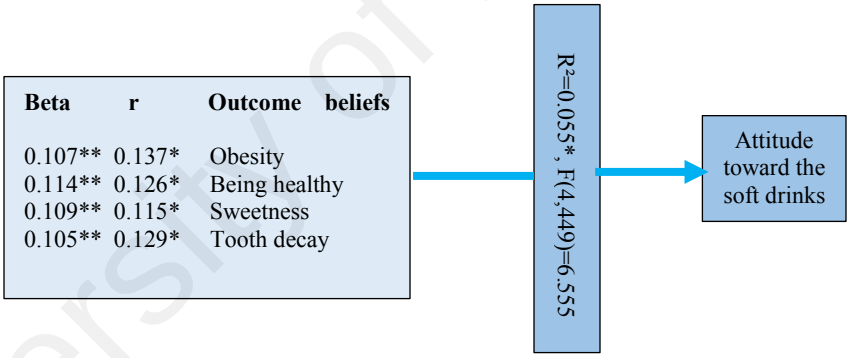


Note: *p≤0.05, **p≤0.001

Figure 4.9 Path diagram of explaination attitude, subjective norm and perceived behavioural control with intention to consume soft drinks

(c) The Influence of Behavioural Beliefs toward Attitude of Soft Drink Consumption

There are 4 factors that are significant predictors for children's attitude toward soft drink consumption at $p<0.05$ which is obesity, being healthy, taste of sweetness and tooth decay (**Figure 4.10**) and they together explained 5% of the variability. Among the variables, being healthy is the main predictor of children's attitude towards consuming soft drinks ($\beta=0.114$; $t=2.479$, $p<0.05$) followed by sweetness ($\beta=0.109$; $t=2.366$, $p<0.05$), obesity ($\beta=0.107$; $t=2.312$, $p<0.05$) and tooth decay ($\beta=0.105$; $t=2.266$, $p<0.05$) (Appendix B: 3rd Regression).

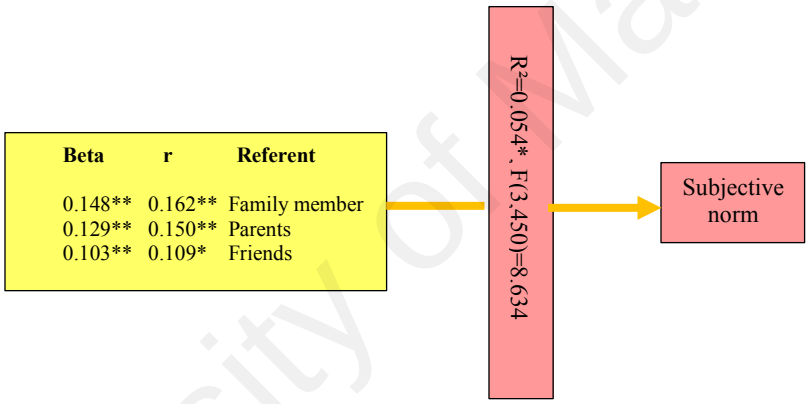


Note: *p≤0.05, **p≤0.001

Figure 4.10 Path diagram of explaination behavioural beliefs toward attitude of soft drinks consumption

(d) The influence of normative belief toward subjective norm about soft drink consumption

There are 3 factors that are significant predictors for children's subjective norm toward soft drink consumption at $p<0.05$ there are family member, parents, and friends (Figure 4.11). Among the variables, family members are the main predictor of children's subjective norm consume soft drink ($R^2=0.026$, $\beta=0.148$; $t=3.204$, $p=0.001$) followed by parents ($\beta=0.129$; $t=2.793$, $p<0.05$) and friends ($\beta=0.103$; $t=2.239$, $p<0.05$) (Appendix B: 4th Regression).

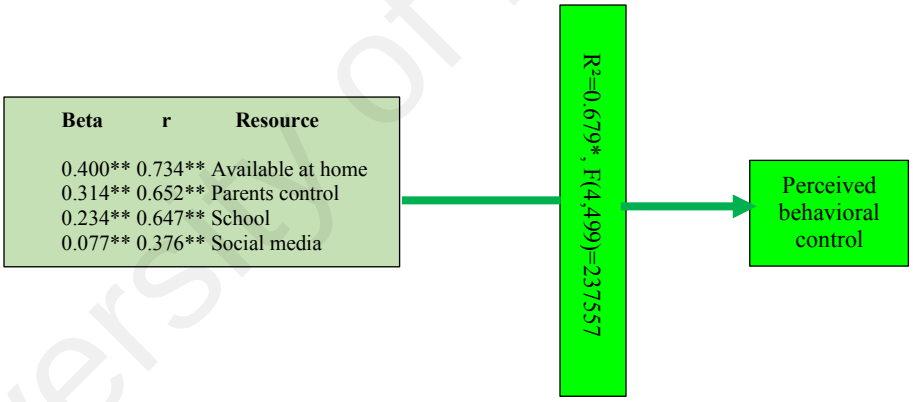


Note: *p≤0.05, **p≤0.001

Figure 4.11 Path diagram of explaination normative belief toward subjective norm of soft drink consumption

(e) The Influence of Control Beliefs toward Perceived Behavioural Control about Soft Drinks Consumption

There are four factors that are significant predictors for children's perceived behavioural control toward soft drink consumption at $p<0.05$ there are available at home, parents control, school, social media. Among the variables, availability at home is the main predictor of children's perceived behavioural control consume soft drink ($R^2=0.539$; $\beta=0.400$; $t=10.884$, $p<0.001$) followed by parents' control ($\beta=0.314$; $t=9.742$, $p<0.001$), availability at school ($\beta=0.234$; $t=6.698$, $p<0.001$), and influences of advertisements ($\beta=0.077$; $t=2.674$, $p<0.05$) (Appendix B: 5th Regression).



Note: *p≤0.05, **p≤0.001

Figure 4.12. Path diagram of explaination control beliefs toward perceived behavioural control about soft drink consumption

4.5 Summary of Theory of Planned Behaviour Constructs

In this study, five regression have been carried out to investigate factors influence the chidren's soft drink consumption. The five regression of this study were as follows:

1. Intention and perceived behavioural control toward soft drinks consumption

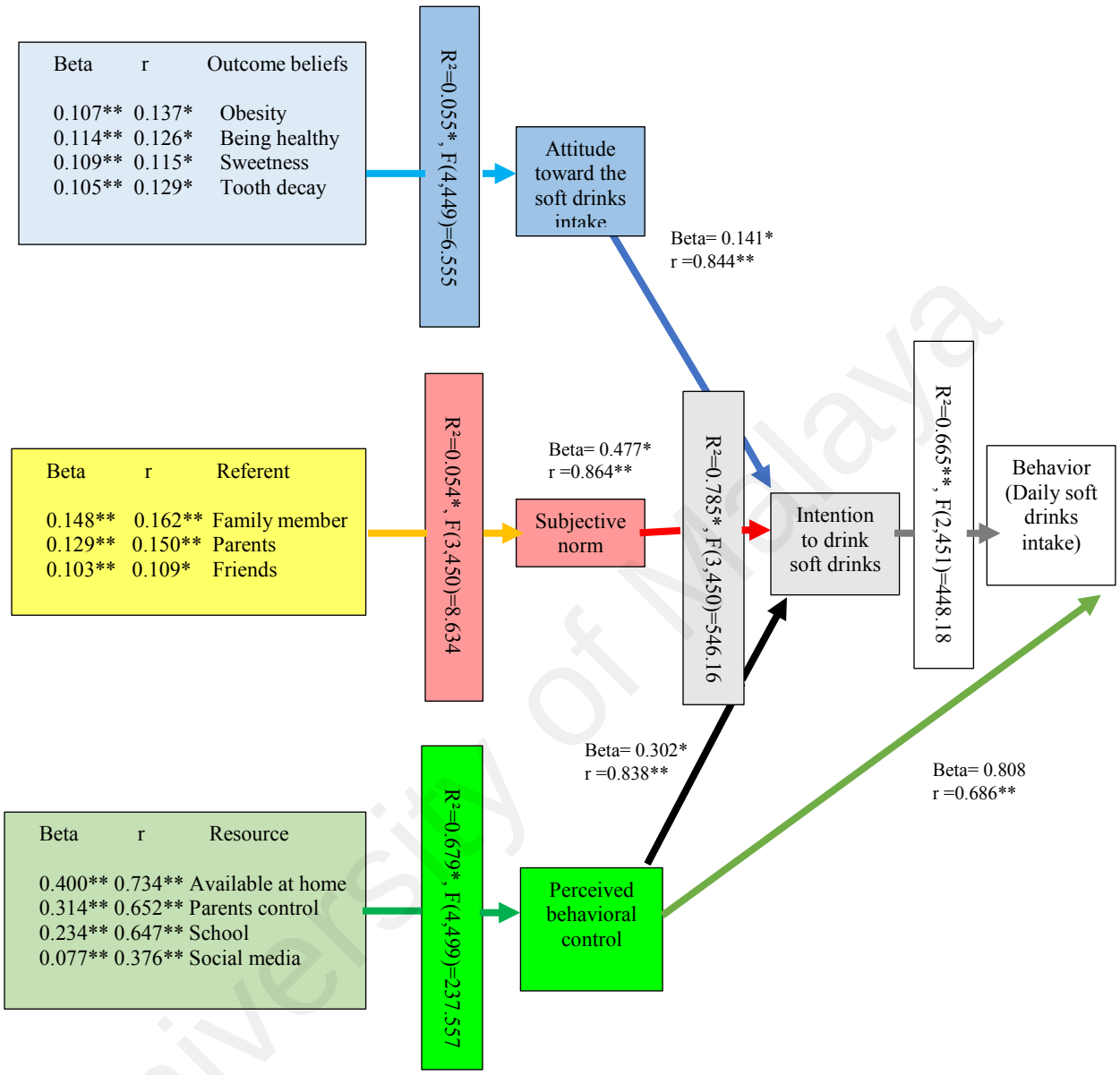
2. The relationship between attitude, subjective norm, perceived behavioural with intention to consume soft drinks

3. The influence of behavioural beliefs toward attitude of soft drink consumption

4. The influence of normative belief toward subjective norm about soft drink consumption

5. The influence of control beliefs toward perceived behavioural control about soft drinks consumption

The diagram for soft drink consumption behaviour based on Theory of Planned Behavior has been presented in **Figure 4.13**.



