

**FRUIT AND VEGETABLE INTAKE AND FACTORS INFLUENCING INTAKE
OF ADOLESCENTS: DEVELOPING THE QUESTIONNAIRES**

by

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Abstract

Studies have suggested that fruit and vegetable intake might reduce the risk of cancer, cardiovascular disease, and other chronic diseases. Adolescents' fruit and vegetable intake appears to be below the recommended level according to Canada's Food Guide to Healthy Eating. There are many factors that may influence adolescents' fruit and vegetable intake. The objectives of this study were to develop a food frequency questionnaire (FFQ) to assess adolescents' fruit and vegetable intake, to develop an Attitude/Behaviour questionnaire looking at factors influencing their consumption of these foods and to test the validity and reliability of these 2 questionnaires. Students in grades 7 through 12 from 4 secondary schools were asked to participate in this study. The statements in the Attitude/Behaviour questionnaire were generated based on the literature and 3 focus group discussions with a total of 26 students. The FFQ was adapted from an existing questionnaire developed by the National Cancer Institute and was used to assess the fruit and vegetable intake over the previous 1 week. The FFQ was validated with a group of 63 students who completed the FFQ as well as a written 24-hour dietary record. The internal consistency reliability of the Attitude/Behaviour questionnaire and the face validity of the FFQ and the Attitude/Behaviour questionnaire were assessed with a group of 48 students. The test-retest reliabilities of these 2 questionnaires were tested with a group of 43 students who completed questionnaires on 2 occasions approximately 2 months apart. The correlation coefficient of the FFQ against the 24-hour dietary record was 0.52 and the test-retest reliability coefficient was 0.46. The internal consistency reliability of the Attitude/Behaviour questionnaire was 0.71 and the test-retest reliability was 0.59. Questionnaires were revised based on comments obtained from the face

validity test. These results suggest that our developed questionnaires could be further used as research tools for the target group.

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Chapter 1

Literature Review

1.1 Introduction

Studies have shown that fruits and vegetables may decrease the risk of certain types of cancer, cardiovascular diseases and other chronic diseases (Ness & Powles, 1997; Steinmetz & Potter, 1996; Terry, Terry & Wolk, 2001). Consequently, many countries have issued recommendations and/or implemented campaigns to increase their populations' fruit and vegetable intake (Dietary Guidelines Advisory Committee, 2004; Health Canada, 2002a; Smith, Kellett & Schmerlaib, 1998; U.S. Department of Health and Human Services, 2000; World Health Organization, 2003). Studies (Grunbaum et al., 2002; Lien, Lytle & Klepp, 2001; Magarey, Daniels & Smith, 2001) have shown that adolescents' fruit and vegetable intake tend to be below the recommended levels.

Adolescence is the period of life from 10 to 18 years of age. Healthy eating habits developed during adolescence may have long-term health implications (Neumark-Sztainer, Story, Perry & Casey, 1999). There are many factors that may affect adolescents' fruit and vegetable intake including age, gender, family, taste preferences, cost, and food availability (Corwin, Sargent, Rheaume & Saunders, 1999). Adolescents enjoy sweet foods, rather than vegetables (Nu, Macleod & Barthelemy, 1996). In order to explore adolescents' intake of fruit and vegetables and the factors that may influence their choices, a food frequency questionnaire (FFQ) to assess adolescents' fruit and vegetable intake and a second questionnaire looking at what factors may affect their choices are needed.

The literature relevant to developing research instruments to assess adolescents' fruit and vegetable intake and to examine factors affecting their choices was reviewed in this chapter. This included the relationship between fruit and vegetable consumption and health benefits, the recommendation for fruit and vegetable intake, fruit and vegetable consumption in adolescents, factors influencing adolescents' fruit and vegetable choices, the theoretical model used for developing the questionnaire looking at factors influencing adolescents' fruit and vegetable choices, and the background of FFQs and focus groups.

1.2 Fruit and Vegetable Consumption and Health Benefits

Evidence supporting the unique health benefits derived from eating fruits and vegetables is growing. Epidemiologic researchers have found links between increased fruit and vegetable consumption and the decreased risk of chronic diseases such as cancer, heart disease, and stroke. Evidence is emerging about a positive role for fruit and vegetable consumption in reducing the risk of cataracts, diverticulosis, chronic obstructive pulmonary disease, and hypertension (Van Duyn & Pivonka, 2000). Studies also suggested that fruit and vegetable consumption might play a role in weight management (Rolls, Ello-Martin & Tohill, 2004). Health benefits derived from the consumption of fruits and vegetables were reviewed in this section.

1.2.1 Fruit and Vegetable Consumption and Cancer

The Canadian Cancer Society (National Cancer Institute of Canada, 2004) estimated that 145,500 new cases of cancer and 68,300 deaths from cancer would occur in Canada in 2004. Thirty eight percent of Canadian women and 43% of Canadian men will develop cancer during their lifetime (National Cancer Institute of Canada, 2004).

The total cost of cancer was \$ 14.2 billion in 1998 in Canada (Health Canada, 2002b; National Cancer Institute of Canada, 2004).

An important factor associated with cancer is diet (Beech, Rice, Myers, Johnson & Nicklas, 1999). The American Cancer Society (2002) estimated that nutritional factors account for about 1/3 of US cancer deaths. Of all the dietary factors postulated to cause cancer, the epidemiological evidence is strongest for an association with low fruit and vegetable consumption (Neumark-Sztainer, Story, Resnick & Blum, 1996).

There is evidence that dietary patterns high in vegetables and / or fruits, or that intakes of selected fruits or vegetables, are associated with a lower incidence of certain kinds of cancer (Agudo et al., 1997; Dietary Guidelines Advisory Committee, 2004; Hertog et al., 1996; Levi et al., 1998). A review article of 206 human epidemiologic studies and 22 animal studies demonstrated that fruit and vegetable consumption could reduce the risk for cancers of the lung, esophagus, oral cavity, stomach, colon, endometrium, pharynx and pancreas (Steinmetz & Potter, 1996). A report commissioned by the World Cancer Research Fund and the American Institute for Cancer Research estimated that at least 5 servings of vegetables and fruits could reduce cancer risk by 20% (World Cancer Research Fund, 1997; Van Duyn & Pivonka, 2000). The mechanisms that explain the health benefits from vegetables and fruits in relation to cancer still needs further investigation (Van Duyn & Pivonka, 2000). Nutrients present in vegetables and fruits such as vitamins C and E, beta-carotene, folic acid and several minerals as well as sources of other carotenoids, bioflavonoids, isothiocyanates and dietary fibre, may be the possible reasons for reducing the risk of cancer (Steinmetz & Potter, 1996).

1.2.2 Fruit and Vegetable Consumption and Cardiovascular Disease

Cardiovascular disease is the leading cause of death in Canada and the underlying cause of death for 1 in 3 Canadians (Heart and Stroke Foundation of Canada, 2003). Approximately 8 million Canadians (1 in 4) have some form of cardiovascular disease (American Heart Association, 2002). In 1999, there were 78,942 deaths attributed to cardiovascular disease; 35% of male and 37% of female deaths (Heart and Stroke Foundation of Canada, 1999). In 1994 cardiovascular disease cost the Canadian economy about \$18 billion (American Heart Association, 2002).

Studies have suggested dietary patterns high in fruits and vegetables are associated with a decreased risk of developing cardiovascular disease (Dietary Guidelines Advisory Committee, 2004; Law & Morris, 1998; Ness & Powles, 1997). A report that reviewed findings from 4 ecological, 2 case-control, and 7 cohort studies conducted after 1994 estimated that fruits and vegetables reduced the risk for coronary heart disease by 20% to 40% (Klerk, Jansen, Van't Veer & Kok, 1998). In the same report, results of an ecological and 4 cohort studies suggested that the high intake of fruit and vegetables might reduce the risk of stroke by up to 25% (Klerk et al., 1998).

A number of possible mechanisms have been put forward to explain the benefits of fruits and vegetables against cardiovascular disease. The antioxidants in fruits and vegetables, such as vitamin C, beta carotene and other carotenoids, and flavonoids may reduce the risk of heart disease by reducing the oxidation of cholesterol in the arteries. Antioxidant minerals, such as selenium and zinc, and other antioxidant compounds such as sulfur-containing compounds or the allium family may also help explain the beneficial effects of fruits and vegetables on heart disease. Folic acid, found in dried beans, green leafy vegetables, melons, and oranges, may help to lower blood homocysteine; and

soluble fibres may help to control serum cholesterol levels (Klerk et al., 1998; Van Duyn & Pivonka, 2000). Recent studies showed that the intake of potassium (Khaw & Barrett-Connor, 1987), flavonoids (Hertog, Feskens, Hollman, Katan & Kromhout, 1993; Keli, Hertog, Feskens & Kromhout, 1996), fibre and folic acid (Klerk et al., 1998) were associated with the lower risk of stroke. As well, high intakes of fruits and vegetables may be associated with a reduced intake of putative harmful substances such as salt or saturated fat, which may lead to the health effects (Ness & Powles, 1997).

1.2.3 Fruit and Vegetable Consumption and Other Chronic Diseases

In addition, a developing body of scientific evidence indicates that fruit and vegetable intake may lower the risk of other chronic diseases such as diabetes, diverticulosis, cataract formation and chronic obstructive pulmonary disease (COPD) (Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000).

1.2.4 Fruit and vegetable Consumption and Weight Status

Most fruits and vegetables are high in water and fibre content and therefore low in energy density. Some fruits and vegetables may promote satiety and decrease energy intake. Studies suggested that increased consumption of fruits and vegetables might be a useful component of programs designed to achieve and maintain weight loss (Dietary Guidelines Advisory Committee, 2004; Rolls et al., 2004).

1.3 Recommendation for Fruit and Vegetable Intake

Due to the importance of fruits and vegetables for promoting health and reducing the risk of chronic diseases, many countries have initiated recommendations to increase the intake of fruits and vegetables.

Canada's Food Guide to Healthy Eating encourages the consumption of 5 to 10 servings of vegetables and fruit per day (Health Canada, 2002a). The Canadian Produce Marketing Association, Canadian Cancer Society and Heart and Stroke Foundation have implemented the campaign: "5 to 10 a day, Are you getting enough?" to raise awareness and to guide the population in increasing fruit and vegetable intake.

The World Health Organization recommends a daily intake of at least 400g of fruits and vegetables (World Health Organization, 2003). In the United States, a range of 5-13 servings (2½ to 6½ cups) of fruits and vegetables each day is recommended for daily energy intakes of 1200-3200 calories. For a 2000 calorie daily energy intake, 9 servings (4½ cups) of fruits and vegetables are recommended (Dietary Guidelines Advisory Committee, 2004). The U.S. Department of Health and Human Services (2000) stated the nation's health goal for Healthy People 2010 included the consumption of 5 or more fruits and vegetables per day. In Britain, the National Health Services Guide recommends that people consume at least 5 servings of fruits and vegetables each day (The National Health Services Plan, 2000). The Australian Guide to Healthy Eating recommends consumption of 7 servings of fruits and vegetables, between 1-5 servings of fruit and 2-9 servings of vegetables each day (Smith et al., 1998). Also in Australia, the Strategic Inter-Governmental Nutrition Alliance of the National Public Health Partnership (2000; 2001) developed policies and implemented programs to increase the populations' fruit and vegetable intake.

1.4 Dietary Patterns of Adolescents Related to Chronic Diseases

Adolescence is generally referred to as the period of life from 10 to 18 years of age and is accompanied by major physical, psychological and behavioural changes that

may affect an individual throughout life (Cavadini et al., 1999). Total nutrient and energy demands are higher in adolescence than during any other time in the life cycle because of rapid physical growth and development. During this period, adolescents tend to search for independence, form their own life style, and begin to have concerns for their appearance; individualism in food choice is being sought as well (Story & Resnick, 1986).

Although food habits are not stable during a person's lifetime, a base for healthy food habits can be created in early childhood (Hursti, 1999). Health-related behaviours and beliefs formed during adolescence have been linked to patterns of behaviour in adulthood. Dietary habits of adolescents may be maintained into their adult lives (Lien et al., 2001). It is during this developmental phase that negative dietary practices can become the foundation of lifestyles in later years (Beech et al., 1999). It is therefore important for adolescents to develop healthy eating habits, which will benefit them long-term.

There is great concern that the dietary habits of adolescents are putting them at risk for developing chronic diseases (Lien et al., 2001). There are 3 critical aspects of adolescence that have an impact on chronic diseases: (i) the development of risk factors during this period; (ii) the tracking of risk factors throughout life; and, in terms of prevention, (iii) the development of healthy or unhealthy habits that tend to persist throughout life (World Health Organization, 2003). Increasing evidence suggests that dietary patterns established in childhood and adolescence may predict the occurrence of obesity and adult cardiovascular disease and may also influence the risk of cancers in adulthood (Gabhainn, Nolan, Kelleher & Friel, 2001; Kemm, 1987; Munoz, Krebs-Smith, Ballard-Barbash & Cleveland, 1997). For example, being overweight as an adolescent is

associated with overweight as an adult; high fat intake during adolescence and into adulthood is associated with an increased risk for coronary heart disease; and low calcium intake during adolescence is associated with low bone density and an increased risk for osteoporosis later in life (Centers for Disease Control and Prevention, 1996; Neumark-Sztainer et al., 1999; Sandler et al., 1985; Story, Neumark-Sztainer & French, 2002; US Department of Health and Human Services, 1990).

As well, childhood obesity has become an issue around the world. Childhood obesity is a risk factor for the development of chronic diseases (Fulkerson, French & Story, 2004). More than 60% of overweight children have at least 1 additional risk factor for cardiovascular disease, such as elevated blood pressure, hyperlipidemia, or hyperinsulinemia. Overweight and obesity track from childhood into adulthood, and adolescent obesity has been linked to higher all-cause mortality in adulthood (Lowry, Wechsler, Galuska, Fulton & Kann, 2002). Two main priorities for the prevention of the increasing epidemic of obesity are increasing physical activity and improving dietary behaviors (Fulkerson et al., 2004).

For the majority of people who do not smoke or excessively drink alcohol, what they eat is one of the most significant controllable risk factors affecting their long-term health. Although the majority of deaths and illnesses attributed to coronary heart disease, cancer, stroke, diabetes, and atherosclerosis occur in older populations, related nutritional risk factors and dietary practices often develop in childhood and adolescence (Corwin et al., 1999). Thus, public health professionals are aware of the necessity for monitoring and reporting adolescents' nutrition patterns.

1.5 Fruit and Vegetable Consumption in Adolescents

Although recommendations have been published in many countries, surveys have reported that fruit and vegetable consumption is lower than the recommended amount. In Canada, 1,543 randomly selected adults (aged 18-65) and 178 adolescents within the sampled household were enrolled in a study to compare their food intakes with those recommended in Canada's Food Guide to Healthy Eating. Authors found that the mean intake of vegetables and fruits was marginal or below the minimum recommended level for most age and sex groups surveyed including teenagers' groups (Starkey, Gray-Donald & Johanson-Down, 2001).

Similar results were found in other countries. Data from the 2001 Youth Risk Behaviour Surveillance Survey (YRBSS) in the United States showed that fewer than 22% of students in grades 9 through 12 (aged approximately 14 to 18 years) ate at least 5 servings per day of fruits and vegetables during the 7 days preceding the survey. Of all the food groups, adolescents were most likely to have an insufficient number of servings from the fruit and vegetable groups (Grunbaum et al., 2002). The 1995 Australian National Nutrition Survey data reported that 1/4 of children and adolescents did not eat fruit on the day of the survey and 1/5 did not eat vegetables. Less than 25% of adolescents had an adequate fruit intake and only 1/3 of children and adolescents met the vegetable intake recommendations. It was noted that fruit and vegetable intakes appeared to have declined in the past 10 years (Magarey et al., 2001).

1.6 Factors Influencing Adolescents' Fruit and Vegetable Intake

A variety of intrinsic and extrinsic factors that influence adolescents' eating behaviors have been identified, including gender, age, race, nutrition knowledge level,

media influence, cultural beliefs, and parental and maternal food preferences (Corwin et al., 1999).

1.6.1 Gender Effects on Adolescents' Fruit and Vegetable Intake

Gender differences could affect adolescents' food habits (Babayan, Budayr & Lindgren, 1966; Fischler & Chiva, 1986; Hall & Hall, 1939; Rolls, 1988; Story, 1989; Walsh, 1993). However, the results of gender differences in adolescents' fruit and vegetable consumption were conflicting.

Roos, Hirvonen, Mikkila and Rimpela (2001) found the daily consumption of raw vegetables was more common among girls than boys, with 35% of girls consuming raw vegetables daily compared with only 16% of boys. A larger proportion of boys than girls (12% vs 5%) reported that they had not eaten raw vegetables at all during the previous week.

Brady, Lindquist, Herd and Goran (2000) assessed the fruit and vegetable consumption of 110 African-American and Caucasian male and female children aged 7-14 years, and they found that a higher percentage of males (30%) met the guidelines for vegetables than females (13%).

In Backman, Haddad, Lee, Johnston and Hodgkin's (2002) study, a sample of 780 adolescents, aged 14 to 19 years, was recruited from 4 public high schools. Six hundred and seventy two adolescents (86%) completed a food frequency questionnaire (FFQ). The results of this study showed that there were no statistically significant gender differences in fruit and vegetable intake.

There are several reasons that might be related to the discrepancies. Firstly, the research instruments used in each study were different. In Roos and colleagues' study

(2001), dietary intake was assessed using a FFQ that included food frequency questions on 15 food items, of which 1 item related to consumption of raw vegetables. In Brady and colleagues' study (2000), dietary data were gathered using the 24-hour dietary recall by trained interviewers. In Backman and colleagues' study (2002), a 67-item FFQ that contained 14 items assessing fruit and vegetable consumption was used, which was developed and validated by the researchers. Thus, differences in the research instruments may have contributed to the variability in study results. Each research instrument has its own limitations and measurement errors. Problems associated with each method of assessing fruit and vegetable intake could influence the results. Recall bias could exist in these studies. Adolescents might have difficulty remembering past events (Macpherson, Hoelscher, Alexander, Scanlon & Serdula, 2000). They may underreport/overreport their intake while completing the questionnaires, dietary recalls and records (Stang, 2002). In addition, previous studies (Bensley, Eenwyk & Bruemmer, 2003) showed that there were differences in responses to frequency questions on the intake of fruit and vegetables depending on whether information about serving sizes was provided.

Secondly, in Roos and colleagues' study (2001), the consumption of raw vegetables was assessed. In Brady and colleagues' study (2000) and Backman and colleagues' study (2002), participants' total fruit and vegetable intake was evaluated.

Thirdly, the sample size of each study differed: 76, 201 students participated in Roos and colleagues' study (2001); 110 children participated in Brady and colleagues' study (2000); and 780 adolescents participated in Backman and colleagues' study (2002). It wasn't a random sample in Backman and colleagues' study (2002) and Brady and colleagues study (2000). The samples of these 2 studies may not be representative of the

population they were intended to assess. The response rate of each study was not 100%. The nonresponders of each study may have differed from those who completed the survey. Roos and colleagues' study (2001) was conducted in Finland, whereas the other 2 studies (Backman et al., 2002; Brady et al., 2000) were conducted in the US. Dietary patterns might differ in these 2 countries, which could influence adolescents' fruit and vegetable intake.

Lastly, the participants' ages differed among studies. In Roos and colleagues' study (2001), students were from grades 8 and 9. The mean age among the adolescents was 15.3 years. Subjects' ages in Brady and colleagues' study (2000) were between 7 to 14 years, and 14 to 19 years in Backman and colleagues' study (2002). The age effects on adolescents' fruit and vegetable intake might influence the results of the various studies.

The discrepancies among these studies could be due to the sample difference, since the samples of Backman and colleagues' study (2002) and Brady and colleagues study (2000) may not be representative of the target population, the difference of geographic locations (Finland & US), or the age difference. In addition, in Roos and colleagues' study (2001), only 1 question without serving information was asked about raw vegetable consumption and in Backman and colleagues' study (2002), no serving information was provided in the questionnaire; thus, the results of these 2 studies may not truly reflect adolescents' fruit and vegetable consumption. When questions of cooked vegetables were included in Roos and colleagues' study (2001) and serving information was provided in the questionnaires of these 2 studies, results might be different from or the same as what authors have observed in the current studies.

1.6.2 Age Effects on Adolescents' Fruit and Vegetable Intake

Age differences influence adolescents' fruit and vegetable intake (Drewnowski, 1989; Sweeting, Anderson & West, 1994). However, results of age effects on teenagers' fruit and vegetable intake have not been consistent.

In the United States, Lytle, Seifert, Greenstein and McGovern (2000) used a longitudinal cohort design to examine changes in eating patterns and food choices of students from the 3rd to the 8th grade. This study indicated that as students moved from elementary school to junior high school, many of their eating habits became less healthy. In particular, their intake of fruits, vegetables, and fruit juice decreased. As well, a Norwegian study reported the prevalence of boys eating fruit daily dropped from 53% at age 14 to 20% at age 21, whereas the prevalence of females eating fruit daily dropped from 59% to 29% during the same period. The prevalence of daily consumers of vegetables was reduced by nearly half from age 14 to 21. Even those who were eating fruit and vegetables most frequently relative to their peers showed deterioration in healthy choices over time (Lien et al., 2001). But in Neumark-Sztainer and co-workers' study (1996), researchers found that age differences in consumption patterns were not significant.

Reasons that might explain differences in these results include research design, sample size, dietary assessment and participants' age of each study. Firstly, a longitudinal cohort study design was used in Lytle and colleagues' study (2000) and Lien and colleagues' study (2001), whereas a cross-sectional study design was used in Neumark-Sztainer and co-workers' study (1996). Different conducted research designs might be one of the reasons that results of these studies were different. Secondly, 535 3rd

grade students participated in Lytle and colleagues' study (2000). Students were tracked into the 5th and 8th grades to collect data and 291 students' data could be used. In Lien and colleagues' study (2001), 885 14 years old students participated. Students were followed till 21 years old and 366 students completed all surveys. In Neumark-Sztainer and co-workers' study (1996), 36,284 grades 7 to 12 students participated. These 3 studies did not use random samples. In both Lytle and colleagues' study (2000) and Lien and colleagues' study (2001), some students were lost to follow-up. Participants who were lost to follow-up may differ from those who participated in the study. Thirdly, in Lytle and colleagues' study (2000), dietary intake was collected by the 24-hour recall. Two-item questionnaires were used in Lien and colleagues' study (2001) and Neumark-Sztainer and co-workers' study (1996) to assess adolescents' fruit and vegetable intake. Different measurement errors were associated with each research instrument. Recall bias could exist in these studies.

Because different research instruments were used to assess adolescents' fruit and vegetable intake, results of these studies might be different. In Lien and colleagues' study (2001) and Neumark-Sztainer and co-workers' study (2002), 2 questions without serving information were asked about fruit and vegetable intake. Results of Lien and colleagues' study (2001) and Neumark-Sztainer and co-workers' study (1996) may not truly reflect adolescents' fruit and vegetable consumption. When information of serving sizes was included in the questionnaires of these 2 studies, results might be the same as or different from what authors have obtained in the current studies.

In Neumark-Sztainer and co-workers' study (1996), cross-sectional study design was used. Because the fruit and vegetable intake was assessed and compared at the same

time in the study, it could not be known if students were followed to their elder ages, their intakes would be changed or not. In Lytle and colleagues' study (2000) and Lien and colleagues' study (2001), some participants were lost to follow-up. If students who didn't change their eating habits were lost to follow-up, then it would be impossible for us to know whether the current obtained results of these 2 studies would be changed or not.

1.6.3 Cultural Difference Regarding Adolescents' Fruit and Vegetable Intake

Cultural differences, like gender and age, may also influence the fruit and vegetable intake of adolescents. The results from various studies have not been consistent and have mainly focused on African-American, Hispanic and Caucasian youth in the US.

One study (Neumark-Sztainer et al., 1996) observed that fruit and vegetable consumption patterns were not consistent for adolescents from different ethnic groups. African-Americans were at greatest risk for inadequate vegetable consumption, yet were at lowest risk of inadequate fruit consumption. American Indians were at greatest risk of inadequate fruit consumption followed by white adolescents. Asian-Americans were the least likely to report inadequate vegetable consumption. Beech and colleagues' study (1999) also demonstrated significant ethnic differences in the frequency of fruit and vegetable consumption, with African-American adolescents reporting a lower mean consumption (2.17 servings) than white adolescents (2.69 servings).

However, Munoz and colleagues' study (1997) showed that white children were less likely than black children to meet the recommendation for vegetables. Neumark-

Sztainer, Story, Hannan and Croll (2002) also indicated that fruit and vegetable intake was lowest among white girls and boys.

Possible reasons to explain these discrepancies are similar to the reasons discussed in the last 2 sections. Sample size, participants' age and dietary assessment of each study differed. In Neumark-Sztainer and co-workers' study (1996), 36,284 students from grades 7 to 12 participated; 2213 9th grade students participated in Beech and colleagues' study (1999); 3307 youth aged 2 to 19 participated in Munoz and colleagues' study (1997) and 4746 adolescents aged 11 to 18 participated in Neumark-Sztainer and colleagues' study (2002). None of these studies were used a random sample. Age difference among participants might influence the results of each study. Two items questionnaire was used in Neumark-Sztainer and co-workers' study (1996); 24-hour dietary recalls was used in Munoz and colleagues' study (1997) and 149-item Youth and Adolescents Food Frequency Questionnaire was used in Neumark-Sztainer and colleagues' study (2002) to assess participants' fruit and vegetable intake. One question about the daily servings of fruit and vegetable consumption was asked in Beech and colleagues' study (1999). Questionnaires used in Neumark-Sztainer and co-workers' study (1996) and in Neumark-Sztainer and colleagues' study (2002) were not developed specifically for diverse cultural backgrounds. Different research instruments had their own measurement errors. Recall bias could exist.

The discrepancies among these studies could be due to the age difference or the sample difference, since the samples of these studies may not be representative of the target population. The research tools used in these studies might influence the differences among the results. In Beech and colleagues' study (1999), only 1 question

without serving information was asked about fruit and vegetable consumption and no serving information was provided as well in the questionnaires in Neumark-Sztainer and co-workers' study (1996) and in Neumark-Sztainer and colleagues' study (2002). Results of these 3 studies may not be the actual adolescents' fruit and vegetable consumption. Students might underreport/overreport their intake while completing the questionnaires. When information of serving sizes or more detailed information was included in the questionnaires of these 3 studies, results might be different from or the same as what authors have obtained in the current studies.

1.6.4 Other Possible Factors That May Influence Adolescents' Fruit and Vegetable Intake

Socioeconomic status (SES), based on parental education and employment status, has been demonstrated to influence adolescent fruit and vegetable consumption (Johansson, Thelle, Solvoll, Bjørneboe, & Drevon, 1999). Several studies have reported low SES as a predictor of low fruit and vegetable consumption. Roos and colleagues (2001) revealed a positive association between household educational level and the daily consumption of raw vegetables. Daily consumption of raw vegetables was more often reported by those with a higher household educational level than by those with a lower educational level. Results of Neumark-Sztainer and colleagues' study (2002) also found statistically significant differences for fruit intake and for combined fruit and vegetable intake, with the highest consumption levels among youths of high SES.

Frequent dieting was associated with inadequate fruit consumption but not with vegetable consumption in one study (Neumark-Sztainer et al., 1996) and higher consumption of fruit and vegetables in another (Pesa & Turner, 2001). Vegetarianism

was associated with higher fruit and vegetable intakes (Perry, McGuire, Neumark-Sztainer & Story, 2002) as was sports participation (Pate, Trost, Levin & Dowda, 2000). Health-compromising behaviours such as low physical activity (Pate, Heath, Dowda & Trost, 1996), television viewing (Boynton-Jarrett et al., 2003), fast food restaurant use (French, Neumark-Sztainer, Fulkerson & Hannan, 2001), smoking (Wilson & Nietert, 2002), binge eating, alcohol use, marijuana use, and past suicide attempts (Neumark-Sztainer et al., 1996) were correlated with inadequate fruit and vegetable intake.

Taste preferences, cost, and availability are found to be related to fruit and vegetable intake of adolescents. In addition, most studies found positive associations of nutrition knowledge, self-efficacy and belief in a relationship between diet and health with fruit and vegetable consumption (Trudeau, Kristal, Li & Patterson, 1998). Peer groups also play an important role in influencing adolescents' individual food habits, such as what kinds of food they like to eat, their daily meal pattern and the composition of the meal (Von Post-Skagegard et al., 2002).

1.7 Health Belief Model

Dietary habits established during adolescence could be retained in adulthood (Kelder, Perry, Klepp & Lythe, 1994; Wiecha, Fink, Wiecha & Hebert, 2001). More knowledge of adolescents' diet patterns and understanding of factors that have an impact on adolescents' fruit and vegetable intake can help direct efforts to design specific educational resources to improve adolescents' consumption of fruits and vegetables. Relatively little, however, is known about the barriers and motivations that influence an adolescent's consumption of fruits and vegetables in BC. For this study, the Health

Belief Model (HBM) was the theoretical framework used to develop the questionnaire to examine these factors.

The HBM was developed initially in the 1950s, a time in which new public health programs were being initiated. A group of social psychologists in the U. S. Public Health Services developed the HBM to explain the widespread failure of consumer participation in programs to prevent and detect disease, such as screening and immunization programs (Finfgeld, Wongvatunyu, Conn, Grando & Russell, 2003; Hochbaum, 1958; Janz, Champion & Strecher, 2002; Poss, 2001; Rosenstock, 1960, 1966, 1974; Strecher & Rosenstock 1997). Later, the model was expanded to address existing health problems and therapeutic interventions (Finfgeld et al., 2003; Rosenstock 1974; Strecher & Rosenstock, 1997).

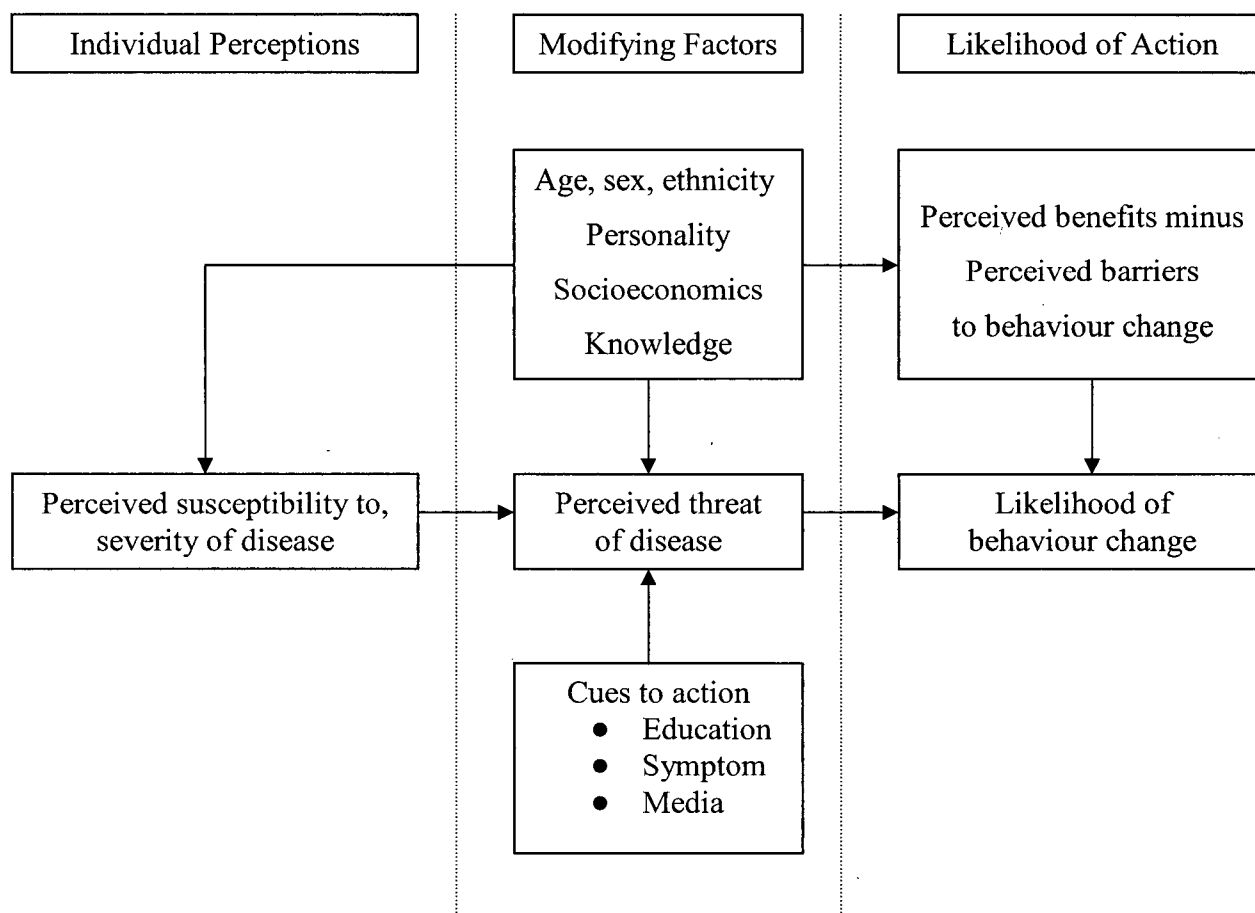
The HBM is one of the most widely used public health theoretical frameworks (Strecher & Rosenstock, 1997; Zak-Place & Stern, 2004). It has been used as a theoretical guide in an extensive number of health behaviour studies (Hanson & Benedict, 2002; Janz & Becker, 1984). Many researchers employed this model to guide the development of health interventions with the aim of changing behaviours (Austin, Ahmad, McNally & Stewart, 2002; Strecher & Rosenstock, 1997). Previous studies have successfully used the HBM in adolescents to investigate their health-related behaviours, such as smoking (Li et al., 2003), condom use (Thato, Charron-Prochownik, Dorn, Albrecht & Stone, 2003), intended sexual behaviour (Selvan, Ross, Kapadia, Mathai & Hira, 2001) and HIV prevention (Macintyre, Rutenberg, Brown & Karim, 2004).

1.7.1 Components of Health Belief Model

Key concepts in HBM model are perceived susceptibility (one's belief regarding the possibility of getting a condition or being harmed by the condition), perceived severity (one's belief of how serious a condition is and the consequences of the condition, such as mortality or disability), perceived benefits (one's belief in the efficacy of the advised action to reduce risk or seriousness of impact), perceived barriers (one's belief about the tangible and psychological costs of the advised action), cues to action (strategies to activate one's "readiness" to apply behaviours, which may include a physician's advice, print or electronic advertisement, or television program) and self-efficacy (one's confidence in one's ability to take action) (Janz et al., 2002). As well, other variables such as age, gender, ethnicity, socioeconomics and knowledge may have an indirect effect on behaviour by influencing the perception of susceptibility, severity, benefits and barriers (Chew, Palmer, Slonska & Subbiah, 2002; Janz et al., 2002).

The HBM components are summarized in Figure 1.1 as follows.

Figure 1.1. Health Belief Model Components and Linkages (Janz et al., 2002).