Note: *p≤0.05, **p≤0.001

Figure 4.13 Diagram for Soft drink consumption behavior based on Theory of Planned Behavior

CHAPTER 5: DISCUSSION

The Malaysian's lifestyle and dietary behaviour has changed over the past decades. There are limited studies conducted locally to understand beverage consumption among the Malaysians especially children. Understanding eating habit and beverage consumption of children is important for planning and implementing more efficient policy or campaign for the public. Our study is the first to use the Theory of Planned Behaviour to investigate the patterns of soft drink intake among children and factors that influence children's soft drink consumption in Malaysia.

5.1 Patterns of Soft Drink Intake among Children

The first objective of this study was to study the patterns of soft drink consumption among Malaysian school children. The finding shows that 94.9% of respondents consumed soft drinks at least once a week. Only 5.1% of respondents stated that they seldom consume soft drinks. This number is higher than the 73% which was reported previously by Radzi et al. (2013). Besides that, our research also found that fruit juices were the most popular beverage, followed by soft drinks, tea, milk, soya drinks, coffee, malt drinks and others. This finding is slightly different from a previous study conducted in Selangor state in the year 2010 (Hendijani and AbKarim, 2010). The ranking of popular beverages reported by their research group was drinking water, followed by Milo, fruit juices, milk, yoghurt, Ribena, tea and the last on the ranking was soft drinks. This difference in findings could probably be due to the difference in research methodology and research focus. Hendijani and AbKarim (2010) investigated the beverage choice preference of school children and examined the most preferred type of milk that was available in the market while Radzi et al. (2013) focused on

different target groups. Besides that, the types of beverage and questionnaire items included in their survey differed from the present study. Difference in research methodology may result in variation in the final results. Thus, better-designed studies with large number of respondents should be encouraged in order to contribute to the current knowledge body.

In our study, respondents also reflected that they preferred soft drinks to milk and this observation is similar to a number of findings in previous studies (Cook et al., 2001; Mrdjenovic & Levitsky, 2003; Blum et al., 2005). Soft drink consumption could lead to displacement of milk (Blum et al., 2005; Cook et al., 2001). Cook, et al. (2001) compared the result of Australian National Nutrition Survey in 1985 and 1995, soft drink consumption by adolescents increased during that period but milk consumption had declined by approximately 10%. Mrdjenovic and Levitsky (2003) observed 30 children aged 6 to 13 years old over 4 to 8 weeks and found that excessive soft drink consumption (>360 ml/day) displaced about 25 ml of milk from children's diet. In another longitudinal study involving 164 American children aged 9 (Blum et al., 2005), researchers found a significant decrease in milk and increase in diet soda intake over a 2-year period. Displacement of milk with soft drinks may increase the risk of prevalence of serious health conditions (Nicklas & Hayes, 2008). The linkage between soft drink consumption and displacement of milk has been found and supported by previous studies (Blum et al., 2005; Cook et al., 2001; Nicklas & Hayes, 2008). Thus, parents should be aware of their children's beverage choice and educate their children to substitute soft drinks with healthier options such as low fat milk and plain water.

This study found that most of respondents consumed soft drinks at home (47%), followed by 30% who had it at school. These findings are consistent with previous studies which showed more than half of the soft drink consumers consumed soft drinks at home (Hafekost et al., 2011; Hebden et al., 2013). Indeed, parents and family members have great responsibility in shaping the health of our future generation. Accessibility of soft drinks at home will encourage children to consume more soft drinks and it has also been found as one of important social environmental factors influencing children soft drink consumption (Hebden et al., 2013). Public health awareness campaigns should be organised to increase parents' awareness about the potential threat of soft drinks on their children's health and limit the accessibility of soft drinks at home.

About 30% of our respondents stated that they usually purchase soft drinks at schools. This finding is appalling. Since 2004, the Malaysian government had developed national regulations to limit the availability of soft drinks in schools (Hawkes, 2010). Based on a previous study conducted in Selangor in the year 2013, only 10% of the respondents reported that vending machines were available in their schools and more than half of them (60.5%) made purchases from the vending machines (Radzi et al., 2013). Compared with the United States, the accessibility of vending machines in Malaysian schools are still very low. Vending machines in the United States, many of which sell soft drinks, were available in almost 50% of all elementary schools, 75% of middle schools, and 96% of high schools (Wechsler et al., 2001). Although vending machines were considered to be less common in Malaysian primary schools, this research shows that these convenient vending machines were already available in some primary schools. It is an important mission for the school authorities to comply with the law and limit the availability of soft drinks in schools. Schools should organise generic

healthy eating campaigns to change children's nutrition-related attitudes, beliefs, eating behaviours and promote a healthier lifestyle.

5.2 Factors that Influence Children's Consumption of Soft Drinks

Living Locations

In this study, the living locations of respondents did not directly influence the patterns of soft drink intake. High soft drink intake trend was observed in both urban and rural areas. This might be due to the high availability and wide accessibility of soft drinks in both urban and rural areas in Malaysia. Soft drinks have become one of the most common beverages among children and adolescents (Radzi et al., 2013). However, this finding is different from the previous study which was done in Australia (Savige et al, 2007). The study argued that the intake of soft drinks among Australian children and adolescents was higher in urban areas than rural areas. Our study did not find the difference of soft drink consumption pattern maybe because the socioeconomic status of residents in Johor and Selangor is similar. The previous study pointed out that the difference of socioeconomic status in different region is the main factor influencing the soft drink consumption pattern. Thus, more researches should be conducted in different regions of Malaysia to compare the soft drink consumption pattern to have a better overview at the national level.

Gender

Sugar sweetened beverage consumption rate of males was claimed to be higher than females, as females appeared to be more concerned about personal health and body weight than the male population (French et al., 2003, Gillis & Bar-Or, 2003, Ranjit et al., 2010). Similar findings were indicated in this study. The results showed that among respondents who consumed more than 1000 ml of soft drinks a day, 66.7% were male while 33.3% were female. Taken together, Ministry of Education and policy maker should pay more attention on increasing health awareness of children especially school boys about the potential threat of soft drinks' to their health to reduce their consumption rate.

Age

The results indicated no significant difference in the amount of daily soft drink consumption between ages (9-12 years old). However, Ogden and Carroll (2010) pointed that older children and adolescent's soft drink consumption rate were higher than other age groups. Pettigrew et al. (2015) also stated that older children and adolescents have more pocket money and more freedom to access to retail outlets, enabling them to be more independent in their food choices. Based on the results, no significant difference in the amount of daily soft drink consumption between ages was found. This might be due to the setting of age gap (9-12 years old) was too narrow, thus further study is needed and the age gap should be widened to make better comparison.

Family Income

The income level was found to influence availability and frequency of certain food at home (Melissa et al., 2014). A previous study stated that the lowest income families will spend less on soft drinks as soft drinks are considered luxury items and unaffordable (Vereecken et al., 2005). Our study also revealed that those who came from higher income families were more likely to consume soft drinks. However, it is different from the adult population (Groeneveld et al., 2007). According to Groeneveld et al. (2007), adult with lower level of education, occupational status and lower income appeared to be more prone to adopt unhealthy eating behaviour compared to those with high income. School children still depend on their parents' financial support and they have lack of freedom to choose or purchase their food and drinks. Low income families with limited grocery budget will indirectly reduce the accessibility of soft drinks among the children.

Ethnic Race

The results also indicated that there was a significant difference in the amount of daily soft drink consumption between ethnic races. There were 33% of the Malay respondents who consumed more than 500 ml of soft drink per day and this percentage was slightly higher compared to Chinese (24.5%) and Indian (23.5%) respondents. Our findings were supported by previous studies that have shown the different ethnic races have different soft drink consumption behaviour (Booth et al., 2006; Harnack et al., 1999; Novotny et al., 2003; Rajeshwari et al., 2005) due to different cultural habits. Malaysia is a multiracial society, more studies should be conducted to examine the influence of different cultures to food preference and eating behaviour because the mechanisms are still remain unclear.

5.2.1 The Theory of Planned Behaviour Constructs

The current study is the first to estimate the association between the Theory Planned Behaviour (TPB) and Malaysian children's soft drink consumption by using the visual analogue scales (VAS). The results showed that "Intention" predicted the soft drink intake significantly but perceived behavioural control did not (t= 0.183, p=0.854). Based on the TPB, perceived behavioural control can directly influence the behaviour through actual control (Ajzan, 1991). A few previous studies argued that young children have inaccurate perceptions and behavioural control towards soft drink consumption behaviour, possibly due to lack of knowledge and easily influenced by habit (Ouellette & Wood, 1998). However, another study found that perceived behavioural control was strongly associated with intention especially among those older children and adolescent (McEachan et al, 2011). In the present study, we found that the association of perceived behavioural control and intention is easier to be proved among the older children or adolescent because younger children are generally still lack of self-control and easily influenced by other factors.

Perceived behavioural control (t=2.272, p<0.001), attitude towards the behaviour (t=8.916, p<0.001) and subjective norm (t=5.924, p<0.001) were statistically significant to predict intention. The four significant predictors for children perceived behavioural control towards soft drink consumption at p<0.05 were soft drink availability at home, parental control, availability at school and influence of advertisement on social media. Among the variables, soft drink availability at home is the main predictor of children's perceived behavioural control (R^2=0.539, p<0.05), followed by parental control, availability at school, and influence of advertisement. These findings are consistent with previous studies showing

the association between soft drink availability at home and soft drink consumption behaviour among the children (Hafekost et al., 2011; Hebden et al., 2013). Cooke et al. (2014) stated that younger children are more likely to live and stay at home so they have less control over beverage or food choices. Indeed, parents and family members become their main reference group in making dietary choices. Our study also showed that parental control will directly influence their soft drink consumption behaviour. Interestingly, Casey and Rozin (1989) assessed parental opinions on the efficacy of using restricting method to control their children eating habit and discovered only 40% of the parents reported that restricting or forbidding intake of a particular food helped to affect their children's attitude toward that food. Thus, parents must be aware with the food choices because it will directly their children's health. Parents should always look for healthier options and educate their children. Our research also found that advertisement influence children soft drink consumption and it was supported by previous studies with similar findings (Grimm et al., 2004; Kassem & Lee, 2004). Advertisement that promote soft drink consumption should be limited and prohibited from advertising directly to children as they are still lack of maturity to justify and filter information.