According to the HBM, individuals will engage in behaviour change when they see themselves as susceptible to their current behavioural patterns and perceive the consequences of the current behavioural patterns as serious (perceived susceptibility and severity), believe that change of a specific kind will result in a valued outcome (perceived benefit), and believe that the benefits of the healthful behaviours exceed the costs (perceived barriers). They also must feel themselves competent (self-efficacy) to overcome perceived barriers to taking action (Hanson & Benedict, 2002; Janz et al., 2002). Cues to action (eg, education, public health interventions) are considered modifying variables that influence behaviour by prompting action. Cues to action

influence perceived threat, which, in turn, influences behaviour (Hanson & Benedict, 2002).

1.7.2 Previous Studies Using the HBM to Explain Fruit and Vegetable Consumption

Food choices are the result of a complex interplay among sociodemographic, psychosocial, and environmental factors. Because the purpose of this study was to find out what factors may motivate or hinder adolescents' fruits and vegetables intake, the HBM model was used as a framework for understanding factors that have an impact on the consumption of fruits and vegetables.

Dittus, Hillers and Beerman (1995) have used the HBM to identify the benefits of and the barriers to fruit and vegetable intake in adults. In Dittus and colleagues' study (1995), a questionnaire was developed to identify attitudes of Washington state residents regarding the nutritional benefits of and the barriers to fruit and vegetable intake. The benefits of fruit and vegetable intake measured in this study included reducing cancer risk, contribution to vitamin/mineral/fibre intakes and a low calorie content. Barriers included cost, taste, availability and family acceptance. Readiness to consume fruits and vegetables was examined by assessing nutrition concerns related to fruit and vegetable intake. Perceived susceptibility to cancer was measured as well. A qualitative preliminary survey with participants in two Washington state counties (n=33) and a focus group (n=8) were conducted to identify concepts to include for each variable. Based on participants' responses to the qualitative data collection, a series of statements was included in the survey to address each of the previously mentioned variables. Each series of statements was extensively peer reviewed by faculty members in human nutrition to determine the appropriateness of each statement in addressing the intended variable.

After modifications, the statements were peer reviewed again. The survey was pretested using a group of 14 participants. Appropriate revisions were made based on pretesting and the survey was peer reviewed a final time (Dittus et al., 1995). The questionnaire was then mailed to Washington state residents and 1069 persons responded. Results showed that barriers to fruit and vegetable consumption were negatively correlated to fruit and vegetable intake. The benefits of fruit and vegetable consumption, readiness to consume fruits and vegetables and susceptibility to cancer were positively correlated to fruit and vegetable intake (Dittus et al., 1995).

Although the HBM has been applied to diverse areas, few studies have used the HBM to investigate factors associated with adolescents' fruit and vegetable intake.

1.8 Assessing Fruit and Vegetable Intake

Measuring dietary intake is important for nutrition monitoring, research and intervention efforts. Assessment of dietary intake involves the collection of information on foods and beverages consumed (Smiciklas-Wright & Guthrie, 1995). Dietary data are collected for many different purposes. They may be used to estimate population prevalence of intakes of particular foods or food components, to study time trends in consumption patterns, to compare intakes of groups, and to study the relationships between intake and health outcomes. They are also used by nutritionists and other health professionals to design nutritional care plans and to evaluate the effectiveness of therapeutic and educational interventions (Smiciklas-Wright & Guthrie, 1995).

Various methods for collecting food consumption data are available such as 24-hour recalls, food records, food frequency questionnaires (FFQs) and diet histories (Lee

& Nieman, 2003) but no single method is considered to be generally accepted for all purposes. All these methods have their own strengths and weakness.

The dietary record provides a quantitative account of a person's diet during a specific period, usually ranging from 1 to 7 days (Rocket & Colditz, 1997). The food record does not depend on memory, because the respondent ideally records food and beverage consumption at the time of eating. It can provide detailed food intake data and information about eating habits. However, respondents may change their eating habits while reporting the food records (Lee & Nieman, 2003). Completion of a food record is a demanding task for the subject, who must be willing to expend the time and effort to record dietary intake (Smiciklas-Wright & Guthrie, 1995). The information provided from food records is self-reported and is subject to overestimation and underestimation (Stang, 2002).

The 24-hour recall, a snapshot of a person's eating habits (Rocket & Colditz, 1997), is commonly used because it is easy to administer, can be done in-person or by telephone and can be used to assess adequacy of energy and macronutrient intakes (Stang, 2002). In the 24-hour recall method, a trained interviewer asks the respondent to recall in detail all the food and drink consumed during a period of time in the recent past. The interviewer then records this information for later coding and analysis. The time period is the previous 24 hours (Lee & Nieman, 2003). However, the 24-hour recall is dependent on respondent's memory. People may not be able to remember what they ate or know how much they ate. Respondents may tend to underreport/overreport the consumption of the foods they ate (Lee & Nieman, 2003; Smiciklas-Wright & Guthrie, 1995; Stang, 2002). A single 24-hour recall is effective for assessing average intakes of foods and/or

nutrients for large groups, but it is not suitable for assessing usual food and/or nutrient intakes of individuals (Gibson, 1990).

FFQs ask respondents to report frequency of consumption and sometimes portion sizes for a defined list of foods; the questionnaire can be self-administered or conducted with individual or group assistance. Respondents report their usual intake over a defined period of time in the past year, month, or week. FFQs can be classified as quantitative, semiquantitative, or non-quantitative. Quantitative means the quantity of food consumed is estimated using weights, measures, or food models. Semiquantitative means the quantity of food consumed is estimated using a standard portion size, serving, or a predetermined amount. Non-quantitative means the quantity of food consumed is not determined (Macpherson et al., 2000).

FFQs have become widely used, particularly in epidemiologic studies (Smiciklas-Wright & Guthrie, 1995). FFQs could be used for different purposes. They could be designed to assess usual food intake and are commonly used in case-control and cohort studies to examine the relationship between diet and disease. They have also been used in cross-sectional surveys to estimate the means and standard deviations of population intakes, and in randomized controlled trials to measure change in intake (Amanatidis, Mackerras & Simpson, 2001).

Although 24-hour recalls and food records have been used successfully for school children and adolescents, the methods are cumbersome and resource-intensive. FFQs represent 1 alternative for collecting dietary data in a less resource-intensive manner (Buzzard et al., 2001). In order to estimate the fruit and vegetable intake of adolescents living in the Lower Mainland, BC, a FFQ was developed in this study. FFQ

was chosen over 24-hour recalls, food records and other diet assessment methods in this study, because it is easy to administer, cost-effective and easily adapted for population studies (Macpherson et al., 2000).

However, FFQ has its own limitations. The food list in the FFQ may not represent usual foods by respondents (Lee & Nieman, 2003). FFQs may underestimate/overestimate the proportion of fruit and vegetable intake of participants. "Serving" is difficult to define and students may have some difficulty in estimating portion sizes. Adolescents may also have some difficulty recalling past events (Macpherson et al., 2000). Young children and adolescents also tend to have limited knowledge of foods (Buzzard, et al., 2001). Through pilot testing and conducting focus groups with a sub-group of the target population, some of these limitations could be minimized.

Existing Food Frequency Questionnaires

In order to develop a FFQ for the current study, a literature review was conducted to look for appropriate existing instruments. There are several FFQs available for use by adolescents, such as the Youth/Adolescent Questionnaire (YAQ) for assessing the diets of older children and adolescents aged 9 to 18 (Lee & Nieman, 2003, Rocket, Wolf & Colditz, 1995), Youth Risk Behaviour Surveillance System questionnaire (YRBSS) (Field et al., 1998), Behavioural Risk Factor Surveillance System questionnaire (BFRSS) (Field et al., 1998), and a FFQ developed by Backman and colleagues (2002) to identify healthful dietary behaviour.

YRBSS questionnaire, developed at the Center for Disease Control and Prevention, contains 4 questions assessing fruit (fruit, fruit juice) and vegetable (green

salad and cooked vegetables) intake. Each question asks the respondent how many times (0 to 3 or more) he/she consumed the item on the previous day (Field et al., 1998).

BFRSS was modified from a telephone to a self-administered format questionnaire, containing 2 questions assessing fruit (fruit and fruit juice) and 4 questions assessing vegetable (salad, potatoes, carrots, and other vegetables) intake (Field, et al., 1998).

In Field and colleagues' study (1998), a sample of 120 students was selected for the validation study of the YRBSS and BFRSS questionnaires. Students completed 3 24-hour recalls, each conducted approximately 2 weeks apart. Directly preceding the second 24-hour recall, the BFRSS questionnaire was administered. After the 3rd 24-hour recall, the YRBSS questionnaire was administered. The results showed that Spearman correlation between YRBSS questionnaire and the average of 3 24-hour recalls was 0.28 for fruit and vegetables. The Spearman correlation between BFRSS questionnaire and the average of 3 24-hour recalls was 0.30 for fruit and vegetables (Field et al., 1998). Thus, both YRBSS and BFRSS questionnaire had poor correlations with 24-hour recalls.

A sample of 261 youths (aged 9 to 18) participated in the validation study of the YAQ. The participants completed 3 24-hour recalls and 2 YAQs twice during 1 year. Validity was evaluated by comparing the average of the 3 24-hour recalls to the average of the 2 YAQs. The average Pearson correlation coefficient was 0.45 for nutrients (Rocket et al., 1997). A sample of 179 (aged 9 to 18) participated in the reliability study of the YAQ study. They completed the questionnaire twice at 1 year apart. Pearson correlation was used to evaluate the test-retest reliability. The reproducibility coefficient for fruits and vegetables were 0.49 and 0.48 respectively (Rocket et al., 1995). Overall, the data suggested that a self-administered food frequency questionnaire had a reasonable

ability to assess older children's and adolescents' eating habits (Rocket & Colditz, 1997). However, the YAQ questionnaire was not developed for diverse ethnic backgrounds (Neumark-Sztainer et al., 2002).

The FFQ developed by Backman and colleagues (2002) contained 14 items assessing fruit and vegetable intake. A total of 53 adolescents participated to validate the FFQ. The participants completed the FFQ as well as 1 weekend day and 3 weekday food records. The correlation was 0.44 for servings of fruits and vegetables (Backman et al., 2002). The association was slightly weaker than coefficients of 0.5 or greater that are seen typically in validation studies (Backman et al, 2002). It is agreed to some extent that if a correlation coefficient of a FFQ with a reference instrument is greater than $r=0.5$, then the FFQ can be regarded as a relatively valid tool (Plesko, Cotugna & Aljadir, 2000; Van Assema, Brug, Ronda, Steenhuis & Oenema, 2002). Thus, this FFQ was modestly correlated with dietary records.

A FFQ developed by National Cancer Institute (2000) was designed specifically to evaluate fruit and vegetable intake for the purpose of nutrition surveillance, intervention research and epidemiology. Two hundred and two men and 260 women living throughout the United States participated in the validation study of this food frequency questionnaire (Thompson et al., 2002). Participants completed 4 24-hour dietary recalls over 1 year. The correlation coefficient for the FFQ with the 24-hour recalls was about 0.5. Thus, this questionnaire could be used to estimate the intake of fruits and vegetables (Thompson et al., 2002).

FFQs developed for 1 population may not be suitable for another population, because of the types of foods and the portions listed that may vary from population to

population (Jain, 1999). The above discussed questionnaires were not developed to specifically assess fruit and vegetable intake for diverse cultures. As well, no previous work has been conducted to assess the fruit and vegetable intake of adolescents of diverse cultures in the Lower Mainland of BC. Therefore, one of the purposes of the present study was to develop and validate a FFQ.

The FFQ used in this study was adapted from the questionnaire developed by National Cancer Institute (2000), which was chosen because it was designed specifically to evaluate fruit and vegetable intake (Thompson et al., 2002). The YAQ and the FFQ developed by Backman and colleagues (2002) were not developed specifically for assessing fruit and vegetable intake and questions in YRBSS questionnaire, BRFSS questionnaire, YAQ and the FFQ developed by Backman and colleagues (2002) do not ask about portion sizes. Because the FFQ developed by National Cancer Institute (2002) was developed originally for adults and not for diverse ethnical populations, it needed to be adapted before using it in ethnically diverse populations and adolescent populations (Thompson et al., 2002). Focus groups were conducted to aid in the development of our FFQ. The 24-hour dietary record was used to assess the validity of our FFQ, because it doesn't rely on memory for adolescents to record the foods they ate (Stang, 2002). The reliability of our FFQ was evaluated in a group of students who completed the FFQ on 2 occasions approximately 2 months apart.

1.9 Focus Group

Focus groups were used in this study to aid in the development of the research instruments. Although the term "focus group" originated in sociology, focus groups have become an important research tool for program evaluation, marketing, public policy,

advertising, and communications (Stewart & Shamdasani, 1990). Focus groups generally are semi-structured group meetings during which participants contribute to the generation of data on specific questions of concern to communities, stakeholders, projects or policies. The focus group interview generally involves 4 to 12 individuals who discuss a particular topic under the direction of a moderator who promotes interaction and assures that the discussion remains on the topic of interest (Stewart & Shamdasani, 1990). Although it is possible to have as few as 4 or as many as 12 discussants in a focus group interview, about 7 to 10 participants are optimal. A typical focus group session lasts from 1½ to 2½ hours (Stewart & Shamdasani, 1990).

Focus groups tend to be used very early in a research project and are often followed by other types of research that provide more quantifiable data from larger groups of respondents (Stewart & Shamdasani, 1990). A common use of focus groups is to develop and pilot quantitative surveys (Phillips, Johnson & Maddala, 2002).

Even though focus groups are efficient and effective ways to collect interview data, when used appropriately (Padgett, 1998), they do have their limitations. First, they are not suitable for personal stories (Padgett, 1998). Second, the interaction of respondents with one another and with the researcher may have some undesirable effects, such as the responses from members of the group are not independent of one another, which restrict the generalizability of results and the results obtained in a focus group may be biased by a very dominant or opinionated member. More reserved group members may be hesitant to talk (Stewart & Shamdasani, 1990). Despite these drawbacks, focus group interviewing has become an important means of data collection.

Previous studies have conducted focus groups exploring the factors that may influence adolescents' food choices. A study conducted 21 focus groups with 141 adolescents in 7th and 10th grades in the United States to assess adolescents' perceptions about factors influencing their food choices and eating behaviours (Neumark-Sztainer et al., 1999). Factors perceived most likely as influencing food choices included hunger and food cravings, appeal of food, time considerations of adolescents and parents, convenience of food, food availability, parental influence on eating behaviours, benefits of foods, body image, habit, cost, media, and vegetarian beliefs. Major barriers to eating more fruits and vegetables included a lack of sense of urgency about personal health in relation to other concerns, and taste preferences for other foods. Suggestions for helping adolescents eat a more healthful diet included making healthful food taste and look better, making healthful food more available and convenient, and teaching children good eating habits at an early age (Neumark-Sztainer et al., 1999).

A second study used 25 focus groups with 203 adolescents to investigate the meanings of "healthy" and "unhealthy" eating and importance of healthy eating among adolescents. The barriers to healthy eating included a lack of time, limited availability of healthy foods in schools, and a general lack of concern regarding following healthy eating recommendations (Croll, Neumark-Sztainer & Story, 2001).

A third study conducted 16 focus groups with African-, Euro- and Mexican-American students and parents to identify social and environmental influences on fruit, juice and vegetable consumption. Participants mentioned peer influence as a reason for not eating fruits and vegetables and TV commercials promoting "junk foods" and non-juice sport drinks. Availability and accessibility to fruits and vegetables and parent

factors were reported as factors that influenced fruit, juice and vegetable consumption (Cullen, Baranowski, Rittenberry & Olvera, 2000).

1.10 Validity and Reliability of Measurements

To develop a FFQ looking at adolescents' fruit and vegetable consumption and a second questionnaire assessing the factors that may motivate and/or hinder adolescents' consumption of these foods, relative validity and test-retest reliability of the FFQ and face validity, content validity, construct validity, internal consistency reliability and test-retest reliability of the second questionnaire were assessed in this study.

Measurement validity concerns the extent to which an instrument measures what it is intended to measure. There are 4 types of measurement validity. Face validity indicates that an instrument appears to test what it is supposed to test (Portney & Watkins, 2000). Content validity indicates that the items that make up an instrument adequately sample the universe of content that defines the variable being measured. For instance, an instructor preparing a final examination can determine if the questions address each unit covered during the semester and if the requested information was included in course materials (Portney & Watkins, 2000). Criterion validity (relative validity) indicates that the outcomes of 1 instrument, the target test, can be used as a substitute measure for an established gold standard criterion test. When both tests are administered to one group of subjects, the scores on the target test are correlated with those achieved by the criterion measure. If the correlation is high (the correlation coefficient is close to 1.00), the target test is considered a valid predictor of the criterion score (Portney & Watkins, 2000). Construct validity establishes the ability of an instrument to measure an abstract construct

and the degree to which the instrument reflects the theoretical components of the construct (Portney & Watkins, 2000).

Measurement reliability measures the extent to which a measurement is consistent and free from error. Test-retest reliability establishes that an instrument is capable of measuring a variable with consistency. In a test-retest study, 1 sample of individuals is subjected to the identical test on 2 separate occasions, keeping all testing conditions as constant as possible. The coefficient derived from this type of analysis is called a test-retest reliability coefficient (Portney & Watkins, 2000). Internal consistency reliability reflects the extent to which items measure various aspects of the same characteristic and nothing else (Portney & Watkins, 2000) and it is concerned with the homogeneity of the items within a scale (Devellis, 2003). For example, if a professor gives an exam to assess students' knowledge of research design, the items should reflect a summary of that knowledge (Portney & Watkins, 2000).

1.11 Research Objectives

The specific aims of the present study were as follows:

1. To develop a semi-quantitative food frequency questionnaire (FFQ) for adolescents.

This FFQ should be self-administered, understood by adolescents, culturally sensitive and focused on a limited number of foods that are considered the major contributors to fruit and vegetable intake of this population.

2. To test the FFQ for validity and reliability in the target group.
3. To develop a questionnaire that assesses the factors that may motivate and/or hinder the consumption of these foods by the target population.

4. To test for validity and reliability of the questionnaire described in aim #3 in the target group.

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Chapter 2

Fruit and Vegetable Intake and Factors Influencing Intake of Adolescents: Developing the Questionnaires

2.1 Introduction

Studies have suggested that fruit and vegetable intake might reduce the risk of cancer, cardiovascular disease, and other chronic diseases (Ness & Powles, 1997; Steinmetz & Potter, 1996; Terry, Terry & Wolk, 2001). Due to the health benefits of fruits and vegetables, recommendations to increase fruit and vegetable consumption have been initiated by the World Health Organization (World Health Organization, 2002), and by many individual countries, such as Canada (Health Canada, 2002), the United States (Dietary Guidelines Advisory Committee, 2004), Britain (The National Health Services Plan, 2000) and Australia (Smith, Kellett & Schmerlaib, 1998). Studies show that adolescents' fruit and vegetable intake appears to be below the recommended level (Grunbaum et al., 2002; Lien, Lytle & Klepp, 2001; Magarey, Daniels & Smith, 2001), including in Canada (Starkey, Gray-Donald & Johoson-Down, 2001). Low fruit and vegetable intake is putting adolescents at possible risk for chronic diseases (Lytle, 2002).

Many factors may affect adolescents' fruit and vegetable intake such as age, gender, socioeconomic factors and culture (Neumark-Sztainer, Story, Perry & Casey, 1999; Nu, Macleod & Barthelemy, 1996). In order to understand adolescents' fruit and vegetable choices and to develop interventions to improve their eating habits, it is important to know what adolescents are eating and what factors they view as influencing their fruit and vegetable choices and difficulties they face in making healthier choices (Neumark-Sztainer et al., 1999).

Currently, there are no data available in British Columbia on adolescents' fruit and vegetable intake, and the factors that may have an impact on the consumption of these foods. One of the recommendations from the Ministry of Health's Fruit and Vegetable Promotion Paper (Dufresne & Levy-Milne, 2001) states that research should be conducted to "determine the motivation and barriers to fruit and vegetable consumption as well as best practices for fruit and vegetable promotion for youth, seniors, and disabled". For these reasons, we wanted to explore adolescents' fruit and vegetable intake and the factors that may influence their choices.

Existing questionnaires looking at adolescents' fruit and vegetable intake and factors influencing intake have mostly focused on African-American, Hispanic and Caucasian youth. Thus, a food frequency questionnaire (FFQ) to assess adolescents' fruit and vegetable intake and a second questionnaire looking at factors influencing fruit and vegetable intake were developed to better reflect the cultural mix of the Lower Mainland in BC. The purpose of this study was to develop and assess the validity and reliability of these 2 questionnaires.

2.2 Methods

For a larger cross-sectional study that will assess adolescents' fruit and vegetable intake and factors influencing the fruit and vegetable intake of adolescents living in the Lower Mainland, BC, a self-reported FFQ and a questionnaire examining factors that motivate and/or hinder the consumption of these foods were developed.

The self-reported FFQ was developed to assess adolescents' fruit and vegetable intake from the 3 main cultures representative of the Lower Mainland in BC (i.e., Caucasian, Chinese and South Asian). A second (Attitude/Behaviour) questionnaire

consisted of statements that adolescents could respond to by using a 6-point Likert scale (from strongly agree to strongly disagree and don't know) regarding factors that influence or hinder their fruit and vegetable intake. Baseline demographic variables were included such as gender, age, and ethnicity.

Ethical approval was obtained from University of British Columbia Behavioural Research Ethics Board and 2 School Boards in the Lower Mainland in BC.

2.2.1 Subjects and Recruitment

Principals of secondary schools located in the 2 Districts that agreed to participate were contacted. A total of 4 secondary schools agreed to participate in our study. Participants in this study were public high school students in grades 7 through 12. Students' parents/legal guardians signed consent forms and students signed assent forms for participating in this study. Students who agreed to participate in this study were divided into 2 groups. One group of students who were from 2 of the 4 secondary schools was asked to assess the relative validity of the FFQ and the other group of students who were from the other 2 secondary schools was asked to test the test-retest reliability and face validity of the 2 questionnaires and the internal consistency reliability of the Attitude/Behaviour questionnaire.

2.2.2 Development of Research Instruments

Four major steps were employed to develop the research instruments in this study.

Step1 Literature Review for FFQ and Attitude/Behaviour Questionnaire

There are several FFQs that exist for examining fruit and vegetable intake in youth, such as Youth/Adolescent Questionnaire (YAQ), Youth Risk Behaviour

Surveillance System (YRBSS) questionnaire and Behavioural Risk Factor Surveillance System (BFRSS) questionnaire. The FFQ used in this study was adapted from an existing questionnaire (Fruit and Vegetable By-Meal Screener) that was developed by the National Cancer Institute in the U.S. (2000). Although this FFQ was designed originally for adults, it was chosen because it was designed specifically to evaluate fruit and vegetable intake for the purpose of nutrition surveillance, intervention research and epidemiology (Thompson et al., 2002). The YAQ was not developed specifically for assessing fruit and vegetable intake and questions in the YAQ, YRBSS and BFRSS questionnaires do not ask about portion sizes.

Adaptations from the original FFQ were made to suit the current study's purpose: i) time frame was changed from previous month to previous week; ii) the definition of "serving" in our FFQ was based on Canada's Food Guide to Healthy Eating (CFGHE) (Health Canada, 2002; iii) items regarding beans and legumes in the original FFQ were omitted since these foods are included in the meat and alternatives category in CFGHE; iv) pictures of varying cup sizes were provided in order to help participants estimate "serving" sizes (see appendix 3).

Literature on promoting fruit and vegetable consumption and factors that might influence adolescents' fruit and vegetable intake was reviewed to generate questions for focus group interviews and the Attitude/Behaviour questionnaire (Dittus, Hillers & Beerman, 1995; Heatey & Thombs, 1997; Krebs-Smith et al., 1995; Ma et al., 2002; Mei, Ling & Caroline, 1996; Neumark-Sztainer et al., 1999).

Step 2: Conducting Focus Groups

Twenty-six students in grades 7 to 12 from 3 secondary schools and from different cultural backgrounds, such as Caucasian, South Asian and Chinese, participated in this study. They were recruited through principals and teachers of these 3 schools. Each student was given a gift certificate for participating in this study and light refreshments were provided during the focus groups. Each focus group discussion was conducted by the authors, tape-recorded, transcribed and lasted approximately 60 minutes. An assistant moderator took field notes during the focus group discussions. The transcripts were coded to identify major factors that might influence adolescents' fruit and vegetable intake.

Focus groups were conducted for 2 reasons; first, to determine major factors that motivate/hinder adolescents' fruits and vegetables consumption for inclusion in the survey, and second, to ensure the adapted FFQ would be easily understood by high school students. A semi-structured interview guide with open-ended questions based on the constructs of the Health Belief Model (HBM) (see Figure 1.1) was developed. Students were also asked questions regarding the understanding and readability of the questions in the adapted FFQ as well as the format of the FFQ (see appendix 2). The FFQ was modified accordingly.

During the focus group discussions, students mentioned the following factors that influenced their fruit and vegetable consumption: taste, smell, texture and appearance, availability and accessibility, convenience, peer pressure, time of the day for eating, parents' influence, media influence, seasonal availability and cost. Regarding the format of the FFQ, students mentioned that the previous month was a long time for them to remember what they ate and it would be difficult for them to estimate the size of a

serving. Students suggested that the previous week would be a better time frame and that pictures would help them to estimate serving sizes.

Step 3: Development of the Attitude/Behaviour Questionnaire

The Attitude/Behaviour questionnaire that relates to attitudes toward fruit and vegetable consumption and factors that may motivate and/or hinder fruit and vegetable consumption was developed using a Likert scale (see appendix 6). Questions were generated based on focus group findings and results of the literature review (Dittus et al., 1995; Heatey & Thombs, 1997; Krebs-Smith et al., 1995; Ma et al., 2002; Mei et al., 1996; Neumark-Sztainer et al., 1999). Statements were worded to ensure that they would be more acceptable to teenagers. Six-point Likert scale questionnaire was used in this study because some students may not know the content of some statements, such as what fibre is.

The HBM model (see figure 1.1) was used for constructing the statements in this questionnaire. The subscales evaluated in this questionnaire included: (a) perceived benefits (6 items), (b) perceived barriers (8 items), (c) perceived susceptibility (4 items), (d) perceived severity (4 items), (e) cues to action (7 items) and (f) self-efficacy (6 items) (see appendix 6).

Two faculty members in the Human Nutrition program in the University of British Columbia, a nutritionist and 3 graduate students reviewed the initial questionnaire to verify the content and face validity (see appendix 5). After modifications to the questionnaire, another faculty member in the Human Nutrition program and 3 other graduate students reviewed the questionnaire again to verify the construct validity of this

questionnaire (see appendix 5). In accordance to these reviews appropriate revisions were made to the questionnaire (see appendices 6&7).

Step 4 Testing the Validity and the Reliability of the Questionnaires

Relative Validity of the Food Frequency Questionnaire

The validity of the FFQ was assessed against 24-hour dietary records to determine if the amount of servings of fruit and vegetables correlated. Sixty-three high school students in grades 8 to 12 participated and were given a gift certificate for their participation. Students were asked to complete the FFQ and a written 24-hour dietary record of their food and beverage intake. Instructions on how to fill out the FFQ and 24-hour dietary record were provided.

Students completed the FFQ during class time and assistance was provided to help students fill out questionnaires. After completion, students returned their questionnaires to the researcher (L. L.). The 24-hour dietary records were done outside of class time. The completed records were then returned to the homeroom teachers. Once all the records were collected, the teachers contacted the researcher (L. L.) for pick-up.

The total daily number of servings of fruits and vegetables were computed for both the FFQ and 24-hour records and compared using the Pearson correlation test to see whether there was agreement between the two methods.

Face Validity and Reliability of the Questionnaires

To evaluate the test-retest reliability of the FFQ (see appendix 3) and the Attitude/Behaviour questionnaire (see appendix 7), questionnaires were completed by 43

students on both occasions approximately 2 months apart. Pearson correlation test was used to evaluate the test-retest reliability of the 2 questionnaires.

At the first administration of the 2 questionnaires, 48 students completed the 2 questionnaires and the face validity of these 2 questionnaires was assessed with this group of 48 students. Students were asked if the questions were understandable and clear, if the format of the questionnaires seemed logical and 'reader-friendly' (see appendices 9&10) and to provide suggestions for improvement. As well, students were asked if the 2 questionnaires were missing any information that would be of value to the purpose of the study. They were advised that their role was to help make the questionnaire easier for high school students to complete and were asked to identify any items that they found unclear or confusing or that they perceived might be unclear for other students (Barr, 1994).

The internal consistency reliability of the Attitude/Behaviour questionnaire (see appendix 7) was evaluated with the 48 students' questionnaires obtained at the first administration of the questionnaires.

2.2.3 Analysis of the data

Data analysis was performed using SPSS software (version 11.0, 2001, SPSS, Chicago). Descriptive statistics were used to summarize the data, such as means, frequencies and standard deviations. The estimate of fruit and vegetable intake was obtained by converting reported intakes on the questionnaire to daily mean intakes. T-test was used to analyze gender effects on adolescents' fruit and vegetable intake. One-way analysis of variance (ANOVA) was used to assess grade and cultural effects on adolescents' fruit and vegetable intake. Cronbach's alpha reliability coefficient was used

to evaluate the internal consistency reliability of the Attitude/Behaviour questionnaire. Pearson correlation was used to evaluate the associations between the 24-hour food record and FFQ regarding adolescents' fruit and vegetable intake and the test-retest reproducibility of the 2 questionnaires.

Questionnaires and 24-hour food records were examined individually before data entry. According to the original questionnaire developed by the National Cancer Institute (2000), questionnaires should be excluded if frequency information on fruit or other vegetables is missing; if nearly all questions are not answered or if any questions have more than 1 response answered (National Cancer Institute, 2000). In this study, questionnaires with missing answers, multiples responses to each question, or answers that could not be identified were excluded when validity and reproducibility of the 2 questionnaires were analyzed. Due to the difference between portion sizes of juice and French fries provided in the FFQ and the definition of "serving" in CFGHE, portion sizes were converted to the ones according to the definition of "serving" in CFGHE when data was analyzed.

According to classification definitions from Statistics Canada (Statistics Canada, 2004), students of Chinese descent included those whose origin was Mainland China, Hong Kong and Taiwan. Students classified as Caucasian included students whose origins were from European countries such as Portugal, Russia, Ukraine and Spain. Students of Southeast Asian and Filipino descent included those students who reported they were Vietnamese, Cambodian and Philippine. Students of South Asian descent included those students who reported they were South Asians, Hindus, Punjabis, and East

Indians. Students whose origin was Persian, Fijian and Arabian were classified as other (Statistics Canada, 2004).

2.3 Results

Relative Validity of Food Frequency Questionnaire

Demographic data of the students who participated in this part of the study are shown in Table 2.1. Originally, 63 completed the FFQs and 55 finished the 24-hour dietary records. Questionnaires were excluded due to multiple responses to a question, missing answers, or omission of portion sizes on the records, resulting in 46 students' questionnaires and food records were included in the analysis.

Pearson correlation coefficient test was calculated to measure the correlation of servings of fruits and vegetables between the FFQ and 24-hour dietary records. Fruit and vegetable intakes from both questionnaires were found to be correlated ($r=0.52$, $p<0.01$) (Table 2.2). The mean fruit and vegetable intakes in the FFQ were found to be overestimated when compared to the 24-hour dietary record for all students as well as for male students and students in grades 10 and 12. Due to the nature of the subjects in this study, to minimize participants' recording bias or errors associated with completing multiple days' food records, a single 24-hour dietary record was used in this study. Because a person's food selections vary from day-to-day, a single 24-hour dietary record is not representative of a person's usual diet (Lee & Nieman, 2003). The FFQ in this study was used to assess the mean fruit and vegetable intake over the previous 1 week and a single 24-hour dietary record was used to validate this FFQ; thus, the mean fruit and vegetable intake obtained from the FFQ and the 24-hour dietary record might be different.

Table 2.1. Description of students who completed food frequency questionnaires and 24-hour dietary records

	Female (n=30)	Male (n=16)	Total (n=46)
Grade (n) (%)			
8	5 (10.9%)	6 (13%)	11 (23.9%)
9	13 (28.3%)	4 (8.7%)	17 (37%)
10	9 (19.6%)	3 (6.5%)	12 (26.1%)
12	3 (6.5%)	3 (6.5%)	6 (13%)
Age (y) (n) (%)			
13	2 (4.3%)	4 (8.7%)	6 (13%)
14	15 (32.6%)	5 (10.9%)	20 (43.5%)
15	9 (19.6%)	2 (4.3%)	11 (23.9%)
16	1 (2.2%)	2 (4.3%)	3 (6.5%)
17	3 (6.5%)	2 (4.3%)	5 (10.9%)
18		1 (2.2%)	1 (2.2%)
Ethnicity (n) (%)			
Caucasian	7 (15.2%)	4 (8.7%)	11 (23.9%)
Chinese	10 (21.7%)	7 (15.2%)	17 (37%)
South Asian	5 (10.9%)	3 (6.5%)	8 (17.4%)
Filipino & Southeast Asian	6 (13%)	2 (4.3%)	8 (17.4%)
Others (Fijian & Arabian)	2 (4.3%)		2 (4.3%)

Table 2.2. Estimated mean daily intake of servings of fruit and vegetables from food frequency questionnaires and 24-hour dietary records

	Fruit and Vegetable Intake	
	FFQ	24-hour dietary record
	Servings/day (Mean±SD)	Servings/day (Mean±SD)
Gender		
Female (n=30)	6.98±5.82	5.66±3.64
Male (n=16)	6.72±3.82 (P>0.05) ^a	3.78±1.51* (P>0.05) ^a
Grade		
8&9 (n=28)	6.49±5.66	5.07±3.12
10&12 (n=18)	7.52±4.39 (P>0.05) ^b	4.92±3.36* (P>0.05) ^b
Ethnicity		
Caucasian (n=11)	8.73±7.35	5.03±3.21
Chinese (n=17)	6.36±3.91	4.27±2.89
South Asian (n=8)	5.77±3.47	4.28±0.75
Filipino & Southeast Asian (n=8)	6.77±5.91	6.83±4.69
Others (Fijian & Arabian) (n=2)	6.31±6.1 (P>0.05) ^c	6.8±3.61 (P>0.05) ^c
Overall	6.89±5.17	5.0±3.18*

^a No significant difference between female and male students

^b No significant difference between students in grade 8&9 and students in grades 10&12

^c No significant difference among students of diverse ethnicities

*Significant difference (P<0.05) between the data from FFQ and 24-hour dietary record

Reliability of Food Frequency Questionnaire

Table 2.3 provides the description of the students who participated in this phase of the study. Of the 43 students who completed the FFQ at both times, 30 students' questionnaires were included in the analysis. Questionnaires were excluded due to multiple responses to a question, missing answers and incomplete questionnaires. The test-retest reliability of the FFQ was evaluated using Pearson correlation test. The correlation coefficient was 0.46 for fruit and vegetable intake between the 2 administrations. The mean intakes of fruit and vegetables were 8.67 ± 4.85 servings/day and 9.08 ± 6.89 servings/day at the first and second administrations, respectively. There was no significant difference ($P > 0.05$) between the mean intakes at both times.