Among the variables, family members are the main predictor of children's subjective norm consuming soft drink (R^2=0.026, $p<0.05$), followed by parents and friends. Parents and family members play a critical, exemplary and influential role in educating their children about healthy drink preference (van der Horst et al., 2007). In a previous study by Orlet-Fisher et al. (2000), they were using data from 180 non-Hispanic, white families who live in America with their 5-year-old daughters, the findings showed a positive association between

milk intake of mothers and daughters, and an inverse association between mothers' milk intake and soft drink consumption of their daughters. Findings of the study also suggested that mothers' preferences might influence the availability of beverages, because soft drinks were not accessible at homes of mothers who drank more milk. Our finding is consistent with other previous studies that the association between friends and subject norm towards soft drinks consumption were found; however, the association is weaker than parents (Berg, Jonsson & Conner, 2000; de Brujin et al., 2007; Gummeson, Jonsson & Conner, 1997). Gummeson, Jonsson and Conner (1997) even stated clearly that friends have lower impact on children's beverage choice. Here, we found that the influence of parents and family members are greater than peer influence among the younger children.

Obesity is one of the main predictor of children's attitude towards consuming soft drinks (β=0.107, $p<0.001$). Obesity or weight were reported by a few previous studies regarding its influence on soft drink consumption (Kassem et al., 2003, Berg, Jonsson & Conner, 2000). Kassem et al. (2003) found the influence of weight gain on soft drink consumption only applied on female while Berg, Jonsson and Conner (2000) found that it influenced Swedish adolescent beverage consumption rate. However, it is alarming to find that the children have a misconception about soft drinks: they misbelieved that soft drinks not only would not cause weight gain, they even can improve their health which motivate them to consume continuously. The awareness of the potential health consequences of soft drink consumption should be increased though public education and organised health promotion programs. Taste of sweetness was one of the strong predictors of attitude toward soft drink intake (β=0.109; t=2.366, $p<0.05$) and it plays a role in influencing the children

beverage choice. The importance of taste has been repeatedly found to influence on soft drink consumption among the children by previous study as well (de Bruijn et al., 2007; Kassem & Lee, 2004; Kassem et al.,2003).

CHAPTER 6: CONCLUSION

6.1 Summary of the Finding

The purpose of this study was to determine the patterns of soft drink intake among children and investigate factors that influence children's soft drink consumption. Based on the survey conducted in urban and rural areas in Malaysia, about 94.9% of the respondents consume soft drinks at least once a week and 27.5% of respondents reflected that they consumed soft drinks more than 500 ml per day. The results showed no significant difference between amount of daily soft drink consumption and age ($p=0.942$), living area ($p=0.063$) but there was a significant difference between gender ($p=0.001$), ethnic race ($p=0.018$) and family income ($p<0.001$). In this study, we found males consuming more soft drinks than female, and soft drink consumption rate of Malay respondents (33%) is somewhat higher than Chinese (24.5%) and Indian (23.5%) respondents. Children who came from a high income family consumed more soft drinks. The majority (47%) consumed soft drinks at home, followed by 30% who had them at school. Intention ($t=16.18$, $p<0.001$) was statistically significant to predict soft drink intake but perceived behavioural control was not ($t= 0.183$, $p=0.854$). Attitude towards the behaviour ($t=8.916$,$p<0.001$), subjective norm ($t=5.924$,$p<0.001$) and perceived behavioural control ($t=2.272$,$p<0.001$) were statistically significant to predict intention. Among the variables, being healthy is the main predictor of children's attitude towards consuming soft drinks ($\beta=0.114$; $t=2.479$, $p<0.05$) followed by sweetness ($\beta=0.109$; $t=2.366$, $p<0.05$), obesity ($\beta=0.107$; $t=2.312$, $p<0.05$) and tooth decay ($\beta=0.105$; $t=2.266$, $p<0.05$). Among the variables, family members are the main predictor of children's subjective norm to consume soft drink ($R^2=0.026$, $p<0.05$), followed by parents and friends. Among the variables, availability at home is the main predictor of children's

perceived behavioural control (R^2=0.539; β=0.109; t=10.884, p<0.0001) followed by parental control, availability at school, and influence of advertisements.

6.2 Implications for Practice and Theory

Implications for Practice

According to a recent study published in May 2014 by The Lancet, Malaysia's obesity rate was rated highest in Asia at 45.3% of its population, followed by South Korea (33.2%), Pakistan (30.7%) and China (28.3%) (Soh et al., 2015). As sugar consumption of Malaysians increases from year to year, the Malaysian government has heightened concern, especially due to the adverse effects of excessive consumption of sugars. Other than launching programs to educate Malaysian to eat healthy food, practice a healthy lifestyle, and reduce intake of sugar, it is also critical to create an effective and efficient food and nutrition policy to regulate unhealthy food supplies that would threaten general health of the public. It is thus necessary to identify the main sources of sugar in Malaysians' daily diet. Sugary beverages are considered one of the major sources of sugar in children's diet as they are one of the most common and favorite beverages for children. A close focus on children's food intake is equally important, as they are the future hope of the development and prosperity of any country.

The present study adds valuable data to the limited research on soft drink consumption in Malaysian school children. Our study offers important insight to understand the factors that influence children's soft drink consumption. Most of the interventions in Malaysia have been aimed at limiting availability of soft drinks in school. However, our

findings pointed out that the main factors influencing the soft drink consumption is closely related to parents, family members and their practices. Moreover, it was alarming to find that many children believed that soft drink consumption was good to their health and soft drink consumption was not related to obesity. The public education should be organised to encourage parents to offer plain water to children and be aware of the potential threat of soft drink. Parents and family members play an important role in shaping young children's eating behaviour because children will refer to their parents' behaviour as their role model. Parents must always aware with their behaviour and food choices (McGarvey et al., 2004). Thus, policy makers must set parents as an important target group to educate them about healthy lifestyle and healthy dietary behaviour. Different approaches should be implemented for different populations, for example, policy makers can use social media to promote a reduction in soft drink consumption among the national youths (Hattersley & Hector, 2008).

Implications for Theory

This study is the first to use TPB to explain the soft drink consumption behaviour among Malaysian school children and implicate the Visual Analogue Scales (VAS) to develop a questionnaire for children. Compared to Likert-type scales, VAS is easier for children's understanding and to increase the reliability of questionnaire (Balian, 2009). VAS can access the respondent's actual experience more accurately compared to Likert-type scales. However, researchers need to make sure of the commitment of respondents for instruction and that the young children can understand and answer the VAS correctly.

The TPB was able to explain and identify some related factors which influenced the soft drink consumption behaviour and find the linkage between the variables in an effective way. Through TPB, it is evident that perceived behavioural control of youth cannot predict intention as the children were lacking self-control and immature in decision-making. Availability of soft drinks at home and parental control are both main contributors to perceived behavioural control. To effective reduce the soft drink consumption among the children, parents should be educated to pay close attention to their daily dietary behaviour and reduce the accessibility of unhealthy food and beverages at home. Children should be educated and encouraged by parents and family members to have correct and positive attitude towards their daily diet. Policy makers can have a clearer picture to solve the current problem in a more effective way. Although TPB is very useful in public health, there were still some variances that could not be accounted. Hence, some researchers have suggested a modified TPB to fit with different populations and needs (Kida & Astrom, 1998; de Bruijin et al., 2007).

6.3 Limitations and Recommendations

This study aims primarily to examine the soft drink intake patterns among children and the related potential factors. More research and data required to understand the consumption patterns of the entire population among different target groups. Most of the studies had been conducted in adolescents. By understanding the trend of the whole population, it could help to broaden the horizon and provide a bigger picture on the collective soft drink consumption of all Malaysians.

The cross-sectional design of this survey leads to the concern that any inferences related to "cause and effect" must be made with caution and thus would not be conclusive. Thus, our study findings might not be generalized beyond the study group. Additional studies are necessary to verify the findings in representative population samples. In our study, total energy intake and consumption of other foods were also not taken into account. For future studies, these potential factors should be included to avoid bias. Other types of sugar-sweetened beverages should be studied too, including tea, coffee, sports drinks, alcoholic beverages, and so on. Besides that, well-designed prospective studies with a longer follow-up time are strongly encouraged in order to provide stronger evidence for the independent role of intake of sugar-sweetened beverages in increasing prevalence of overweight and obesity. According to Pereira (2006), only high-quality randomized trials or experimental studies can provide the necessary data to accurately evaluate the linkage between changes in sugar-sweetened beverage intake and obesity risk. Future studies should also focus on the biological mechanisms of weight gain from consuming sugar-sweetened beverages, in order to establish concrete evidence for associations between beverage consumption and BMI.

BIBLIOGRAPHY

Ahmad, Q. I., Ahmad, C. B., Ahmad, S. M. (2010). Childhood obesity. *Indian Journal Endocrinology Metabolism*, *14* (1): 19-25.

Ajzen I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl (Ed.), *Action-control: from cognition to behaviors* (pp. 11–39). Berlin: Springer. Retrieved April 23, 2014, from https://link.springer.com/chapter/10.1007%2F978-3-642-69746-3_2

Ajzen, I. (1988). *Attitudes, personality, and behavior*. Chicago: Dorsey Press. Retrieved April 20, 2014, from https://psicoexperimental.files.wordpress.com/2011/03/ajzeni-2005-attitudes-personality-and-behaviour-2nd-ed-open-university-press.pdf

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Ajzen, I. (2002). *Constructing a TPB questionnaire: Conceptual and methodological considerations*. Retrieved April 23, 2014, from http://www.people.umass.edu/aizen/pdf/tpb.measurement.pdf

Ajzen, I. (2011). The theory of planned behaviour: reactions and reflections. *Psychology & Health*, *26*(9), 1113-27. Doi: 10.1080/08870446.2011.613995.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour.* Englewood Cliffs, NJ: Prentice-Hall.

Al-Dlaigan, Y. H., Shaw, L., & Smith, A. (2001). Dental erosion in a group of British 14-year-old, school children. Part I: Prevalence and influence of differing socioeconomic backgrounds. *British Dental Journal,* 190, 145 – 149.