Table 2.3. Description of students who participated in testing the reliability of the food frequency questionnaire

	Female (n=19)	Male (n=11)	Total (n=30)
Grade (n) (%)			
8	5 (16.7%)	9 (30%)	14 (46.7%)
9	7 (23.3%)	1 (3.3%)	8 (26.7%)
10	2 (6.7%)	1 (3.3%)	3 (10%)
11	1 (3.3%)		1 (3.3%)
12	4 (13.3%)		4 (13.3%)
Age (y) (n) (%)			
13	4 (13.3%)	8 (26.7%)	12 (40%)
14	8 (26.7%)	1 (3.3%)	9 (30%)
15	1 (3.3%)	1 (3.3%)	2 (6.7%)
16	2 (6.7%)	1 (3.3%)	3 (10%)
17	4 (13.3%)		4 (13.3%)
Ethnicity (n) (%)			
Caucasian	6 (20%)	4 (13.3%)	10 (33.3%)
Chinese	10 (33.3%)	6 (20%)	16 (53.3%)
South Asian	2 (6.7%)		2 (6.7%)
Filipino & Southeast Asian		1 (3.3%)	1 (3.3%)
Others (Persian)	1 (3.3%)		1 (3.3%)

Internal Consistency Reliability of Attitude/Behaviour Questionnaire

Of the original 48 students, 47 students' questionnaires were included in the analysis of assessing the internal consistency reliability of the Attitude/Behaviour questionnaire (Table 2.4). One student's questionnaire was excluded due to missing answers to questions of the questionnaire. Responses to statements of the questionnaire were summed to form a score (from 0 to 5). Negatively worded statements were reverse coded to represent a positive response before calculation scores. Cronbach's alpha was used to test the internal consistency reliability. Means, standard deviations and Cronbach's alpha values were calculated for all subscales and the overall questionnaire and are presented in Table 2.5. The Cronbach's alpha reliability coefficients ranged from 0.16 for perceived susceptibility subscale to 0.72 for perceived barriers subscale. The coefficient for the whole questionnaire was 0.71, which suggested that the statements included in this whole questionnaire were acceptable. However, the Cronbach's alpha value of perceived susceptibility subscale was low with only 0.16, which could be due to the wording of statements that made students feel confused as pointed out by students who participated in assessing the face validity of this questionnaire.

Table 2.4. Description of students who completed Attitude/Behaviour questionnaires

	Female (n=27)	Male (n=20)	Total (n=47)
Grade (n) (%)			
8	10 (21.3%)	11 (23.4%)	21 (44.7%)
9	7 (14.9%)	2 (4.3%)	9 (19.2%)
10	3 (6.4%)	3 (6.4%)	6 (12.8%)
11	2 (4.3%)	1 (2.1%)	3 (6.4%)
12	5 (10.6%)	3 (6.4%)	8 (17%)
Age (y) (n) (%)			
13	1 (2.1%)	10 (21.3%)	11 (23.4%)
14	8 (17.0%)	2 (4.3%)	10 (21.3%)
15	8 (17.0%)	2 (4.3%)	10 (21.3%)
16	1 (2.1%)	2 (4.3%)	3 (6.4%)
17	4 (8.5%)	2 (4.3%)	6 (12.8%)
18	5 (10.6%)	2 (4.3%)	7 (14.9%)
Ethnicity (n) (%)			
Caucasian	8 (17.0%)	5 (10.7%)	13 (27.7%)
Chinese	14 (29.8%)	13 (27.7%)	27 (57.5%)
South Asian	3 (6.4%)		3 (6.4%)
Filipino & Southeast Asian	1 (2.1%)	2 (4.3%)	3 (6.4%)
Others (Persian)	1 (2.1%)		1 (2.1%)

Table 2.5. Internal consistency reliability coefficient of the Attitude/Behaviour questionnaire

Subscale Score	Statements Per Subscale	Score (Mean±SD)	Cronbach's α Coefficient
Perceived Benefits	6	19.4±4.97	0.51
Perceived Barriers	8	17.2±5.17	0.72
Perceived Susceptibility	4	12.4±3.27	0.16
Perceived Severity	4	15.6±3.57	0.55
Cues to action	7	19.15±4.58	0.59
Self-efficacy	6	17.9±4.65	0.52
Overall	35	101.9±14.5	0.71

Test-Retest Reliability of Attitude/Behaviour Questionnaire

Of the 43 students who completed the questionnaire at both times, 34 students' questionnaires were included in the analysis of testing the reliability of the Attitude/Behaviour questionnaire (Table 2.6). Questionnaires could not be included in the analysis, due to missing answers to questions, multiple responses to a question or answers to questions that couldn't be recognized.

The test-retest reproducibility of the questionnaire was evaluated using Pearson correlation. Means and standard deviations for scores of each subscale of the questionnaire at the first and second administrations are presented in Table 2.7. Mean scores were comparable for the 2 administrations of the questionnaire; except the mean score for the self-efficacy subscale which was significantly higher at the second administration compared with the score at the first administration. The Pearson

correlation coefficient of the Attitude/Behaviour questionnaire from the 2 administrations was 0.59 (Table 2.7).

Table 2.6. Description of students who participated in the testing of the reliability of the Attitude/Behaviour questionnaire

	Female (n=20)	Male (n=14)	Total (n=34)
Grade (n) (%)			
8	7 (20.6%)	7 (20.6%)	14 (41.2%)
9	6 (17.6%)	2 (5.9%)	8 (23.5%)
10	3 (8.8%)	2 (5.9%)	5 (14.7%)
11	1 (2.9%)	1 (2.9%)	2 (5.9%)
12	3 (8.8%)	2 (5.9%)	5 (14.7%)
Age (y) (n) (%)			
13	6 (17.6%)	6 (17.6%)	12 (35.2%)
14	7 (20.6%)	2 (5.9%)	9 (26.5%)
15	1 (2.9%)	1 (2.9%)	2 (5.9%)
16	3 (8.8%)	2 (5.9%)	5 (14.7%)
17	3 (8.8%)	2 (5.9%)	5 (14.7%)
18		1 (2.9%)	1 (2.9%)
Ethnicity (n) (%)			
Caucasian	5 (14.7%)	4 (11.8%)	9 (26.5%)
Chinese	12 (35.3%)	8 (23.5%)	20 (58.8%)
South Asian	2 (5.9%)		2 (5.9%)
Filipino & Southeast Asian		2 (5.9%)	2 (5.9%)
Others (Persian)	1 (2.9%)		1 (2.9%)

Table 2.7. Test-retest reliability coefficient of the Attitude/Behaviour questionnaire

Subscale score	Score (Mean±SD)		Pearson Correlation
	First Time (n=34)	Second Time (n=34)	
Perceived Benefits	19.15±4.86	19.65±5.07	0.41
Perceived Barriers	17.21±5.04	17.41±5.47	0.57
Perceived Susceptibility	12.38±3.26	12.91±3.8	0.27
Perceived Severity	15.65±3.84	15.53±3.19	0.16
Cues to action	19.41±5.05	20.82±4.53	0.57
Self-efficacy	17.79±4.75	19.32±4.56*	0.75
Overall	101.59±15.36	105.65±16.25	0.59

* The difference for self-efficacy subscale between scores at first and second administrations was significant at $P<0.05$

Face Validity of the Food Frequency Questionnaire and the Attitude/Behaviour Questionnaire

Forty-eight students participated in this part of study to assess the face validity of the FFQ and the Attitude/Behaviour questionnaire (Table 2.8).

Food Frequency Questionnaire

Eighty-five percent students considered the FFQ easy to answer and 92% students considered the questions were easy to understand; 90% students liked the format of the questionnaire; and on average the questionnaire took students 12 minutes to complete. Some students mentioned they could not remember what they ate during the past week and they were not sure about the portion sizes of the food they ate or drank.

Table 2.8. Description of students who tested the face validity of the food frequency questionnaire and the Attitude/Behaviour questionnaire

	Female (n=27)	Male (n=21)	Total (n=48)
Grade (n) (%)			
8	10 (20.8%)	11 (22.9%)	21 (43.7%)
9	7 (14.6%)	2 (4.2%)	9 (18.8%)
10	3 (6.3%)	3 (6.3%)	6 (12.6%)
11	2 (4.2%)	1 (2.1%)	3 (6.3%)
12	5 (10.4%)	4 (8.3%)	9 (18.7%)
Age (y) (n) (%)			
12	1 (2.1%)		1 (2.1%)
13	8 (16.7%)	10 (20.8%)	18 (37.5%)
14	8 (16.7%)	2 (4.2%)	10 (20.9%)
15	1 (2.1%)	2 (4.2%)	3 (6.3%)
16	4 (8.3%)	2 (4.2%)	6 (12.5%)
17	5 (10.4%)	3 (6.3%)	8 (16.7%)
18		2 (4.2%)	2 (4.2%)
Ethnicity (n) (%)			
Caucasian	8 (16.7%)	5 (10.4%)	13 (27.1%)
Chinese	14 (29.2%)	14 (29.2%)	28 (58.4%)
South Asian	3 (6.3%)		3 (6.3%)
Filipino & Southeast Asian	1 (2.1%)	2 (4.2%)	3 (6.3%)
Others	1 (2.1%)		1 (2.1%)

Attitude/Behaviour Questionnaire

Eighty-five percent students viewed the Attitude/Behaviour questionnaire as easy to answer and 92% students viewed the questions as easy to understand. Ninety-one percent students liked the format of the questionnaire and students took about 10 minutes on average to answer the questions. Several students mentioned some questions were worded in a negative way, whereas some questions were worded more positive, which made them feel confused at times.

2.4 Discussion

We have presented a systematic approach for developing a brief, self-administered FFQ and an Attitude/Behaviour questionnaire focusing on fruit and vegetable intake specifically designed to use with adolescents living in the Lower Mainland of British Columbia. We were hoping that the students who participated would reflect the cultural diversity in the Lower Mainland. According to 2001 Canadian Census Data (Statistics Canada, 2002): top three languages in the Lower Mainland were English (61%), Chinese (15.2%) and Punjabi (4.7%) and children aged 14 and under accounted for 15% of the Chinese population in 2001 and 23% of the Punjabi population.

Although our sample was a convenience sample and the students' ethnicities in this study could not be representative of all cultures in the Lower Mainland, the ethnicities of students recruited in our study were diverse. Students were from Caucasian, Chinese, Filipino, South Asian, and Southeast Asian cultural backgrounds.

Approximately 37% to 59% of the participants in the various phases of this study were of Chinese descent. This is not surprising because the area in which the schools that participated were situated had a large Chinese population (about 40% of

population is Chinese) (Statistics Canada, 2001; 2003). In the phase of the study to test the validity of the FFQ, about 17% of students were Filipino and Southeast Asian. Again, this was not surprising since about 8.6% of the population is Filipino and Vietnamese in the area where the schools are located (Statistics Canada, 2001).

The FFQ used in this study was a semi-quantitative questionnaire, with questions not only asking about the frequency of consumption of different fruit and vegetable items but also asking about portion sizes. Some studies have shown that the accuracy of FFQs could be improved by asking questions about portion sizes (Haraldsdottir, Tjonneland & Overvad, 1994; Jain, 1999). Results of Bensley, Eenwyk and Bruemmer's study (2003) showed that there were differences in responses to frequency questions on the intake of fruit and vegetables depending on whether information about serving sizes was provided. In this study, researchers compared two methods of measuring fruit and vegetable consumption using a random-digit-dialed telephone survey with 917 Washington state adults. The survey included two sets of questions, one providing and the other not providing standard definitions of serving sizes. Results showed that although only 26% of respondents met the 5-A-Day recommendations without serving size information, 50% met these recommendations when using a measure that included a definition of serving size (Bensley et al., 2003). Thompson and colleagues (2002) found that the FFQs without portion size information produced lower fruit and vegetable serving estimates compared with participants' fruit and vegetable intake from 24-hour dietary recalls.

Studies of portion sizes have shown that not only is it difficult for individuals to accurately report their portion sizes, but also that beliefs about what constitutes a portion

vary widely among individuals (Bensley et al., 2003; Smiciklas-Wright, Mitchell, Mickle, Goldman & Cook, 2003). Wolfe, Frongilio and Cassano (2001) asked 31 adults about their understanding of fruit/vegetable questions and found that definitions of a “serving” of vegetables, provided by participants, included “a plate”, “1 cup”, “a scoop or two”, “1/4 cup carrots”, and “1/2 cup vegetables”, and definitions of a “serving” of fruit included “a handful of grapes”, “two handfuls of grapes”, “1/4 melon”, “one piece of fruit”, “two apples”, and “1 cup”.

Studies have shown that overestimation of food intake is a problem that may occur in the teenager group (Rockett et al., 1997). Several studies have found that teenagers tend to overestimate the food intake compared to corresponding records (Domel et al., 1994; Jenner, Neylon, Croft, Beilin & Vandongen, 1989, Rockett et al., 1997; Van Assema, Brug, Ronda, Steenhuis & Oenema, 2002). Van Assema and colleagues (2002) found that their FFQ overestimated the mean daily intake of fruit and vegetables compared with food records among adolescents. In our study, male students and students in grades 10 and 12 overestimated their intake in the FFQs compared with their 24-hour dietary records.

Validity of a FFQ is the degree to which the instrument measures the diet of the subjects it was designed to study. When validating nutritional assessment methods, the reference method should be as precise and accurate as possible and any errors due to the method should be independent of the other method used (Rockett et al., 1997). However, all dietary assessment methods have their inherent errors. Although the 24-hour dietary record was used as the reference method in this study to test the validity of the FFQ, any errors related to food records and FFQs could contribute to a lack of agreement in the

validation. When we analyzed the data, as Koehler and colleagues (2000) found in their study, some food descriptions on students' 24-hour records were vague or ambiguous. Thus, some reporting errors would be expected when students recorded and described foods and beverages that they consumed for both assessment methods. The FFQ in this study was used to assess the fruit and vegetable intake over the previous 1 week. A single 24-hour dietary record can provide reasonably accurate data about 1 day's dietary intake for a group (Gibson, 1990; Lee & Nieman, 2003). Group mean fruit and vegetable intakes (per day) and individual usual intakes (per day) may both vary with the day of week (Gibson, 1990). Difference between the measured time frames of the FFQ and the single 24-hour dietary record could influence the results of testing the validity of the FFQ.

The FFQ used in this study was adapted from the Fruit and Vegetable By-Meal Screener developed by National Cancer Institute in the United States (2000), which has been validated with a group of 202 men and 260 women aged 20 to 70 years living throughout the U.S. The correlation coefficient was 0.5 between the questionnaire and the 4 24-hour dietary recalls conducted over a year for the adult population (Thompson et al., 2002). Many studies have found correlation coefficients between 0.4 and 0.7 in dietary validation studies of FFQs (Jain, 1999; Willett, 1994). Backman, Haddad, Lee, Johnston and Hodgkin (2002) reported a correlation coefficient of 0.44 for servings of fruit and vegetables in a FFQ that contained 14 items. The FFQ was validated against food records in a group of 53 students (aged 14-19). In Rockett and colleagues' study (1997), the Pearson correlation coefficient was 0.45 for nutrients for the YAQ against 24-hour dietary recalls in a group of 261 youths (aged 9-18). The Pearson correlation coefficient of 0.52 found in the present study is comparable with these studies.

The test-retest reliability coefficient of the FFQ in this study was 0.46, similar to that of other FFQs developed for adolescents. The reproducibility coefficient for the YAQ for fruit was 0.49, for vegetables was 0.48 and for the combination of fruit and vegetables was 0.48 over a 1-year period in a group of 179 youths (aged 9-18) (Rocket, Wolf & Colditz, 1995). Buzzard and colleagues (2001) reported a reproducibility coefficient of 0.47 for fruit and vegetables of their FFQ over a 4-month interval among grades 6 and 7 students. In this study, 21% (r^2) of the variability of the mean fruit and vegetable intake obtained at the second administration of the FFQ could be predicted from the mean fruit and vegetable intake obtained at the first administration of the FFQ. Thus, the predictability for the test-retest reliability of the FFQ was low. However, previous FFQs developed for adolescents also have a low predictability in terms of the test-retest reliability of the FFQs.

Few studies used the HBM to predict factors affecting fruit and vegetable intake of adolescents. However, Cronbach's alphas of perceived benefits and perceived barriers subscales obtained from this study were consistent with a previous study using HBM constructs to assess benefits and barriers to fruit and vegetable intake in adults. Dittus and colleagues' study (1995) was conducted with a sample of Washington state residents aged 20 to 88 years to identify their attitudes regarding nutritional benefits of fruit and vegetables and the barriers to fruit and vegetable intake. In Dittus and colleagues' study (1995), Cronbach's alphas were 0.48 for benefits of fruit and vegetable intake and 0.73 for barriers to fruit and vegetable intake. In our study, the Cronbach's alphas were 0.51 for perceived benefits subscale and 0.71 for perceived barriers subscale. The Cronbach's alpha in our study for perceived susceptibility subscale was 0.16. The test-retest

reliability coefficients for perceived severity, perceived susceptibility and perceived benefits subscales were 0.16, 0.27 and 0.41. These values are low and may be due to incorrect interpretations of the some questions because several students mentioned that the negative and positive wording of the questions made them feel confused sometimes. Devellis (2003) suggested that reversals in item polarity may be confusing to respondents. Or as Birnbaum and colleagues (2002) mentioned in their study, students might not know the answers and may guess at both times of administration. Rockett and colleagues (1995) suggested that there was higher within-person variability in children than in adults, which could contribute to the low reproducibility coefficients. The perceived susceptibility subscale measured 4 different aspects of susceptibility regarding fruit and vegetable intake including the susceptibility to cancer, heart disease, balanced diet and weight status. The diversity of susceptibilities measured in the questionnaire might result in a lower Cronbach's alpha for perceived susceptibility subscale.

The score of the self-efficacy subscale on the second administration of the questionnaire was significantly higher than that on the first administration. The reason for this is unknown. It might be that the students participating became more aware about the nutritional benefits of fruit and vegetables after the first administration and felt more confident to increase their fruit and vegetable consumption 2 months later. It could also be due to the possibility of chance, since there were 6 t-tests done with no adjustment to keep the overall alpha at 0.05. Overall, the questionnaire is acceptable, with the internal consistency reliability coefficient of 0.71 and the test-retest reliability coefficient of 0.59.

After certain revisions to the FFQ and the Attitude/Behaviour questionnaire, these 2 questionnaires could be further used as tools to assess adolescents' fruit and

vegetable consumption and to identify factors influencing adolescents' consumption of these foods from diverse backgrounds in future studies. The FFQ could be used more often to assess adolescents' fruit and vegetable consumption, such as administering the FFQ 4 times during a month to capture an adolescent's fruit and vegetable consumption for 1 month. The pictures provided in the FFQ could be changed to using shapes to illustrate portion sizes and to help students estimate portion sizes, for instance, 1 playing dice is about 1tsp/5ml; a tip of an adult thumb is about 1 tablespoon/15ml; 4 stacked dice is about 1oz/28g; 2 adult finger tips are about 1½ oz/45g; the size and thickness of a deck of cards is about 3 oz/85g of meat, fish or poultry; a golf ball is roughly the same size as a medium apple or peach or a 1/3 of a cup/78ml; a medium egg is about ¼ cup; 1 adult handful is about equal to one 1 ounce or ½ a cup/125ml and 1 adult fist is about 1 cup/250ml.

Revisions could be made to the Attitude/Behaviour questionnaire for perceived benefits, perceived susceptibility and perceived severity subscales. The perceived susceptibility and perceived severity subscales could be deleted from the Attitude/Behaviour questionnaire because the test-retest reliability coefficients of these 2 subscales were low and the internal consistency reliability coefficient of the perceived susceptibility subscale was low. As well these 2 subscales would have lower prediction regarding adolescents' fruit and vegetable consumption since students may not worry about their health as much as adults do. In addition, the perceived susceptibility subscale measured diversity susceptibilities in the questionnaire, which reduced the internal consistency reliability of the questionnaire. Revisions to perceived benefits subscale was based on the suggestions from students' s assessing the face validity of the questionnaire.

For example, a statement in the perceived benefit subscale was changed to “People who eat more fruits and vegetables are more likely to have a balanced diet” from “People who eat more fruits and vegetables are less likely to have an unbalanced diet” (see appendix 8).

There are some limitations associated with this study. A 7-day food record is usually considered appropriate for the estimation of average intakes of individuals (Gibson, 1990). However, students may not treat multiple records seriously or may not have been motivated to participate due to anticipated respondent burden. Thus, we chose a 24-hour dietary record as the reference tool to test the validity of the adapted FFQ since a 24-hour record doesn't rely on memory and it is less of a burden for a participant to complete. The questions used in the Attitude/Behaviour questionnaire to address constructs of HBM may not be broad enough to capture all aspects of a construct. For example, perceived benefits could have been expanded to include benefits related to feeling better or looking better. However, we tried to include all major factors in this questionnaire without making the questionnaire too long.

2.5 Relevance to Practice

Low fruit and vegetable intakes have been associated with an increased risk for many diet-related diseases. Since adolescence is a critical time for developing eating habits that continue into adulthood, there has been interest in examining the fruit and vegetable intakes of teenagers. To be able to adequately assess the intake of this food group and factors that influence intake in youth living in the Lower Mainland in B.C., we adapted or developed and validated 2 questionnaires, a FFQ and Attitude/Behaviour questionnaire. These 2 questionnaires will be valuable in tracking fruit and vegetable intakes and factors affecting the intake of this food group in teenagers from diverse

cultural backgrounds. The 2 questionnaires developed here may be useful for both researchers and practitioners to identify adolescents' fruit and vegetable intake and factors influencing their choices. These 2 questionnaires could be further used in our next step cross-sectional study, which would provide information regarding the fruit and vegetable intake and factors influencing the choices of adolescents living in the Lower Mainland, BC.

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Chapter 3

Conclusion, Limitations and Future Directions

3.1 Conclusion

Epidemiological and clinical evidence indicates that increasing intakes of fruits and vegetables decreases the risk of cancer, cardiovascular disease, and other chronic diseases (Ness & Powles, 1997; Steinmetz & Potter, 1996; Terry, Terry & Wolk, 2001). Thus, healthy eating habits (including consumption of fruits and vegetables) during adolescence may have long-term health implications (Neumark-Sztainer, Story, Perry & Casey, 1999).

The discrepancies between dietary recommendations and actual fruit and vegetable consumption have led to public health initiatives aimed at increasing fruit and vegetable consumption among adolescents (Brug, Lechaner & Vries, 1995). Although Canada, many other countries and the World Health Organization have issued recommendations to increase fruit and vegetable intake, the research concerning fruit and vegetable intake is limited in Canada. As well, few studies have compared the fruit and vegetable intake of adolescents with the national recommendations in Canada. In the Lower Mainland, British Columbia, we also lack information to determine whether adolescents meet recommendations from Canada's Food Guide to Healthy Eating (CFGHE) (Health Canada, 2002).

In this study, we adapted a food frequency questionnaire (FFQ) measuring adolescents' fruit and vegetable intake and developed an Attitude/Behaviour questionnaire assessing factors that may have impacts on adolescents' fruit and vegetable choices. The FFQ and the Attitude/Behaviour questionnaire developed in this study had

reasonable ability to estimate fruit and vegetable intake and to identify factors influencing the consumption of this food group in adolescents from diverse culture backgrounds. With certain improvements made to the Attitude/Behaviour questionnaire, these two questionnaires could be used for future cross-sectional studies.

3.2 Limitations

There are some limitations to the present study that should be considered. Firstly, there was likely some degree of selection bias introduced by the methods used in the recruitment of study participants. Participants who agreed to participate in this research were recruited through home economics teachers and school principals, which result in a group of volunteers and a sample with more girls than boys. One secondary school is a new one, which has only grades 7 and 8 and another school home economics teacher only recruited grade 9 and 10 students, which resulted in a sample with more grades 8 and 9 students compared with grades 10 and 12. "Foods" is an elective course and is offered from grade 9 in the secondary schools that agreed to participate in our study. Because the study used a convenience sample, it can be assumed that the students who participated in this study and completed their questionnaires were more motivated and interested in their health. Non-responder bias could exist in this study, especially if non-responders were different from responders.

Secondly, the Attitude/Behaviour questionnaire was developed based on focus group discussions. Participants of focus groups should be similar to each other and it is ideal that they are strangers (Krueger, 1994). However, in the current study, focus group interviews were conducted in 3 secondary schools and it is impossible to recruit a full group of strangers. Students had likely interacted with each other prior to the focus group

interviews. The group process of discussion and interaction may have been influenced by peer relationships and each student's ability to express individual views in the context of a peer group. This context of peer interaction could result in some individuals not expressing their personal opinions as clearly or forcefully as others. Moreover, more female students participated in the focus group sessions than male students. Therefore, the opinions set forth by these adolescents might not be considered representative of all adolescents. To minimize this bias, we reviewed the literature and combined previous studies and questionnaires for developing this Attitude/Behaviour questionnaire.

Thirdly, all information obtained from this study was based on self-reported questionnaires and food records. Students might alter their eating behaviors while answering questionnaires and recording food records. The information provided from food records and questionnaires might be subject to overestimation and underestimation (Stang, 2002). Questions are also raised about students' abilities to estimate portion sizes or to describe their dietary patterns accurately while answering questionnaires and food records (Smiciklas-Wright & Guthrie, 1995). Children's developmental level, including verbal and literacy skills, and as well, some participants in this study, whose first language was not English, may have contributed to their accuracy in completing both the 24-hour dietary record and two questionnaires. As well, individuals may systematically differ in their reporting accuracy (Tran, Johnson, Soultanakis & Matthews, 2000). Thus, responses to questionnaires and food records may be subject to error because of false reporting. In addition, a single 24-hour dietary record was used to validate the FFQ in this study. A single 24-hour dietary record can provide reasonably accurate data about 1 day's dietary intake (Lee & Nieman, 2003). The FFQ in this study was used to assess the

mean fruit and vegetable intake over the previous 1 week. Different used time frames between these 2 methods may influence the validity of the FFQ. Adolescents' fruit and vegetable consumption may also vary by season. The FFQ in this study evaluated the mean fruit and vegetable intake over the previous 1 week and the study was conducted in the spring. These could limit the application of the results to the whole year.

Fourthly, the HBM may not be the most appropriate theoretical model to understand adolescents' fruit and vegetable consumption behaviour, since adolescents may not worry about their health as much as adults do. However, the relationship between health beliefs and adolescents' fruit and vegetable intake could provide insight into intervention development to increase adolescents' fruit and vegetable intake. To evaluate the construct validity of the Attitude/Behaviour questionnaire, a group of experts who have certain experience in using the HBM should be asked. However, the construct validity of the Attitude/Behaviour questionnaire in this study was assessed with a group of people who didn't have much experience in using the HBM, which, therefore, limited the construct validity of the Attitude/Behaviour questionnaire.

Fifthly, students did not respond to all questions of the questionnaires at both administrations. In the process of checking missing values for the questionnaires, it was found that some students seemed to skip items. These differences and reporting errors might affect the reliability or validity of questionnaires.

Lastly, neither group was a random sample, limiting generalization to the general population.

3.3 Future Directions

This was the first study in British Columbia to develop a FFQ looking at adolescents' fruit and vegetable intake and to develop an Attitude/Behaviour questionnaire assessing factors influencing the fruit and vegetable choices among adolescents living in the Lower Mainland. Although other questionnaires have been developed to examine adolescents' fruit and vegetable consumption, these other questionnaires were developed mostly focused on African-American, Hispanic and Caucasian youth.

The FFQ developed in this study was adapted from the Fruit and Vegetable By-Meal Screener developed by the National Cancer Institute (2000) in the United States. The sample used in this study testing validity and reproducibility of the FFQ was recruited from students attending secondary schools in Lower Mainland, BC and included disproportionate representation of students of Chinese ethnicity. Thus, this FFQ needs to be further refined and the validity and reproducibility need to be retested, when it is used with other ethnically diverse populations, or with other samples of populations from different geographic locations. More research is still needed to develop FFQ for diverse ethnical populations, such as Asian populations. The mean fruit and vegetable intake from the FFQ in this study was higher compared with the mean intake from the 24-hour dietary record, future studies could use multiple 24-hour recalls or multiple dietary records to test the validity of the FFQ based on the nature of the population.

The Attitude/Behaviour questionnaire developed in this study was a Likert scale questionnaire assessing factors influencing adolescents' fruit and vegetable choices. The questionnaire was developed according to focus group discussions and based on previous studies and questionnaires and the HBM. Subjects attending the focus group interviews,

the validity test study and the reliability test study were also recruited from the students attending secondary schools in Lower Mainland, BC and included many individuals with Chinese ethnicity. It is necessary to continue refining and testing this instrument when applying it with other samples of adolescents from other cultural backgrounds in different geographic locations or with other samples of populations. The statements should be reviewed before using the questionnaire. This Attitude/Behaviour questionnaire was developed for adolescents, which may not be suitable for adults or other age groups.

A variety of behaviour theories have been employed to understand dietary behaviour, such as the Theory of Reasoned Action (TRA) or the Theory of Planned Behaviour (TPB), the Social Cognitive Theory (SCT), the Transtheoretical Model (TTM) and the HBM (Baranowski, Cullen & Baranowski, 1999). Previous results showed relatively low predictiveness of the TRA-TPB model, the SCT model and TTM model in predicting dietary behaviour (Baranowski et al., 1999). Not enough research was conducted with the HBM regarding fruit and vegetable consumption to draw from conclusions (Baranowski et al., 1999). Thus, more studies using the HBM to detect factors influencing adolescents' fruit and vegetable intake could still be conducted. Continued work could be conducted to refine the format, the number of questionnaire items and the statements to capture more aspects of the constructs of the HBM and to evaluate the theoretical appropriateness and predictiveness of the HBM.

Further studies to assess adolescents' fruit and vegetable intake and to examine mediating factors affecting their consumption of these foods could be conducted in a larger and more diverse group of adolescents. Future research using a prospective design to explore the age differences on adolescents' fruit and vegetable consumption could be

beneficial in guiding a healthy development of eating behaviors from adolescence to adulthood.

3.4 References

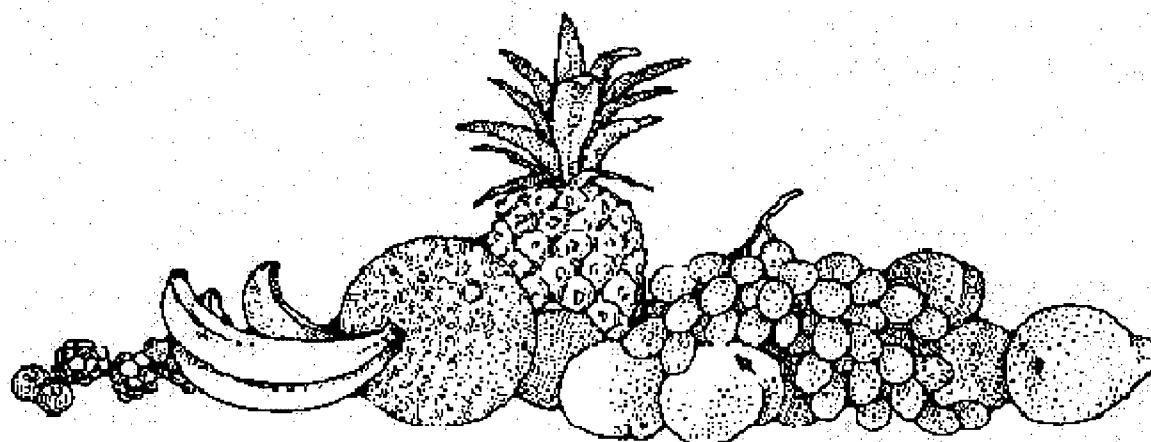
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1. What do you think about fruits? Do you like them? Do you eat them? What are your favorite fruits?
2. What about vegetables? What do you think about vegetables? Do you like them? Do you eat them? What are your favorite vegetables?
3. Do you know how many servings of fruits and vegetables you should eat per day according to Canada's Food Guide to Healthy eating? And do you know what is the size of one serving?
4. Do you think fruits and vegetables would benefit to your health? Where did you hear about it? What do you think of it? If you know about this, would you increase your fruit and vegetables intake and what would you do to increase your intake?
5. What kind of factors do you think might influence your fruits and vegetables intake (e.g. age, family, gender, friends, religion, or media)?
6. What kind of factors do you think are the barriers for your fruits and vegetables intake (e.g. the price of fruits and vegetables, the availability where usually shop, preparation time, taste or the pesticides of the fruits and vegetables)?
7. What kinds of factors do you think might improve your fruits and vegetables intake (let you eat more fruits and vegetables), (e.g. education, knowledge, family influences, media, friends or others)?
8. Do you think you would worry about your health or yourself, if you didn't have enough fruits and vegetables every day?
9. Do you think you would worry about being at risk for getting chronic diseases in your later on life, such as cancer, heart diseases or diabetes?
10. What do you think about the seriousness of these diseases, like cancer, heart diseases and stroke?
11. In terms of eating fruits and vegetables, do you think you would be able to eat at least 5 servings of fruits and vegetables per day? (If yes, why do you think you could eat at least 5 servings of fruits and vegetables, if not, why do you think you cannot eat at least 5 servings of fruits and vegetables?) Do you think you would eat differently at home and in schools? How about weekend? Do you think you would eat differently at weekend and weekdays?
12. Do you have any suggestions or comments for the questions that we could ask for other students in our questionnaire?

13. There are some food frequency questionnaires here, which are about assessing fruit and vegetable intake. What do you think about this questionnaire? Do you think you could understand the questionnaire? Do you have any difficulty to complete the questionnaire? Do you have any questions, suggestions or comments about the questionnaires?

**Fruit and Vegetable Intake and Factors Influencing Intake of
Adolescents: Developing the Questionnaires**

Food Frequency Questionnaire



Name: _____

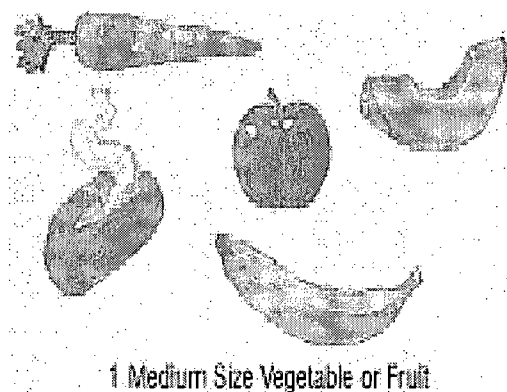
Date: _____

INSTRUCTIONS

We would like to know about your usual fruit and vegetable intake during last week. Please complete this questionnaire.

- Think about what you usually ate during the last week.
- Please think about all the fruits and vegetables that you ate during last week. Include those that were:
 - raw and cooked,
 - eaten as snacks and at meals,
 - eaten at home and away from home (restaurants, friends, take-out), and
 - eaten alone and mixed with other foods.
- Report how many times per week, or day you ate each food, and if you ate it, how much you usually had.
- If you mark "Never" for a question, follow the "Go to" instruction.
- Choose the best answer for each question. Mark only one response for each question.

The pictures below may help you estimate the size of one medium vegetable or fruit, $\frac{1}{2}$ cup, $\frac{3}{4}$ cup or one cup.