Andersen, L. F., Lillegaard, I.T., Overby, N., Lytle, L., Klepp, K. I., & Johansson, L. (2005). Overweight and obesity among Norwegian school children: Changes from 1993 to 2000. *Scandinavian Journal of Public Health*, *33*(2), 99-66. Retrieved November 23, 2012, from http://www.ncbi.nlm.nih.gov/pubmed/15823970

Anderson, G.H. (1997). Sugars and health: A review. *Nutrition Research*, 17(9), 1485-1498.

Armitage, C., & Conner, M. (2001). Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*, 471-499.

Åstrøm, A. N. (2004). Validity of cognitive predictors of adolescent sugar snack consumption. *American Journal of Health Behavior*, *28*(2), 112–121.

Åstrøm, A. N., & Okullo, I. (2004). Temporal stability of the theory of planned behavior: A prospective analysis of sugar consumption among Ugandan adolescents. *Community Dentistry and Oral Epidemiology*, *32*(6), 426–434.

Austin, S. B., & Rich, M. (2001). Consumerism: Its impact on the health of adolescents. *Adolescent Medicine, 12*(3), 389-409.

Bachmen, C. M., Baranowski, T., & Nicklas, T. A. (2006). Is there an association between sweetened beverages and adiposity? *Nutrition Reviews*, 64, 153–174.

Backett-Milburn, K. C., Wills, W. J., Roberts, M. L., & Lawton, J. (2010). Food, eating and taste: parents' perspectives on the making of the middle class teenager. *Social Science & Medicine,* 71(7):1316-23. Doi: 10.1016/j.socscimed.2010.06.021.

Baker, C. W., Whisman, M. A., & Brownell, K. D. (2000). Studying intergenerational transmission of eating attitudes and behaviors: methodological and conceptual questions. *Health Psychology, 19*(4), 376-381.

Balian, A. (2009). *Influences on School-Age Children's Milk And Soft Drink Intake* (Doctoral thesis, Case Western Reserve University, United States). Retrieved August 2, 2013, from https://etd.ohiolink.edu/

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior change. *Psychological Review, 84*, 191-215.

Bandura, A. (1989). Social cognitive theory. In R. Vasta (Ed.), *Annals of child development. Vol. 6. Six theories of child development* (pp. 1-60). Greenwich, CT: JAI Press.

Baranowski, T., Cullen, K., & Baranowski, J. (1999). Psychosocial correlates of dietary intake: Advancing dietary intervention. *Annual Review of Nutrition, 19*, 17-40.

Barkeling, B., Rössner, S., & Sjöberg, A. (1995). Methodological studies on single meal food intake characteristics in normal weight and obese men and women. *International Journal of Obesity*, 19(4), 284-90.

Basu, S., McKee, M., Galea, G., & Stuckler, D. (2013). Relationship of Soft Drink Consumption to Global Overweight, Obesity, and Diabetes: A Cross-National Analysis of 75 Countries. *American Journal of Public Health,* 103(11):2071-7. Doi: 10.2105/AJPH.2012.300974.

Becker, G. S. (1974). A Theory of Social Interactions. *Journal of Political Economy, 82*(6), 1063-1093. Retrieved April 22, 2014, from http://www.jstor.org/stable/1830662

Bell, A.C., & Swinburn, B. A. (2005). School canteens: Using ripples to create a wave of healthy eating. *Medical Journal of Australia, 183*(1), 5–6.

Bendelow, G., Williams, S. J., & Oakley, A. (1996). It makes you bald: Children's knowledge and beliefs about health and cancer prevention. *Health Education, 3*, 12-19.

Bere, E., SørliGlomnes, E., TeVelde, S. J., & Klepp, K. I. (2007). Determinants of adolescents'soft drink consumption. *Public Health Nutrition, 11*(1), 49–56.

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.

Berkey, C. S., Rockett, H. R., Field, A. E., Gillman, M. W., & Colditz, G. A. (2004). Sugar-added beverages and adolescent weight change. *Obesity Research*, *12*(5), 778-788. Retrieved May 20, 2013, from http://www.ncbi.nlm.nih.gov/pubmed/15166298

Bernama (2007). *Rakyat Malaysia Tidak Jaga Makan.* Retrieved January 20, 2012, from http://www.bernama.com/bernama/v3/bm/news.php?id=284195.

Beverages. (2011, May). *Sugar Stacks*. Retrieved Retrieved January 20, 2012, from http://www.sugarstarcks.com/beverages.htm

Birch, L. L., & Fisher, J. O. (1998). Development of eating behaviors among children and adolescents. *Pediatrics, 101*, 539-549.

Bissonnette, M. M. & Contento, I. R. (2001). Adolescents' perspectives and food choice behaviours in terms of the environmental impacts of food production practices: application of a psychosocial model. *Journal of Nutrition Education,* 33(2), 72-82

Bleich, S., Wang, C. Y., & Gortmaker, S. L. (2009). Increasing consumption of sugar-sweetened beverages among US adults: 1988-1994 to 1999-2004. *The American Journal of Clinical Nutrition,* 89. 372-381. Retrieved Retrieved January 12, 2013, from http://www.ajcn.org/cgi/content/full/89/1/372

Blum, J. W., Jacobsen, D. J., & Donnelly, J. E. (2005). Beverage consumption patterns in elementary school aged children across a two-year period. *The Journal of the American College of Nutrition, 24*(2), 93-98. Retrieved Retrieved January 20, 2013, from http://www.ncbi.nlm.nih.gov/pubmed/15798075

Bolton-Smith, C., Woodward, M. (1994). Dietary composition and fat to sugar rations in relation to obesity. *International Journal of Obesity and Related Metabolic Disorders,* 18, 820-828.

Booth, M., Okely, A. D., Denney-Wilson, E., Hardy, L., Yang, B., & Dobbins, T. (2006). *NSW Schools Physical Activity and Nutrition Survey (SPANS) 2004: Full Report.* Sydney: NSW Department of Health.

Borrud, L., Wilkinson-Enns, C., & Mickle, S. (1997). *What we eat: USDA surveys food consumption changes. Community Food and Nutrition Program Report.* Marblehead: Community Nutrition Institute.

Bortsov, A. V., Liese, A. D., Bell, R. A., Dabelea, D., D'Agostino, R. B. Jr., Hamman, R. F., … Mayer-Davis, E. J. (2011). Sugar-sweetened and diet beverage consumption is

associated with cardiovascular risk factors profile in youth with type-1-diabetes. *Acta Diabetologica,* 48(4), 275-282.

Branscum, P., & Sharma, M. (2012). After-school based obesity prevention interventions: a comprehensive review of the literature. *International Journal of Environmental Research and Public Health*, *9*(4), 1438-57. Doi: 10.3390/ijerph9041438.

Bray, G. A., Smara, J. N., & Barry, M. P. (2004). Consumption of high-fructose corn syrup in beverages may play a role in the epidemic of obesity. *The American Journal of Clinical Nutrition,* 79, 537-543.

Brouns, F., Kovacs, E. M., & Senden, J. M. (1998). The effect of different rehydration drinks on post-exercise electrolyte excretion in trained athletes. *International Journal of Sports Medicine, 19*(1), 56–60.

Brown, J. E. (2008). Nutrition now (5thed.). In J.E. Brown (Ed.), *Obesity to underweight: The highs and lows of weight status* (pp.9-2-9-20). Belmont, CA: Thomson/ Wadsworth.

Brug, J., te Velde, S. J., Chinapaw, M. J. M., Bere, E., De Bourdeaudhuij, I., Moore, H., Maes, L., … Singh, A. S. (2010). Evidence-based development of school-based and family-involved prevention of overweight across Europe: the ENERGYproject's design and conceptual framework. *BMC Public Health*, 10:276

Buchanan, H., & Coulson, N. S. (2006).Consumption of carbonated drinks in adolescents: a transtheoretical analysis. *Child: Care, Health and Development,* 33(4), 441–447.

Campbell, K. J., Crawford, D. A., Salmon, J., Carver, A., Garnett, S. P., & Baur, L. A. (2007). Associations between the home food environment and obesity-promoting eating behaviours in adolescence. *Obesity,* 15(3), 719–730.

Capital Health Edmonton Area. (2007). *Sugar shocker: An activity kit to help teach students about making healthy drink choices.* Retrieved September 23, 2011, from http://www.capitalhealth.ca/NR/rdonlyres.pdf

Casey, R. & Rozin, P. (1989). Changing children's food preferences: Parent opinions. *Appetite,* 12(3), 171-182.

Centers for Disease Control and Prevention (CDC). (2006). *Does Drinking Beverages with Added Sugars Increase the Risk of Overweight?* Retrieved January 20, 2013, from http://www.cdc.gov/nccdphp/dnpa/nutrition/pdf/r2p_sweetend_beverages.pdf

Central Intelligence Agency. (2013). *World Factbook: Malaysia Demographics Profile 2013*. Retrieved April 20, 2013, from http://www.indexmundi.com/malaysia/demographics_profile.html

Chan, T. (2011). *Sugar-Sweetened Beverage Consumption Frequency vs. BMI: National Health and Nutrition Examination Survey 2003-2004*." (Doctoral thesis, Georgia State University, United States). Retrieved April 20, 2013 from http://scholarworks.gsu.edu/iph_theses/186

Charlet, B. & Henneberry, S. R. (2002). *A profile of food consumption trends and changing market institutions.* Oklahoma State University Publication: Oklahoma.

Check, D., Dodson, M., & Kirk, C. (2012). *Americans drink more soda than anyone else: A map of soda consumption in 80 countries.* Retrieved April 20, 2013, from http://www.slate.com/articles/health_and_science/map_of_the_week/2012/07/map_of_soda_consumption_americans_drink_more_than_anyone_else_.html

Cheng, R., Yang, H., Shao, M., Hu, T., & Zhou, X. (2009). Dental erosion and severe tooth decay related to soft drinks: a case report and literature review. Journal of Zhejiang University. Science. B, 10(5), 395–399. Retrieved May 12, 2012, from http://doi.org/10.1631/jzus.B0820245

Chocolate, Biscuits & Confectionery of Europe (CAOBISCO). (1995). *Sugars.* Retrieved August 23, 2011, from http://www.caobisco.com/doc_uploads/nutritional_factsheets/sugars.pdf

Collison, K. S., Zaidi, M. Z., Subhani, S. N., Khalid Al-Rubeaan, Mohammed Shoukri, & Futwan A Al-Mohanna. (2010). Sugar-sweetened carbonated beverage consumption correlates with BMI, waist circumference, and poor dietary choices in school children. *BMC Public Health*, 10, 234. Doi: 10.1186/1471-2458-10-234

Coca-cola Company Annual Report 2012. Retrieved May 23, 2014, from http://assets.coca-colacompany.com/b2/9a/cdcd7b7541a3b25e2dfb0c665c37/2011-per-capita-consumption.pdf

Cook, T., Rutishauser, I., & Seelig, M. (2001). *Comparable data on food and nutrient intake and physical measurements from the 1983, 1985 and 1995 national nutrition survey.* Canberra, Australian Food and Nutrition Monitoring Unit.