250ml



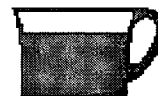
1 cup
(8 ounces)

125ml



$\frac{1}{2}$ cup
(4 ounces)

175 ml



$\frac{3}{4}$ cup
(6 ounces)

1. Over the last week, how many times per week, or day did you drink **100% fruit juice** such as orange, apple, grape, or grapefruit juice? **Do not count** fruit drinks like Kool-Aid, lemonade, Hi-C, cranberry juice drink, Tang, and Twister. Include juice you drank at all mealtimes and between meals.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Never	1-2	3-4	5-6	1	2	3	4	5 or more
(Go to	times	times	times	time	times	times	times	times
Question 2)	per week	per week	per week	per day	per day	per day	per day	per day

1a. Each time you drank **100% juice**, how much did you usually drink?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Less than $\frac{3}{4}$ cup	$\frac{3}{4}$ to $1\frac{1}{4}$ cup	$1\frac{1}{4}$ to 2 cups	More than 2 cups

2. Over the last week, how often did you eat **lettuce salad (with or without other vegetables)**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Never	1-2	3-4	5-6	1	2	3	4	5 or more
(Go to	times	times	times	time	times	times	times	times
Question 3)	per week	per week	per week	per day	per day	per day	per day	per day

2a. Each time you ate **lettuce salad**, how much did you usually eat?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
About $\frac{1}{2}$ cup	About 1 cup	About 2 cups	More than 2 cups

3. Over the last week, how often did you eat **French fries or fried potatoes**?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Never	1-2	3-4	5-6	1	2	3	4	5 or more
(Go to	times	times	times	time	times	times	times	times
Question 4)	per week	per week	per week	per day	per day	per day	per day	per day

3a. Each time you ate **French fries or fried potatoes**, how much did you usually eat?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Small order or less (About 1 cup or less)	Medium order (About $1\frac{1}{2}$ cups)	Large order (About 2 cups)	Super Size order or more (About 3 cups or more)

4. Over the last week, how often did you eat **other white potatoes**? Count **baked, boiled, and mashed potatoes, potato salad, and white potatoes that were not fried.**

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Never	1-2	3-4	5-6	1	2	3	4	5 or more
(Go to	times	times	times	time	times	times	times	times
Question 5)	per week	per week	per week	per day	per day	per day	per day	per day

4a. Each time you ate **these potatoes**, how much did you usually eat?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 small potato or less ($\frac{1}{2}$ cup or less)	1 medium potato ($\frac{1}{2}$ to 1 cup)	1 large potato (1 to $1\frac{1}{2}$ cups)	2 medium potatoes or more ($1\frac{1}{2}$ cups or more)

Now, divide your waking hours into three time periods:

- MORNING
- LUNCHTIME AND AFTERNOON
- SUPPERTIME AND EVENING

Please think about the foods you ate during each of those time periods over the last week.

MORNING

5. Think about all the foods you ate at your morning meal and snacks over the last week. On how many days did you eat **fruit** for your morning meal or morning snacks? Count any kind of fruit—fresh, canned, and frozen. **Do not count** juices.

- ☐ Never
(Go to Question 6)
- ☐ 1-2 days
per week
- ☐ 3-4 days
per week
- ☐ 5-6 days
per week
- ☐ Every day

5a. When you ate **fruit** in the morning, what is the **total** amount of **fruit** that you usually ate in a morning?

- ☐ Less than 1 medium fruit
- ☐ 1 medium fruit
- ☐ 2 medium fruits
- ☐ More than 2 medium fruits

OR

- ☐ Less than ½ cup
- ☐ About ½ cup
- ☐ About 1 cup
- ☐ More than 1 cup

6. Think about all the foods you ate at your morning meal and morning snacks. On how many days did you eat **vegetables** for your morning meal or morning snacks?

- DO NOT COUNT:**
- Lettuce salads
 - White potatoes
 - Cooked dried beans
 - Vegetables in mixtures, such as in sandwiches, omelets, casseroles, Mexican dishes, stews, stir-fry, soups, etc.
 - Rice

COUNT: • All other vegetables—raw, cooked, canned, and frozen

- ☐ Never
(Go to Question 7)
- ☐ 1-2 days
per week
- ☐ 3-4 days
per week
- ☐ 5-6 days
per week
- ☐ Every day

6a. When you ate **vegetables** in the morning, what is the **total** amount of **vegetables** that you usually ate in a morning?

- ☐ Less than ½ cup
- ☐ ½ to 1 cup
- ☐ 1 to 2 cups
- ☐ More than 2 cups

LUNCHTIME AND AFTERNOON

7. Think about all the foods you ate at lunchtime and for your afternoon snacks last week. On how many days did you eat **fruit** at lunchtime or for your afternoon snacks? Count any kind of fruit—fresh, canned, and frozen. **Do not count** juices.

- ☐ Never
(Go to Question 8)

 ☐ 1-2 days
per week

 ☐ 3-4 days
per week

 ☐ 5-6 days
per week

 ☐ Every day

7a. When you ate **fruit** at lunchtime or for your afternoon snacks, what is the **total** amount of **fruit** that you usually ate then?

- ☐ Less than 1 medium fruit

 ☐ 1 medium fruit

 ☐ 2 medium fruits

 ☐ More than 2 medium fruits

OR

- ☐ Less than ½ cup

 ☐ About ½ cup

 ☐ About 1 cup

 ☐ More than 1 cup

8. Think about all the foods you ate at lunchtime and for your afternoon snacks. On how many days did you eat **vegetables** at lunchtime or for your afternoon snacks?

- DO NOT COUNT:**
- Lettuce salads
 - White potatoes
 - Cooked dried beans
 - Vegetables in mixtures, such as in sandwiches, omelets, casseroles, Mexican dishes, stews, stir-fry, soups, etc.
 - Rice

- COUNT:**
- All other vegetables—raw, cooked, canned, and frozen

- ☐ Never
(Go to Question 9)

 ☐ 1-2 days
per week

 ☐ 3-4 days
per week

 ☐ 5-6 days
per week

 ☐ Every day

8a. When you ate **vegetables** at lunchtime or for your afternoon snacks, what is the **total** amount of **vegetables** that you usually ate then?

- ☐ Less than ½ cup

 ☐ ½ to 1 cup

 ☐ 1 to 2 cups

 ☐ More than 2 cups

SUPPERTIME AND EVENING

9. Think about all the foods you ate at suppertime and for your evening snacks last week. On how many days did you eat **fruit** at suppertime or for your evening snacks? Count any kind of fruit—fresh, canned, and frozen. **Do not count** juices.

- | | | | | |
|---|---|---|---|------------------------------------|
| <input type="radio"/>
Never
(Go to Question 10) | <input type="radio"/>
1-2 days
per week | <input type="radio"/>
3-4 days
per week | <input type="radio"/>
5-6 days
per week | <input type="radio"/>
Every day |
|---|---|---|---|------------------------------------|

9a. When you ate **fruit** at suppertime or for your evening snacks, what is the **total** amount of **fruit** that you usually ate then?

- | | | | |
|---|---|--|--|
| <input type="radio"/>
Less than 1 medium fruit | <input type="radio"/>
1 medium fruit | <input type="radio"/>
2 medium fruits | <input type="radio"/>
More than 2 medium fruits |
| OR | | | |
| <input type="radio"/>
Less than ½ cup | <input type="radio"/>
About ½ cup | <input type="radio"/>
About 1 cup | <input type="radio"/>
More than 1 cup |

10. Think about all the foods you ate at suppertime and for your evening snacks. On how many days did you eat **vegetables** at suppertime or for your evening snacks?

- DO NOT COUNT:**
- Lettuce salads
 - White potatoes
 - Cooked dried beans
 - Vegetables in mixtures, such as in sandwiches, omelets, casseroles, Mexican dishes, stews, stir-fry, soups, etc.
 - Rice

COUNT: • All other vegetables—raw, cooked, canned, and frozen

- | | | | | |
|---|---|---|---|------------------------------------|
| <input type="radio"/>
Never
(Go to Question 11) | <input type="radio"/>
1-2 days
per week | <input type="radio"/>
3-4 days
per week | <input type="radio"/>
5-6 days
per week | <input type="radio"/>
Every day |
|---|---|---|---|------------------------------------|

10a. When you ate **vegetables** at suppertime or for your evening snacks, what is the **total** amount of **vegetables** that you usually ate then?

- | | | | |
|--|-------------------------------------|--------------------------------------|---|
| <input type="radio"/>
Less than ½ cup | <input type="radio"/>
½ to 1 cup | <input type="radio"/>
1 to 2 cups | <input type="radio"/>
More than 2 cups |
|--|-------------------------------------|--------------------------------------|---|

These last few questions ask about how often you ate particular foods at any time of the day.

11. Over the last week, how often did you eat **tomato sauce**? Include tomato sauce on pasta or macaroni, rice, pizza and other dishes.

- | | | | | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Never | 1-2 | 3-4 | 5-6 | 1 | 2 | 3 | 4 | 5 or more |
| (Go to | times | times | times | time | times | times | times | times |
| Question 12) | per week | per week | per week | per day | per day | per day | per day | per day |

11a. Each time you ate **tomato sauce**, how much did you usually eat?

- | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| About ¼ cup | About ½ cup | About 1 cup | More than 1 cup |

12. Over the last week, how often did you eat **vegetable soups**? Include tomato soup, gazpacho, beef with vegetable soup, minestrone soup, and other soups made with vegetables.

- | | | | | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Never | 1-2 | 3-4 | 5-6 | 1 | 2 | 3 | 4 | 5 or more |
| (Go to | times | times | times | time | times | times | times | times |
| Question 13) | per week | per week | per week | per day | per day | per day | per day | per day |

12a. When you ate **vegetable soup**, how much did you usually eat?

- | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Less than 1 cup | 1 to 2 cups | 2 to 3 cups | More than 3 cups |

13. Over the last week, how often did you eat **mixtures that included vegetables**? Count such foods as sandwiches, casseroles, stews, stir-fry, omelets, and tacos.

- | | | | | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Never | 1-2 | 3-4 | 5-6 | 1 | 2 | 3 | 4 | 5 or more |
| | times | times | times | time | times | times | times | times |
| | per week | per week | per week | per day | per day | per day | per day | per day |

Thank you very much for completing this form.

One Day Food Record

Name: _____

Date: _____

Please write down everything you eat or drink for one weekday on the attached form starting from the time you get up in the morning until you go to bed. Please also include how much of each food you eat and drink, where you eat or drink it and approximately the time you eat or drink it.

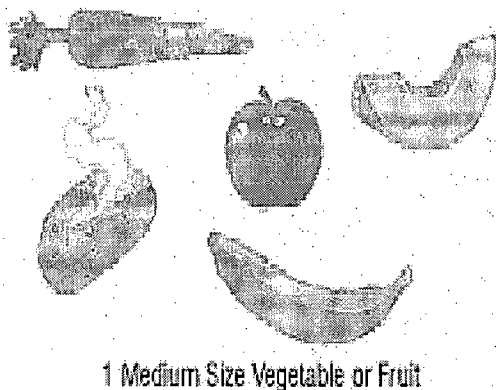
Read these instructions carefully before you start to record what you eat and drink:

1. **DON'T** change your eating habits during the day that you are recording what you eat and drink.
2. Please write down **EVERYTHING THAT YOU EAT AND DRINK**. Be sure to include all snacks. Please record immediately after each meal and snack to ensure accuracy (consider taking this form to school with you).
3. Please write down **HOW MUCH YOU EAT AND DRINK**.

- Use **VOLUME** measures (cups, teaspoons, tablespoons or millilitres) for cereals, rice, pasta, vegetables, canned or sliced fruit, beverages, peanut butter, mayonnaise, salad dressings, margarine, butter, other spreads, sauces, gravies, soups, sugar, honey, jam, etc.
- Use **WEIGHTS** (grams, ounces) where possible for meats and cheeses.
- Use **SIZE** for raw fruits, vegetables, muffins, buns, crackers, baked goods. Try to specify small, medium, large or actual size (e.g. 1 medium apple).
- Be specific about the type of food, the name brand of food if applicable and the content of mixed dishes.

4. Please write in the time and place you ate or drank the food listed.

The pictures below may help you estimate the size of one medium vegetable or fruit, $\frac{1}{2}$ cup, $\frac{3}{4}$ cup or one cup.



250ml



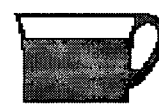
**1cup
(8 ounces)**

125ml



**$\frac{1}{2}$ cup
(4 ounces)**

175 ml



**$\frac{3}{4}$ cup
(6 ounces)**

For Example:

	Time:	Place:	Food item:	Amount:
Morning	6:00AM Breakfast	Home	Whole wheat bread-toasted Peanut butter Orange juice-from frozen Coffee with 2 teaspoons sugar and 2 tablespoons milk	2 regular slices 2 tablespoons 6 oz glass 6 oz mug
Noon	12:00PM Lunch	School	Digestive cookies Apple-Macintosh-large Milk-2%	6 1 8oz glass

Thank you very much for completing this form.

	Foods and beverages consumed			
	Time	Place	Food item	Amount
Morning				
Noon				
Afternoon				
Evening				

We would like to know the factors that influence your fruit and vegetable intake and your attitudes toward eating these foods. Please complete this questionnaire.

Below are statements regarding factors affecting fruit and vegetable intake. Please indicate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

Liming – you might make your example somewhat more explanatory...

Example:

Pretend that you don't like eating fruit very much. If that was true, you'd probably "disagree" with the statement "I like eating fruit."

I like eating fruits.

- ☐ Strongly Disagree
- ☒ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

What about situations in which the participant "doesn't know" the response? For example, some children may not know whether fruits and vegetables are good sources of fibre – they may not even know what fibre is!

(add a break to separate the example from the questionnaire itself)

Benefits of Fruits and Vegetables

Liming, it's good that you've provided these headings in the copy you gave me to comment on, so I can assess whether or not I think the statement reflects the construct appropriately, in the actual questionnaire the headings should be deleted. Also, the order of the questions should be randomized, so that statements on benefits, barriers, perceived severity, susceptibility etc. occur in random order.

All of your Benefits statements are "positively" worded. This should be changed so that about half are "negative". For example, "Eating fruits and vegetables would make me fat." "Eating fruits and vegetables might increase the chance of getting heart disease."

1. Eating fruits and vegetables would help maintain a healthy weight or lose weight.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. Fruits and vegetables, including juices, provide many of the vitamins and minerals which I need to be healthy.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

3. Fruits and vegetables are good sources of fibre.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

4. Eating fruits and vegetables may help to lower the chance of getting cancer.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

5. Eating fruits and vegetables may help to lower the chance of getting heart disease.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Barriers of consuming fruits and vegetables

Similarly, this heading should be removed, and “positive” and “negative” statements should be balanced.

1. It's expensive to eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. It is too hard for me to change my eating habits to include more fruits and vegetables. Is this actually a "barrier"? At some level, it sounds to me like a negatively-worded self-efficacy statement.

☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly Agree

3. My family doesn't like eating fruits and vegetables so I don't eat them very often.

☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly Agree

4. My friends don't like eating fruits and vegetables so I don't eat them very often.

☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly Agree

5. I do not feel I am able to choose fruits and vegetables for a snack.

I'm not sure what this question means. I don't feel I'm able to choose fruits and vegetables for a snack BECAUSE... my friends would make fun of me? They're not available at home? And so on...

☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly Agree

6. I don't eat vegetables since it takes too long for me to prepare them.

☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree
☐ Strongly Agree

7. I don't eat fruits since it takes too long for me to prepare them.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

8. I like the taste of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

9. I like the taste of vegetables

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

10. I don't like the look of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

11. I don't like the look of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

12. I don't like the smell of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

13. I don't like the smell of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

14. I don't like the feel of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

15. I don't like the feel of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

16. Fruit is always available at my house.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

17. Vegetables are always available at my house.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

18. Fruit is not always available in the school cafeteria.

Do all the schools that you'll be surveying have a cafeteria?

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

19. Vegetables are not always available in the school cafeteria.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Susceptibility to chronic diseases

If your instrument is going to use the Health Belief Model as a conceptual framework, it would be important to have approximately similar numbers of items (statements) for each construct of the model. Right now, you've got a lot of "barriers" statements, but very few on susceptibility and severity.

I feel that I would be at risk for getting cancer if I did not eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Perceived severity

To me, these two statements don't reflect perceived severity. Instead, they're actually reflecting susceptibility. Statements that reflect severity would indicate whether or not the consequences of NOT following the recommended behaviour would be severe for the individual. For example, maybe I think that if I don't eat fruits and vegetables I'll increase the chance that I'll catch a cold (in other words, I think I am susceptible to the consequence of not following the recommended behaviour). However, I may think that getting a cold is not a big deal (the perceived severity of the consequence of not following the recommended behaviour is low).

I do not feel it would help me lower the chance of getting cancer if I increased my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

I do not feel it would be good to my health if I increased my fruit and vegetable intake

- ☐ Strongly Disagree

- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Cues to action

1. If I knew the health benefits of fruits and vegetables, I would increase my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. Watching TV, reading newspapers and magazines or searching the Internet would help me increase my fruit and vegetable intake

This seems to be a lot of things to "lump" together!

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

What about other cues to action? For example, if there were fruits and vegetables all ready to snack on at home,....

Other factors

This statement seems repetitive of the first question in "cues to action".

If I knew more about fruits and vegetables, I could increase my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Self-efficacy

Again, need more items and a balance of positively and negatively-worded statements.

1. I am confident that I could increase my fruit and vegetable intake.

- ☐ Strongly Disagree

- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. I am confident that I could eat the recommended (5) servings of fruits and vegetables per day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Thank you very much for completing this form.

Assessing the Content and Face Validity of the Attitude/Behaviour Questionnaire

We would like to know the factors that influence your fruit and vegetable intake and your attitudes toward eating these foods. Please complete this questionnaire.

Below are statements regarding factors affecting fruit and vegetable intake. Please indicate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

Examples

I like eating fruits.