Cooke, L., Munroe-Chandler, K. J., Hall, C. R., Tobin, D., & Guerrero, M. D. (2014). Development of the children's active play imagery questionnaire. *Journal of Sport Sciences*, *32*(9), 860-869. Retrieved May 21, 2012, from http://dx.doi.org/10.1080/02640414.2013.865250

Curhan, G. C. & Forman, J. P. (2010). Sugar-sweetened beverages and chronic disease. *Kidney International,* 77, 569-570.

Daniel, W. W. (1999). Determination of sample size for estimating proportions. In: W.W., Daniel (Eds.), *Biostatistics: Foundation for Analysis in the Health Sciences* (pp. 183), New York, NY: John Wiley & Sons, Inc.

de Bruijn, G. J., 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.

de Bruijn, G. J. & 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, 66-75

Denney-Wilson, E., Crawford, D., Dobbins, T., Hardy, L., & Okely, A. D. (2009). Influences on consumption of soft drinks and fast foods in adolescents. *Asia Pacific Journal of Clinical Nutrition*, 18(3), 447-452.

Department of Information (2015). *Population by States and Ethnic Group*. Malaysia: Ministry of Communications and Multimedia. Retrieved September 20, 2016, from http://pmr.penerangan.gov.my/index.php/info-terkini/19463-unjuran-populasi-penduduk-2015.html

Dreon, D. M., Frey-Hewitt, B., Ellsworth, N., Williams, P. T., Terry, R. B., & Wood, P. D. (1988). Dietary fat: carbohydrate ratio and obesity in middle-aged men. *The American Journal of Clinical Nutrition*, 47, 995-1000.

Drewnowski, A., & Bellisle, F. (2007). Liquid calories, sugar, and body weight. *The American Journal of Clinical Nutrition*, *85*(3), 651–661.

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), 924-34. Retrieved January 20, 2012, from http://dx.doi.org/10.1016/j.jada.2007.03.004

Duffey, K. J., Huybrechts, I., Mouratidou, T., Libuda, L., Kersting, M., De Vriendt, T., …, HELENA Study group. (2012). Beverage consumption among European adolescents in the HELENA study. *European Journal of Clinical Nutrition*, *66*(2):244-52. Doi: 10.1038/ejcn.2011.166.

Dunnigan, M. G., Fyfe, T., McKiddie, M. T., & Crosbie, S. M. (1970). The effects of isocaloric exchange of dietary starch and sucrose on glucose tolerance, plasma insulin and serum lipids in man. *Clinical Science*; 38:1-9.

Eagly, A., & Chaiken, S. (1993). *The Psychology of Attitudes*. San Diego, CA: Harcourt, Brace and Jovanovich.

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. Retrieved January 23, 2012, from http://pediatrics.aappublications.org/content/117/3/673.full

Edwards, J., & Hartwell, H. (2002). Fruit and vegetables–attitudes and knowledge of primary school children. *Journal of Human Nutrition and Dietetics, 15*(5), 365-374.

Elfhag, K., Tynelius, P., & Rasmussen, F. (2007). Sugar sweetened and artificially sweetened soft drinks in association to restrained, external and emotional eating. *Physiology & Behaviour, 91*(2-3), 191–195.

Euromonitor International. (2011). Soft Drinks: Euromonitor from national statistics. Retrieved April 4, 2013, from http://go.euromonitor.com/Passport-Home

Euromonitor International. (2014). Soft Drinks: Euromonitor from trade sources/national statistics. Retrieved March 4, 2015, from http://go.euromonitor.com/Passport-Home

Fassler, A. C. and Bonjour, J. (1995) Osteoporosis as a pediatric problem. *Pediatric Clinics of North America*, 42, 811–824.

Fehily, A. M., Phillips, K. M., & Yarnell, J. W. G. (1984). Diet, smoking, social class, and body mass index in the Caerphilly Heart Disease Study. *The American Journal of Clinical Nutrition*, 40, 827-833.

Fishbein, M. (Ed.). (1967). *Readings in attitude theory and measurement*. New York: Wiley.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach.* New York: Psychology Press.

Flint, A., Raben, A., Blundell, J. E., & Astrup, A. (2000). Reproducibility, power and validity of visual analogue scales in assessment of appetite sensations in single test meal studies. *International Journal of Obesity and Related Metabolic Disorders*, *24*(1), 38-48.

Food Standards Australia New Zealand (2003). *Consumption of intense sweeteners in Australia and New Zealand — Roy Morgan Research Report.* Canberra, Australia : Food Standards Australia New Zealand.

Forshee, R. A., Anderson, P. A., & Storey, M. L., (2004). The role of beverage consumption, physical activity, sedentary behavior, and demographics on body mass index of adolescents. *International Journal of Food Sciences and Nutrition*, *55*(6), 463-78. Retrieved August 20, 2013, from http://www.ncbi.nlm.nih.gov/pubmed/15762311.

Forshee, R. A., Anderson, P. A., & Storey, M. L. (2008). Sugar-sweetened beverages and body mass index in children and adolescents: a meta-analysis. *The American Journal of Clinical Nutrition*, *87*(6), 1662-1671. Retrieved January 20, 2012, from http://www.ajcn.org/content/87/6/1662.full.pdf+html

Forshee, R. A. & Storey, M. L. (2003). Total beverage consumption and beverage choice among children and adolescents. *International Journal of Food Sciences and Nutrition,* *54*(4), 297-307. Retrieved March 10, 2015, from http://www.ncbi.nlm.nih.gov/pubmed/12850891

Foster-Powell, K., Holt, S. H. A., & Brand-Miller, J. C. (2002). International table of glycemic index and glycemic load values: 2002. *American Journal of Clinical Nutrition,* *76*(1), 5-56. Retrieved March 6, 2015, from http://www.ajcn.org/content/76/1/5.full

French, S. A., Lin, B. H., & Guthrie, J. F. (2003). National trends in soft drink consumption among children and adolescents in the United States: data from the national health and nutrition examination surveys. *Journal of the American Dietetic Association,* 103, 1326–1331.

French, S., Rosenberg, M., Wood, L., Maitland, C., Shilton, T., Pratt, I. S., & Buzzacott, P. (2013). Soft drink consumption patterns among Western Australians. *Journal of Nutrition Education and Behavior*, *45*(6):525-32. Doi: 10.1016/j.jneb.2013.03.010.

Gebremariam, M. K., Totland, T. H., Andersen, L. F., Bergh, I. H., Bjelland, M., Grydeland, M., Ommundsen, Y., & Lien, N. (2012). Stability and change in screen-based sedentary behaviours and associated factors among Norwegian children in the transition between childhood and adolescence. *BMC Public Health*, 12, 104. Doi: 10.1186/1471-2458-12-104.

Gedrich, K. (2003). Determinants of nutritional behaviour: A multitude oflevers for successful intervention? *Appetite*, 41, 231-266

Giammattei, J., Blix, G., Marshak, H. H., Wollitzer, A. O., Pettitt, D. J. (2003). Television watching and soft drink consumption: associations with obesity in 11- to 13-year-old schoolchildren. *Archives of Pediatrics and Adolescent Medicine*, *157*(9): 882-6. Retrieved March 4, 2013, from http://archpedi.jamanetwork.com/article.aspx?articleid=481430

Gibson, S. A. (1996). Are high-fat, high-sugar foods and diets conducive to obesity? *International Journal of Food Sciences and Nutrition,* 47, 405-415.

Gillis, L. J. & Bar-Or, O. (2003). Food away from home, sugar-sweetened drink consumption and juvenile obesity. *Journal of the American College of Nutrition, 22*(6), 539-545. Retrieved January 4, 2013, from http://www.ncbi.nlm.nih.gov/pubmed/14684760

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.

Gould, D., Kelly, D., Goldstone, L. & Gammon, J. (2001) Examining the validity of pressure ulcer risk assessment scales: developing and using illustrated patient simulations to collect the data. Information Point: Visual Analogue Scale. *Journal of Clinical Nursing*, 10(5):697-706. Retrieved March 4, 2013, from http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2702.2001.00525.x/full

Greenwood, J. L., & Stanford, J. B. (2008). Preventing or improving obesity by addressing specific eating patterns. *The Journal of the American Board of Family Medicine*, *21*(2):135-40. Doi: 10.3122/jabfm.2008.02.070034.

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.

Groeneveld, I.F., Solomons, N.W. and Doak, C.M. (2007). Nutritional status of urban schoolchildren of height and low socioeconomic status in Quetzaltenango, Guatemale. *Rev. Panam Salud Publica/Pan Am J Public Health*, 22(3)190-177.

Guenther, P. M. (1986). Beverages in the diets of American teenagers. *Journal of the American Dietetic Association,* 86(4), 493-499. Retrieved March 4, 2013, from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=3958400

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.

Guthrie, J. F., & Morton, J. F. (2000). Food sources of added sweeteners in the diets of Americans. *Journal of the American Dietetic Association,* 100, 43-48, 51.

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.

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, 950.

Hagger, M., Chatzisarantis, N., Biddle, S., & Orbell, S. (2001). Antecedents of children's physical activity intentions and behaviour: Predictive validity and longitudinal effects. *Psychology and Health*, *16*(4), 391-407.

Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Louise, A. K. (2002). Application of the Theory of Planned Behaviour in Behaviour Change Interventions: A Systematic Review. *Psychology & Health*, *17*(2), 123-158. Doi:10.1080/08870440290013644a.

Harnack, L, Stang, J, Story, M. (1999). Soft drink consumption among US children and adolescents: Nutritional consequences. *Journal of the American Dietetic Association,* 99, 436-441.

Harris, J. L., Schwartz, M. B., Brownell, K. D., Javadizadeh, J., Weinberg, M., Sarda, V., … Mejjia, P. (2011). Sugary Drink FACTS: *Evaluating sugary drink nutrition and marketing to youth.* New Haven, CT: Rudd Center for Food Policy & Obesity. Retrieved September 4, 2014, from http://sugarydrinkfacts.org/resources/SugaryDrinkFACTS_Report.pdf

Hattersley, L., & Hector, D. (2008). Building solutions for preventing childhood obesity. *Module 1: Interventions to promote consumption of water and reduce consumption of sugary drinks*. Sydney, NSW Cluster for Overweight and Obesity.

Hawkes, C. (2010). The worldwide battle against soft drinks in schools. *American Journal of Preventive Medicine,* 38(4): 457-461. Retrieved September 24, 2014, from http://dx.doi.org/10.1016/j.amepre.2010.01.011

Hebden, L., Hector, D., Hardy, L. L., & King, L. (2013). A fizzy environment: Availability and consumption of sugar-sweetened beverage among school students. *Preventive Medicine.* 56, 416-418. Retrieved March 4, 2015, from http://dx.doi.org/10.1016/j.ypmed.2013.02.017

Hendijani, R. B. & AbKarim, M. S. (2010). Factors affecting milk consumption among school children in urban and rural areas of Selangor, Malaysia. International Food Research Journal, 17, 651-660.

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.

Hector, D., Rangan, A., Louie, J., Flaad, V., Gill, T. (2009). *Soft drink, weight status and health: a review.* Sydney: NSW Centre for Public Health Nutrition. Retrieved September 26, 2013, from http://www0.health.nsw.gov.au/pubs/2009/pdf/soft_drinks_report.pdf

Hunt, N., & Tyrrell, S. (2001). Stratified Sampling. Nottingham: The Royal Statistical Centre for Statistical Education, Nottingham Trent University, UK. Retrieved September 24, 2013, from http://nestor.coventry.ac.uk/~nhunt/meths/strati.html

Ismail, M. N., Chee, S. S., Yusoff, N. K., Lim, T. O., & James, W. P. T. (2002). Obesity in Malaysia. *Obesity Reviews,* 3, 203-208.

Jacobson, M. F. (2005). *Liquid candy: how soft drinks are harming Americans' health.* Washington: Center for Science in the Public Interest.

James, J. & Kerr, D. (2005). Prevention of Childhood obesity by reducing soft drinks. *International Journal of Obesity,* 29, 554-557. Retrieved September 24, 2013, from http://www.nature.com/ijo/journal/v29/n2s/pdf/0803062a.pdf

James, J., Thomas, P., Cavan, D., & Kerr, D. (2004). Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trail. *BMJ*: 328:1237. Retrieved Retrieved September 4, 2012, from from http://www.bmj.com/content/328/7450/1237

Jared, M. T. (2005). *Soft drink consumption and changes in body composition in 170 women: A 4-year prospective study.* Brigham Young University: Department of Exercise Sciences.

Jarvinen, V. K., Rytomaa, I. I., & Heinonen, O. P. (1991). Risk factors in dental erosion. *Journal of Dental Research*, *70*(6), 942–947. Retrieved September 5, 2012, from

http://www.oocities.org/scientistconrad/Colgate_Erosion/Manuscripts/Risk_Factors_in_Dental_Erosion.pdf

Jensen, J. D., Bere, E., De Bourdeaudhuij, I., Jan, N., Maes, L., Manios, Y., ... Brug, J. (2012). Micro-level economic factors and incentives in Children's energy balance related behaviours – findings from the ENERGY European cross-section questionnaire survey. *International Journal of Behavioral Nutrition and Physical Activity, 9*(136). Doi: 10.1186/1479-5868-9-136

Johnson, T., Gerson, L., Hershcovici, T., Stave, C. & Fass, R. (2010). Systematic review: The effects of carbonated beverages on gastro-oesophagel reflux fisease. *Alimentary Pharmacology & Therapeutics*, 31, 607-614.

Johnston, C. C. & Longcope, C. (1990) Premenopausal bone loss—a risk factor for osteoporosis. *New England Journal of Medicine*, 323, 1271–1272.

Joseph, K. S. & Kramer, M. S. (1996). Review of the evidence on fetal and early childhood antecedents of adult chronic disease. *Epidemiologic Review, 18*(2):158-74.

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.

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. Retrieved March 4, 2014, from http://her.oxfordjournals.org/content/18/3/278.full.pdf+html

Kelder, S., Perry, C., Klepp, K., & Lytle, L. (1994). Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. *American Journal of Public Health, 84*(7), 1121-1126.

Kelly, B., Cretikos, M., Rogers, K., & King, L. (2008). The commercial food landscape: outdoor food advertising around primary schools in Australia. *Australian and New Zealand Journal of Public Health*, *32*(6), 522–528.

Kida, I. A., & Åstrøm, A. N. (1998). Correlates of the intention to avoid intake of sugared snacks among Tanzanian adolescents. *Journal of Gender, Culture, and Health*, *3*(3), 171–182.

Kotler, P., & Keller, K. L. (2009). *Marketing Management*. New Jersy: Upper Saddle River.

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.

Kremers, S. P. J., van der Horst, K. & Brug, J. (2007). Adolescents' screen-viewing behaviour is associated with consumption of sugar-sweetened beverages: The role of food habit strength and perceived parental norms. *Appetite*, *48*(3), 345-350.

Kynast-Gales, S. A. & Massey, L. K. (1994). Effect of caffeine on circadian excretion of urinary calcium and magnesium. *Journal of the American College of Nutrition, 13*(5): 467–472.

Larson, N. I., Story, M., Eisenberg, M. E. & Neumark-Sztainer, D. (2006). Food preparation and purchasing roles among adolescents: associations with socio demographic characteristics and diet quality. *Journal of the American Dietetic Association,* 106, 211–218.

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

Lasater, G., Piernas, C., & Popkin, B. M. (2011). Beverage patterns and trends among school-aged children in the US, 1989-2008. *Nutrition Journal*, *10*, 103. Doi: 10.1186/1475-2891-10-103.

Lieb, A. C., Snow, R. E., and DeBoer, M. D. (2009). Socioeconomic factors in the development of childhood obesity and diabetes. *Clinics in Sports Medicien*, 28(3), 349-378.

Lien, N., van Stralen, M. M., Androutsos, O., Bere, E., Fernández-Alvira, J. M., Jan, N., …, Brug, J. (2014). The school nutrition environment and its association with soft drink intakes in seven countries across Europe–the ENERGY project. *Health Place*, 30, 28-35. Doi: 10.1016/j.healthplace.2014.07.013

Lindsay, R., Nieves, J., Golden, A. and Kelsey, J. (1993) Bone mass among premenopausal women. International Journal of Fertility and Menopausal Study, 38 (Suppl. 2), 83–87

Ludwig, D. S., Peterson, K. E., & Gortmaker, S. L. (2001). Relation between consumption of suger-sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet, 357* (9255), 505-508. Retrieved March 4, 2013, from http://www.nosugarybev.org/articles/Relation%20between%20consumption%20of%20sugar-sweetened%20drinks%20and%20childhood%20obesity%20a%20prospective,%20observational%20analysis.pdf

MacFarlane, A., Crawford, D., Ball, K., Savigem, G. & Worsley, A. (2007). Adolescent home food environments and socio-economic position. *Asia Pacific Journal of Clinical Nutrition, 16*(4), 748–756.

Malaysia Food Regulations 1985. Retrieved March 14, 2013, from https://extranet.who.int/nutrition/gina/sites/default/files/MYS%201985%20Food%20Regulations_0.pdf

Malaysian Standard 601: 1994. Retrieved March 14, 2013, from http://moto.lomo.jp/EastAsia/PDF/EastAsia(4)2012E_Malaysia.pdf

Malik, V. S., Schulze, M. B., & Frank, B. H. (2006). Intake of sugar-sweetened beverages aand weight gain: a systematic review. *The American Journal of Clinical Nutrition, 84*(2), 274-288. Retrieved September 14, 2012, from http://www.ajcn.org/content/84/2/274.full.pdf

Marshall, T. A., Levy, S. M., Broffitt, B., Warren, J. J., Eichenberger-Gilmore, J. M., Burns, T. L., Stumbo, P. J. (2003). Dental caries and beverage consumption in young children. *Pediatrics, 112*(3), e184–191.

Matkovic, V., Fontana, D., Tominac, C., Goel, P. and Chesnut, C. H., III (1990) Factors that influence peak bone mass formation: a study of calcium balance and the inheritance of bone mass in adolescent females. *American Journal of Clinical Nursing*, 52, 878–888.

May, J. & Waterhouse, P. J. (2003). Dental erosion and soft drinks: a qualitative assessment of knowledge, attitude and behaviour using focus groups of schoolchildren. A preliminary study. *International Journal of Paediatric Dentistry,* 13, 425–433.

Mazariegos-Ramos, Guerrero-Romero, F., Rodríguez-Morán, M., Lazcano-Burciaga, G., Paniagua, R., & Amato, D. (1995). Consumption of soft drinks with phosphoric acid as a risk factor for the development of hypocalcemia in children: a case-control study. *The Journal of pediatrics*, *126*(6), 940-942. Retrieved March 14, 2012, from http://www.sciencedirect.com.thompson.library.ubc.ca/science/article/B6WKR-4HP5YGY-N/2/89f894491886f1860a855e2b5185bd51

McDermott, M. S., Oliver, M., Svenson, A., Simnadis, T., Beck, E. J., Coltman, T., Iverson, D., Caputi, P., & Sharma, R. (2015). The theory of planned behaviour and discrete food choices: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, 12, 162. Doi:10.1186/s12966-015-0324-z.

McEachan, R. 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.

McGarvey, E., Keller, A., Forrester, M., Williams, E., Seward, D., & Suttle, D. E. (2004). Feasibility and benefits of a parent-focused preschool child obesity intervention. *American Journal of Public Health*, *94*(9), 1490-5.

McGinnis, J.M., Gootman, J.A., & Kraak, V.I. (2006). Food marketing to children and youth: Threat or opportunity? In J.M. McGinnis, J.A. Gootman and VI. Kraak (Eds.), *Factors shaping food and beverage consumption of children and youth* (pp. 910132). Washington: National Academy Press.

Melanson, K. J., Angelopoulos, T. J., Nguyen, V., Zukley, L., Lowndes, J., & Rippe, J. M. (2008). High-fructose corn syrup, energy intake, and appetite regulation. *American Journal of Clinical Nutrition, 88*(6), 1738S-1744S. Retrieved March 14, 2013, from http://www.ajcn.org/content/88/6/1738S.full

Melissa, M.R., Katherine, I. N., & Sara, W. L. (2014). Examining Group Walks in Nature and Multiple Aspects of Well-Being: A Large-Scale Study. *Ecopsychology*, *6*(3), 134-147. Doi:10.1089/eco.2014.0027.

Mertler, C.A., & Vannatta, R.A. (2002). *Advanced and multivariate statistical methods: practical application and interpretation*. Los Angeles: Pyrczak Publishing.

Miller, W. C., Lindeman, A. K., Wallace, J., & Niederpruem, M. (1990). Diet composition, energy intake, and exercise in relation to body fat in men and women. *The American Journal of Clinical Nutrition,* 52, 426-430.

Ministry of Education Malaysia. (2014). *Statistic – Number of Students*. Retrieved April 3, 2015, from http://www.moe.gov.my/en/home

Ministry of Health Malaysia. (2010). *Fakta mengenai gula.* Retrieved April 3, 2011, from http://www.myhealth.gov.my/myhealth/index.php

Morena, L.A., Kersting, M., de Henauw, S., González-Gross, M., Sichert-Hellert, W., Matthys, C., Mesana, M. I., & Ross, N. (2005). How to measure dietary intake and food habits in adolescence: the European perspective. *International Journal of Obesity*, 29, 566-577.

Mrdjenovic, G., & Levitsky, D. A. (2003). Nutritional and energetic consequences of sweetened drink consumption in 6- to 13-year-old children. *Journal of Pediatrics, 142*(6), 604-610. Retrieved April 3, 2015, from http://www.ncbi.nlm.nih.gov/pubmed/12838186

Mundt, C. A., Baxter-Jones, A. D., Whiting, S. J., Bailey, D. A., Faulkner, R. A., & Mirwald, R. L. (2006). Relationships of activity and sugar drink intake on fat mass development in youths. *Medicine & Science in Sports & Exercise, 38*(7), 1245-1254. Retrieved May 23, 2015, from http://www.ncbi.nlm.nih.gov/pubmed/16826021 .

Murray, R. K., Granner, D. K., & Rodwell, V. W. (2003). Harper's Illustrated Biochemistry 27th Edition. New York: Lange Medical Books/McGraw Hill.

Nestle, M. (2000). Soft drink 'pouring rights': marketing empty calories to children. *Public Health Reports*, *115*(4), 308–319.

Newby, P. K., Peterson, K. E., Berkey, C. S., Leppert, J., Willett, W. C., & Colditz, G. A. (2004). Beverage consumption is not associated with changes in weight and body mass index among low-income preschool children in North Dakota. *Journal of the American Dietetic Association, 104*(7), 1086-1094. Retrieved April 3, 2015, from http://www.ncbi.nlm.nih.gov/pubmed/15215766

New York Hospital-Cornell Medical Center Nutrition Information Center. (1998). Report from Nutrition Information Center at the New York Hospital-Cornell Medical Center. April 3, 2015, from http://nyp.org/library/showDocument.php?contentTypeId=76&contentId=14429

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., … , Gakidou, E. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, *384*(9945), 766–781.

Nickelson, J., Roseman, M. G., & Forthofer, M. S. (2010). Association between parental limits, school vending machine purchases, and soft drink consumption among Kentucky middle school students. *Journal of Nutrition Education and Behavior, 42*(2), 115-122.

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), 1038-44.

Nicklas, T. A., Yang, S. J., Baranowski, T., Zakeri, I., & Berenson, G. (2003). Eating patterns and obesity in children: The Bogalusa Heart Study. *American Journal of Preventive Medicine*, *25*(1), 9-16. Doi: http://dx.doi.org/10.1016/S0749-3797(03)00098-9

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

Norimah, A. K., Safiah, M., Jamal, K., Haslinda, S., Zuhaida, H., Rohida, S., Fatimah, S., Norazlin, S., Poh, B. K., Kandiah, M., Zalilah, M.S., Wan Manan, W.M., Fatimah S. & Azmi, M.Y. (2008). Food Consumption Patterns: Findings from the Malaysian Adult Nutrition Survey (MANS). *Malaysian Journal of Nutrition*, *14*(1), 25-39.

Northstone, K., Rogers, I., Emmett, P. & the ALSPAC Team Study Avon Longitudinal Study of Pregnancy and Childhood. (2002). Drinks consumed by 18-monthold children: Are current recommendations being followed. *European Journal of Clinical Nutrition, 56*(3), 236–244.

Novotny, R., Boushey, C., Bock, M. A., Peck, L., Auld, G., Bruhn, C. M., Gustafson, D., Gabel, K., Jensen, J. K., Misner, S., & Read, M. (2003). Calcium intake of Asian, Hispanic and white youth. *Journal of the American College of Nutrition, 22*(1), 64-70.

NSW Department of Health and NSW Department of Education & Training. (2006). *Fresh Tastes NSW Healthy School Canteen Strategy.PD/2002/0058/VO3*. Sydney: NSW Department of Education & Training. Retrieved March 14, 2012, from https://www.det.nsw.edu.au/policies/student_serv/student_health/canteen_gu/PD20020058.shtml

Nur Nadirah, M. S., Ghazali, H., Bakar, A. Z. A., & Othman, M. (2016). Understanding media literacy in relation to adolescent soft drink consumption behavior. *International Food Research Journal*, *23*(1), 381-388.

Ogden, C. & Carroll, M. (2010). *Prevalence of obesity among children and adolescents: United States, trends 1963-1965 through 2007-2008.* United States: National Center for Health Statistic. Retrieved March 15, 2012, from http://www.cdc.gov/nchs/data/hestat/obesity_child_07_08/obesity_child_07_08.pdf

Orlet-Fisher, J., Mitchell, D., Smicklas-Wright, H., & Birch, L. (2000). Maternal milk consumption predicts the tradeoff between milk and soft drinks in young girls' diets. *Journal of Nutrition Education and Behavior,* 131 (2000), pp. 246–250

Olsen, N. J. & Heitmann, B. L. (2009). Intake of calorically sweetened beverages and obesity. *Obesity Research, 10*(1), 68-75. Retrieved March 14, 2012, from http://onlinelibrary.wiley.com/doi/10.1111/j.1467-789X.2008.00523.x/full

Ouellette, I. & Wood, W. (1998). Habit and intention in everyday life. The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*, 124, 54-74.

Overby, N. C., Lillegaard, I. T., Johansson, L., & Andersen, L. F. (2004). High intake of added sugar among Norwegian children and adolescents. *Public Health Nutrition*, *7*(2), 285-293. Doi:10.1079/PHN2003515

Pereira, M. A. (2006). The possible role of sugar-sweetened beverages in obesity etiology: a review of the evidence. *International Journal of Obesity*, *30*(3), S28–S36. Retrieved March 14, 2012, from http://www.nature.com/ijo/journal/v30/n3s/full/0803489a.html

Petridou, E., Karpathios, T., Dessypris, N., Simou, E. & Trichopoulos, D. (1997). The role of dairy products and non-alcoholic beverages in bone fractures among school age children. *Scandinavian Journal of Social Medicine*, 25, 119–125.

Pettigrewa, S., Jongenelisa, M. I., Mooreb, S., & Pratt, I. S. (2015). A comparison of the effectiveness of an adult nutrition education program for Aboriginal and non-Aboriginal Australians. *Social Science & Medicine*, 145, 120-124. Doi:10.1016/j.socscimed.2015.09.025

Phillips, S. M., Bandini, L. G., Naumova, E. N., Cyr, H., Colclough, S., Dietz, W. H., & Must, A. (2004). Energy-dense snack food intake in adolescence: longitudinal relationship to weight and fatness. *Obesity research*, *12*(3), 461-472. Retrieved March 15, 2012, from http://www.ncbi.nlm.nih.gov/pubmed/15044663

Phoon, L. Y. (2011). Sugar Consumption: Case Study on Adolescents' Canned Drinks Intake. (Master thesis, University of Malaya, Malaysia).

Prochaska, J., & DiClemente, C. (1983). Stages and processes of self-change of smoking:Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, *51*(3), 390-395.

Radzi, C. W. J., Phoon, L. Y., Phua, E. K., Kazemipoor, M., & Jamungi, A. Z. (2013). Sugar Consumption: Case Study on Adolescents' Canned Drinks Intake. *Advanced Science Letters, 19*(10), 2974-2978(5). Retrieved March 16, 2014, from http://dx.doi.org/10.1166/asl.2013.5061

Rajeshwari, R., Yang, S. J., Nicklas, T. A., & Berenson, G. S. (2005). Secular trends in children's sweetened-beverage consumption (1973 to 1994): The Bogalusa Heart Study. *Journal of the American Dietetic Association, 105*(2), 208-214

Ranjit, N., Evans, M.H., Byrd-Williams, C., Evans, A. E., & Hoelscher, D. M. (2010). Dietary and activity correlates of sugar-sweetened beverage consumption among adolescents. *Pediatrics, 126*(4), e754-e761. Doi: 10.1542/peds.2010-1229

Riebl, S. K., MacDougal, C., Hill, C., Estabrooks, P. A., Dunsmore, J. C., Savla, J., …, Davy, B. M. (2015). Beverage Choices of Adolescents and Their Parents Using the Theory of Planned Behavior: A Mixed Methods Analysis. *Journal of the Academy of Nutrition and Dietetics*, *116*(2), 226-239. Retrieved August 14, 2016, from http://dx.doi.org/10.1016/j.jand.2015.10.019

Robert Wood Johnson Foundation. (2009). *The negative impact of sugar-sweetened beverages on children's health.* Retrieved March 14, 2012, from http://www.rwjf.org/files/research/20091203herssb.pdf

Rodriguez – Artalejo, F., Garcia, E. L., Gorgojo, L., Garcés, C., Royo, M. A., Martín Moreno, J. M., Benavente, M., Macías, A., & De Oya, M. (2003). Consumption of bakery products, sweetened soft drinks and yogurt among children aged 6-7 years: association with nutrient intake and overall diet quality. *British Journal of Nutrition, 89*(3), 419-429. Retrieved March 14, 2012, from http://www.ncbi.nlm.nih.gov/pubmed/12628036

Rolls, B. J., Kim, S., & Fedoroff, I. C. (1990). Effects of drinks sweetened with sucrose or aspartame on hunger, thirst and food intake in men. *Physiology & Behavior, 48*(1), 19–26.

Sahoo, K., Sahoo, B., Choudhury, A. K., Sofi, N. Y., Kumar, R., & Bhadoria, A. S. (2015). Childhood obesity: causes and consequences. *Journal of Family Medicine and Primary Care*, *4*(2): 187–192. Doi: 10.4103/2249-4863.154628

Saunders, R., Pate, R., Felton, G., Dowda, M., Weinrich, M., Ward, D., Parsons, M., & Baranowski, T. (1997). Development of questionnaires to measure psychosocial influences on children's physical activity. *Preventive Medicine, 26*(2), 241-247.

Savige, G.S., Ball, K., Worsley, A., & Crawford, D. (2007). Food intake patterns among Australian adolescents. *Asia Pacific Journal of Clinical Nutrition, 16*(4), 738-747.

Saniah, K. & Samsiah, M. (2012). The application of Stevia as sugar substitute in carbonated drinks using Response Surface Methodology. *Journal of Tropical Agriculture and Food Science,* 40(1), 23– 34

Scaglioni, S., Salvioni, M., & Galimberti, C. (2008). Influence of parental attitudes in the development of children eating behaviour. *British Journal of Nutrition*, *99*(Suppl. 1), S22–S25. Doi: 10.1017/S0007114508892471.

Schlegel, R., D'Avernas, J., Zalma, M., & DeCourville, N. (1992). Problem drinking: A problem for the theory of reasoned action? *Journal of Applied Social Psychology*, 22, 358-385.

Scully, M., Dixon, H., White, V. & Beckmann, K. (2007). Dietary, physical activity and sedentary behaviour among Australian secondary students. *Health Promotion International*, *22*(3), 236–245.

Soh, K. G., Yusof, A., Soh, K. L., Japar, S., Ong, S. L., Fauzee, M. S. O. (2015). Physical Activity and Health-Promoting Lifestyle of Student Nurses in Malaysia. *Journal of Biosciences and Medicines, 3*, 78-87.

St-Onge, M. P., Ross, R., Parsons, W. D., Jones, P. J. (2003). Medium-chain triglycerides increase energy expenditure and decrease adiposity in overweight men. *Obesity research*, *11*(3), 395-402.

Striegel-Moore, R. H., Thompson, D., Affenito, S. G., Franko, D. L., Obarzanek, E., Barton, B. A., … Crawford, P. B. (2006). Correlates of beverage intake in adolescent girls: the National Heart, Lung, and Blood Institute Growth and Health Study. *Journal of Pediatrics*, *148*(2), 183-187. Retrieved March 15, 2012, from http://www.cbsnews.com/htdocs/pdf/striegel_moore.pdf

Sutton, S. (2004). The SAGE handbook of health psychology. In S. Sutton, A. Baum, and M. Johnson (Eds.), *Determinants of health-related behaviours: Theoretical and methodological issues* (pp. 94-126). Great Britain: Crowell Press.

Swanson, V., & Power, K. G. (2005). Initiation and continuation of breastfeeding: Theory of planned behaviour. *Journal of Advanced Nursing, 50*(3), 272-282.

Swinburn, B. A., Caterson, I., Seidell, J. C., & James, W. P. (2004). Diet, nutrition and the prevention of excess weight gain and obesity. *Public Health Nutrition*, *7*(1A), 123–46.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics* (4th ed.). Boston: Allyn and Bacon.

Tahmassebi, J. F., Duggal, M. S., Malik-Kotru, G. & Curzon, M. E. (2006). Soft drinks and dental health: a review of the current literature. *Journal of Dentistr*y, *34*(1): 2–11.

Tak, N. I., Velde, S. J. T., Oenema, A., van der Horst, K., Timperio, A., Crawford, D. & Brug, J. (2011). The association between home environmental variables and soft drink consumption among adolescents: Exploration of mediation by individual cognitions and habit strength. *Appetite*, *56*(2), 503-510.

Tam, C. S., Garnett, S. T., Cowell, C. T., Campbell, K., Cabrera, G., & Baur, L.A. (2006). Soft drink consumption and excess weight gain in Australian school students: Results from the Nepean study. *International Journal of Obesity* (Lond), 30(7): 1091-1093. Retrieved March 16, 2012, from http://www.ncbi.nlm.nih.gov/pubmed/16801946

Terry-McElrath, Y. M., O'Malley, P. M., & Johnston, L. D. (2014). Energy drinks, soft drinks, and substance use among United States secondary school students. *Journal of Addiction Medicine*, *8*(1): 6-13. Doi: 10.1097/01.ADM.0000435322.07020.53

Thomas, W. I. & Znaniecki, F. (1918). *The Polish Peasant in Europe and America*. Chicago: University of Chicago Press.

Townsend, N., Rutter, H., & Foster, C. (2012). Age differences in the association of childhood obesity with area-level and school-level deprivation: cross-classified multilevel analysis of cross-sectional data. *International Journal of Obesity*, *36*(1): 45–52.

Troiano, R. P., Briefel, R. R., Carroll, M. D., & Bialostosky, K. (2000). Energy and fat intakes of children and adolescents in the United States: data from the National Health and Nutrition Examination Surveys. *American Journal of Clinical Nutrition*, *72*(suppl):1343S–53S.

Trost, S., Saunders, R., & Ward, D. (2002). Determinants of physical activity in middle school children. *American Journal of Health Behavior, 26*(2), 95-102.

Tucker, K. L., Morita, K., Qiao, N., Hannan, M. T., Cupples, L. A., Kiel, D. P. (2006). Colas, but not other carbonated beverages, are associated with low bone mineral density in older women: The Framingham Osteoporosis Study. *American Journal of Clinical Nutrition*, 84, 936-942.

U.S. National Soft Drink Association. (2004). *Soft drink facts*. Retrieved March 14, 2012, from http://www.nsda.org/softdrinks/History/funfacts.html

van der Horst, K., Kremer, 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.

van der Horst, K., Timperio, A., Crawford, D., Roberts, R., Brug, J., & Oenema, A. (2008). The school food environment associations with adolescent soft drink and snack consumption. *American Journal of Preventive Medicine*, *35*(3):217-23. Doi:10.1016/j.amepre.2008.05.022.

Varnam, A. H & Sutberland, J. P. (1994). Beverages: Technology, Chemistry and Microbiology. London : Chapman & Hall.

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. Retrieved March 20, 2012, from http://ajph.aphapublications.org/cgi/reprint/97/4/667.pdf

Vereecken, C. A., Bobelijn, K. & Maes, L. (2005). School food policy at primary and secondary schools in Belgium-Flanders: does it influence young people's food habits? *European Journal of Clinical Nutrition,* 59: 271–277.

Vereecken, C. A., Inchley, J., Subramanian, S. V., Hublet, A., & Maes, L. (2005b). 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.

Vereecken, C. A., Keukelier, E. & Maes, L. (2004). Influence of mother's educational level on food parenting practices and food habits of young children. *Appetite, 43*(1), 93–103.

Washi, S. A. & Ageib, M. B. (2010). Poor diet quality and food habits are related to impaired nutritional status in 13-to 18-year-old adolescents in Jeddah. *Nutrition Research*, 30, 527-534.

Weaver, C. M., Martin, B. R. and Peacock, M. (1995) Calcium metabolism in adolescent girls. *Challenges of Modern Medicine*, 7, 121–128.

Wechsler, H., Brener, N., Kuester, S., & Miller, C. (2001). Food service and foods and beverages available at school: Results from the School Health Policies and Programs Study 2000. *Journal of School Health,* 71:313-324.

Wicker, A. W. (1969). Attitudes versus actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues,* 25, 41-47.

Woodward, D. R., Cumming, F. J., Ball, P. J., Williams, H. M., Hornsby, H., Boon, J.A. (2002). Urban-rural differences in dietary habits and influences among Australian adolescents. *Ecology in Food and Nutrition,* 39, 271–92.

World Health Organization. (2013). Research for universal health coverage: World health report 2013. Retrieved June 7, 2014, from http://www.salute.gov.it/imgs/C_17_pubblicazioni_2089_ulterioriallegati_ulteriorealllegato_0_alleg.pdf

Wyshak, G. (2000). Teenaged girls, carbonated beverage consumption, and bone fractures. *Archives of Pediatric Adolescent Medicine*, 154, 610–613.

Wyshak, G. and Frisch, R. E. (1994). Carbonated beverages, dietary calcium, the dietary calcium/phosphorus ratio, and bone fractures girls and boys. *Journal of Adolescent Health*, 15, 210–215.

LIST OF PUBLICATIONS AND PAPERS PRESENTED

ACADEMIC JOURNALS

Radzi, C. W. J. W. M., Phoon, L. Y., **Phua En Kiat**, Kazemipoor, M. & Jamungi, A. Z. (2013). Sugar consumption: Case study on adolescents canned drinks intake. *Advanced Science Letters, 19*(10), 2974-2978.

Radzi, C. W. J. W. M. & **Phua, E. K.** (2013). Intake of sugar-sweetened beverages and weight gain among children and adolescents: A review. *Current Research in Malaysia, 2*(3), 7-16.

Kazemipoor, M., Cordell, G. A., Sarker, M. M. R., Radzi, C. W. J. W. M., Hajifaraji, M., **Phua, E. K**. (2015). Alternative treatments for weight loss: Safety/risks and effectiveness of anti-obesity medicinal plants. *International Journal of Food Properties*, *18*(9), 1942-1963. Doi: 10.1080/10942912.2014.933350.

Radzi, C. W. J. W. M. & **Phua, E. K.** (2017). The relationship between family-related factors and school children's soft drinks consumption by race in Malaysia. *Children's Health Care.* (Submitted).

PROCEEDINGS

Phua, E. K., & Radzi, C. W. J. W. M. (2012). Intake of sugar-sweetened beverages and weight gain among children and adolescents: A review. In M. S. Yaapar. *Prosiding Seminar Hasil Penyelidikan Kementerian Pengajian Tinggi.* Paper presented at Seminar Hasil Penyelidikan Kementerian Pengajian Tinggi, Seremban. Malaysia, Kementerian Pengajian Tinggi.