- ☐ Strongly Disagree
- ☒ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Benefits of Fruits and Vegetables

1. Eating fruits and vegetables would help maintain a healthy weight or lose weight.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. Fruits and vegetables, including juices, provide many of the vitamins and minerals which I need to be healthy.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

3. Fruits and vegetables are good sources of fiber.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

4. Eating fruits and vegetables may help to lower the chance of getting cancer.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

5. Eating fruits and vegetables may help to lower the chance of getting heart disease.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Barriers of consuming fruits and vegetables

1. It's expensive to eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. It is too hard for me to change my eating habits to include more fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

3. My family doesn't like eating fruits and vegetables so I don't eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

4. My friends don't like eating fruits and vegetables so I don't eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

5. I do not feel I am able to choose fruits and vegetables for a snack.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

6. I don't eat vegetables since it takes too long for me to prepare them.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

7. I don't eat fruits since it takes too long for me to prepare them.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

8. I like the taste of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

9. I like the taste of vegetables

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

10. I don't like the look of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

11. I don't like the look of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

12. I don't like the smell of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

13. I don't like the smell of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

14. I don't like the feel of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

15. I don't like the feel of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

16. Fruit is always available at my house.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

17. Vegetables are always available at my house.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

18. Fruit is not always available in the school cafeteria.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

19. Vegetables are not always available in the school cafeteria.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Susceptibility to chronic diseases

I feel that I would be at risk for getting cancer if I did not eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Perceived severity

I do not feel it would help me lower the chance of getting cancer if I increased my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

I do not feel it would be good to my health if I increased my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Cues to action

1. If I knew the health benefits of fruits and vegetables, I would increase my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. Watching TV, reading newspapers and magazines or searching the Internet would help me increase my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Other factors

If I knew more about fruits and vegetables, I could increase my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Self-efficacy

1. I am confident that I could increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. I am confident that I could eat the recommended (5) servings of fruits and vegetables per day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Thank you very much for completing this form.

Comments:

I looked at your questionnaire, and I think you did a good job phrasing the questions clearly. It is a good idea to keep the questions concise, as you did. I also thought that it was a good idea to include an example in your instructions (an illustration of how respondents should indicate their

answers).

Are you planning to pilot-test the questionnaire with a small group of teenagers? I find that pilot-testing is a really good way to try out the questionnaire with its intended audience. If you have the time, it would probably be worth doing, to get feedback from teenagers re. how clear the questionnaire was, etc.

I just had a couple of comments/suggestions (sorry, but for some reason, dashed lines are appearing here as I type this, and I can't get rid of them! Let me know if you have trouble reading the message!):

- * It might be a good idea to remove the titles from the various sections (e.g., benefits, barriers, self-efficacy). it may influence the respondents by causing them to think about the types of questions you are asking more than they would otherwise (and it also sounds a bit "academic" to include terms like self-efficacy. the teenagers might wonder what you are asking about). You could have a "master document" for yourself that indicates which questions fall into which categories, but perhaps don't include the categories in the questionnaire that the teenagers answer.
- * I noticed that you have many more questions about barriers (19) than benefits (5), and I wasn't sure if that was intentional. perhaps there should be roughly equal numbers of questions assessing those perceptions?
- * Typically, questions are mixed up in a questionnaire (so not all questions pertaining to a given category are presented together in a clump; i.e., the questions about benefits/barriers/self-efficacy, etc., would all be mixed up within the questionnaire)
- * Some of the questions did not have numbers
- * I find it useful to add a column or a line along the edge of the paper for coding, so that when you are coding the data from the questionnaires, there is a spot already printed on the sheet for it (although, since the questionnaire is not too long, you probably don't need to have that).
- * Do you ask them about their actual (self-reported) intake of fruits and vegetables?

Hopefully some of that might be helpful! Let me know if you have any questions about any of these things.

Assessing the Content and Face Validity of Attitude/Behaviour Questionnaire

We would like to know the factors that influence your fruit and vegetable intake and your attitudes toward eating these foods. Please complete this questionnaire.

Below are statements regarding factors affecting fruit and vegetable intake. Please indicate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

Examples

I like eating fruits.

- ☐ Strongly Disagree
- ☒ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Benefits of Fruits and Vegetables

1. Eating fruits and vegetables would help maintain a healthy weight or lose weight.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. Fruits and vegetables, including juices, provide many of the vitamins and minerals which I need to be healthy.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

3. Fruits and vegetables are good sources of fiber.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

4. Eating fruits and vegetables may help to lower the chance of getting cancer.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

5. Eating fruits and vegetables may help to lower the chance of getting heart disease.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Barriers of consuming fruits and vegetables

1. It's expensive to eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. It is too hard for me to change my eating habits to include more fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

3. My family doesn't like eating fruits and vegetables so I don't eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

4. My friends don't like eating fruits and vegetables so I don't eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

5. I do not feel I am able to choose fruits and vegetables for a snack.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

6. I don't eat vegetables since it takes too long for me to prepare them.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

7. I don't eat fruits since it takes too long for me to prepare them.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

8. I like the taste of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

9. I like the taste of vegetables

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

10. I don't like the look of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

11. I don't like the look of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

12. I don't like the smell of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

13. I don't like the smell of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

14. I don't like the feel of fruit.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

15. I don't like the feel of vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

16. Fruit is always available at my house.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

17. Vegetables are always available at my house.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

18. Fruit is not always available in the school cafeteria.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

19. Vegetables are not always available in the school cafeteria.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Susceptibility to chronic diseases

I feel that I would be at risk for getting cancer if I did not eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Perceived severity

I do not feel it would help me lower the chance of getting cancer if I increased my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

I do not feel it would be good to my health if I increased my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Cues to action

1. If I knew the health benefits of fruits and vegetables, I would increase my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. Watching TV, reading newspapers and magazines or searching the Internet would help me increase my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Other factors

If I knew more about fruits and vegetables, I could increase my fruit and vegetable intake

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Self-efficacy

1. I am confident that I could increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

2. I am confident that I could eat the recommended (5) servings of fruits and vegetables per day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree

Thank you very much for completing this form.

Comments:

Sorry it took me so long to get back to you. I've looked over your survey and have some suggestions for you (feel free to take them, or ignore them!) I hope some of them are worthwhile.

The survey I'm using is in a different population (elementary school) and is only 1 of three tools, so it's not as extensive as yours.

- Question #1 in "Benefits" section asks about weight. I wouldn't ask about weight as the first question, because it can make people upset or offended so they won't want to finish the survey.
- Consistent wording: i.e. Barrier section # 1 and 2 use "it is" and "it's". Questions 4 5 use "don't" and "do not". Maybe just choose one of these wordings and use them in both questions.
- You forgot to number the questions for the "susceptibility" and "perceived severity" and "other factor" sections. Maybe it's because they're so short, but I think it looks good to be consistent again.
- I'm a bit confused by the "Cues to Action" question 2 about watching tv, reading newspaper/magazines or searching the net will increase fruit and vegetable intake. Do you mean if they watch tv and read about fruits and vegetables in particular, or are you just trying to see if they think that fruit and vegetable info is prevalent in these different mediums? You probably do have a purpose for the wording I'm not sure.
- I was also a bit confused about your disease questions. In the benefits section you asked about heart disease and cancer. Then you ask only about cancer in "susceptibility to chronic diseases" and "perceived severity" sections. Is there a reason you repeated the same question so much (I do often see this in surveys, so there likely is a good reason!). If so, why didn't you also ask about heart disease in all three places?
- It seemed to me that the one question in "other factors" could fit into the "cues to action" section if you like.

Well I hope that helps a bit, let me know if you have any questions about what I've said.

Assessing the Construct Validity of the Attitude/Behaviour Questionnaire

Below are statements regarding factors affecting adolescents' fruit and vegetable intake. This questionnaire was developed based on Health Belief Model. Key concepts of Health Belief Model include perceived benefit, perceived barrier, perceived susceptibility, perceived severity, self-efficacy and cues to action.

Please indicate whether you think below statements in this questionnaire reflected key constructs of Health Belief Model, i.e. perceived benefit, perceived barrier, perceived susceptibility, perceived severity, self-efficacy or cues to action. If so, please indicate which construct you think the statement reflected. If not, could you tell me why and how to make changes? You could either underline the construct or change the font color of the construct; or use other symbols that you would prefer. I would also welcome any comments regarding this questionnaire.

Example:

If you think the statement "it is expensive to eat fruits and vegetables" reflect the construct "cues to action", you probably would choose the construct "cues to action"

1. It is expensive to eat fruits and vegetables.

- ☐ Perceived benefits
 - ☐ Perceived barriers
 - ☐ Perceived susceptibility
 - ☐ Perceived severity
 - ☐ Cues to action
 - ☐ Self-efficacy
-

1. It is expensive to eat fruits and vegetables.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

2. I feel that I would be at risk for getting cancer if I did not eat fruits and vegetables.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity

- Cues to action
- Self-efficacy

3. Fruits and vegetables are good sources of fibre.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

4. Watching TV would not help me increase my fruit and vegetable intake. (I'm not sure what you're getting at here; I expect everyone would agree with this statement pretty strongly!)

- Perceived benefits
- Perceived barriers??
- Perceived susceptibility
- Perceived severity
- Cues to action??
- Self-efficacy

5. I am confident that I could shop for a variety of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

6. If I do not eat fruits and vegetables I will not increase the chance that I will get heart disease. (This statement may be difficult for some respondents, because it has 2 negatives in it. I expect you're trying to vary the way you make statements, but it's a lot clearer to say 'If I eat fruits and vegetables, I will decrease the chance that I will get heart disease; It still assesses 2 constructs—i.e., agreeing with this statement requires that someone see benefit in eating fruits and vegetables, and sees themselves as at risk for heart disease).

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

7. If I knew of health benefits of fruits and vegetables, I would increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

8. I do not eat fruits and vegetables since it takes too long for me to prepare them.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

9. I do not feel that I would be at risk for an unbalanced diet if I did not include fruits and vegetables in my diet. (Again, 2 negatives make it easy to misinterpret this statement. How about 'My diet would be unbalanced diet if it did not include fruits and vegetables.').

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

10. I am not confident that I could increase my fruit and vegetable intake each day.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

11. Eating fruits and vegetables would make me fat.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity

- Cues to action
- Self-efficacy

12. If I do not eat fruits and vegetables I will increase the chance that I will catch a cold.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

13. I am not confident that I could increase my 100% juice intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

14. If I there were more fruits and vegetables available in the school cafeteria, I still would not increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

15. Searching the Internet would not help me increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

16. I do not like the feel of fruits and vegetables. (Do you mean texture? It might be clearer to say 'I do not like the way fruits and vegetables feel in my mouth')

- Perceived benefits
- Perceived barriers
- Perceived susceptibility

- Perceived severity
- Cues to action
- Self-efficacy

17. Eating fruits and vegetables may help to lower the chance of getting cancer.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

18. People in my family do not like eating fruits and vegetables, so I do not eat them very often.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

19. I am confident that I could eat fruits and vegetables when eating away from home.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

20. If I do not eat fruits and vegetables I will have an unhealthy diet.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

21. I like the taste of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility

- Perceived severity
- Cues to action
- Self-efficacy

22. I do not feel that I would be at risk for getting heart disease if I did not eat fruits and vegetables. (Another double negative!)

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

23. My friends do not like eating fruits and vegetables so I do not eat them very often.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

24. I do not like the look of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

25. I am not confident that I could ask my parents to buy more fruits and vegetables for me.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

26. If my parents told me to eat more fruits and vegetables, I would increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers

- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

27. Reading newspapers and magazines would not help me increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

28. Eating fruits and vegetables might increase the chance of getting heart disease. (To clearly separate items assessing perceived benefits from items assessing perceived susceptibility, you may want to make these statements so they clearly refer to general principles: 'People who eat more fruits and and vegetables may have an increased chance of getting heart disease.' Consider similar wording for item 17)

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

29. I do not feel it would be good to for my health if I increased my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

30. I like the smell of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

31. I am confident that I could eat the recommended (5) servings of fruits and vegetables each day.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

32. Fruits and vegetables, including juices, do not provide many of the vitamins and minerals which I need to be healthy.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

33. If there were more fruits and vegetables available at home, I would increase my fruit and vegetable intake.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

34. If I do not eat fruits and vegetables I will not increase the chance of getting cancer. (Again, I'd avoid double negatives)

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

Thank you very much for completing this form.

Overall, I think the questionnaire does a good job of assessing most of the constructs. I wasn't sure about the items asking about TV, Internet, and Newspapers/magazines—

because I'm familiar with the theoretical framework, I think I had a sense of what you were getting at, but I think someone who doesn't know the constructs would think those questions are weird!

Also, I didn't think you had any items assessing Perceived severity. I expected something like:

- I would be very upset if I developed heart disease
- I would be very concerned if I caught a cold
- I would not be worried if I was diagnosed with cancer
- It would not be a problem for me if I gained weight

Otherwise, other than the specific wording suggestions I made, I think it looks good.

Good luck!

Gwen

Assessing the Construct Validity of the Attitude/Behaviour Questionnaire

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Perceived barriers: One's belief about the tangible and psychological costs of the advised action.

Perceived susceptibility: One's belief regarding the chance of getting a condition

Perceived severity: One's belief of how serious a condition and its sequelae are

Cues to action: Strategies to activate one's "readiness"

Self-efficacy: One's confidence in one's ability to take action

Please indicate whether you think below statements in this questionnaire reflected key constructs of Health Belief Model, i.e. perceived benefit, perceived barrier, perceived susceptibility, perceived severity, self-efficacy or cues to action. If so, please indicate which construct you think the statement reflected. If not, could you tell me why and how to make changes? You could either underline the construct or change the font color of the construct; or use other symbols that you would prefer. I would also welcome any comments regarding this questionnaire.

Please note: In this questionnaire, the perceived benefits are referred to health-related ones and perceived barriers are referred to personal and environmental ones.

Thanks so much for completing this questionnaire and help me out in advance.

Example:

If you think the statement "it is expensive to eat fruits and vegetables" reflect the construct "cues to action", you probably would choose the construct "cues to action"

1. It is expensive to eat fruits and vegetables.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action

- Self-efficacy

1. It is expensive to eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

2. I would be at risk for getting cancer if I eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

3. Fruits and vegetables are good sources of fibre.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

4. When I watch TV, I sometimes see something that makes me think about increasing my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

5. I am confident that I could shop for a variety of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action

- Self-efficacy
6. I would be very upset if I developed heart disease.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility
 - Perceived severity (although believing you might get heart disease is perceived susceptibility, it seems that being upset about it is a consequence, so that would be related to severity)
 - Cues to action
 - Self-efficacy
7. If I knew of health benefits of fruits and vegetables, I would increase my fruit and vegetable intake.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility
 - Perceived severity
 - Cues to action?
 - Self-efficacy
8. I do not eat fruits and vegetables since it takes too long for me to prepare them.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility
 - Perceived severity
 - Cues to action
 - Self-efficacy
9. I would be more likely to gain weight if I eat fruits and vegetables.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility
 - Perceived severity
 - Cues to action
 - Self-efficacy
10. I am not confident that I could increase my fruit and vegetable intake each day.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility

- Perceived severity
- Cues to action
- Self-efficacy

11. Eating fruits and vegetables would make me fat.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

12. I would be very concerned if I have an unhealthy diet.

- Perceived benefits?
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

13. I am not confident that I could increase my 100% juice intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy (although I don't find the term "100% juice" to be very clear for students...)

14. If there were more fruits and vegetables available in the school cafeteria, I still would not increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

15. When I search the Internet, I sometimes read something that causes me to want to eat more fruits and vegetables.

- Perceived benefits

- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

16. I do not like the way fruits and vegetables feel in my mouth.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

17. People who eat more fruits and vegetables may have an increased chance of getting cancer.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

18. People in my family do not like eating fruits and vegetables so I do not eat them very often.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

19. I am confident that I could eat fruits and vegetables when eating away from home.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

20. It would not be a problem for me if I gained weight.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

21. I like the taste of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

22. I would be more likely to get heart disease if I did not eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

23. My friends do not like eating fruits and vegetables so I do not eat them very often.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

24. I do not like the look of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

25. I am not confident that I could ask my parents to buy more fruits and vegetables for me.

- Perceived benefits

- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

26. If my parents told me to eat more fruits and vegetables, I would increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

27. When I read newspapers and magazines, I never see anything that makes me think about eating fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

28. People who eat more fruits and vegetables are less likely to get heart disease.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

29. My diet would be an unbalanced diet if I eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

30. I like the smell of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

31. I am confident that I could eat the recommended (5) servings of fruits and vegetables each day.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

32. Fruits and vegetables, including juices, do not provide many of the vitamins and minerals which I need to be healthy.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

33. If there were more fruits and vegetables available at home, I would increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

34. I would not be worried if I was diagnosed with cancer.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

35. People who eat more fruits and vegetables are more likely to have an unbalanced diet.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

Thank you very much for completing this form.

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Thanks so much for completing this questionnaire and help me out in advance.

Example:

If you think the statement "it is expensive to eat fruits and vegetables" reflect the construct "cues to action", you probably would choose the construct "cues to action"

1. It is expensive to eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity

- Cues to action
- Self-efficacy

1. It is expensive to eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

2. I would be at risk for getting cancer if I eat fruits and vegetables. Not sure whether this would be a perceived barrier to eating fruits and vegetables, or perceived susceptibility to cancer.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

3. Fruits and vegetables are good sources of fibre.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

4. When I watch TV, I sometimes see something that makes me think about increasing my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

5. I am confident that I could shop for a variety of fruits and vegetables.

- Perceived benefits
- Perceived barriers

- Perceived susceptibility
- Perceived severity
- Cues to action
- **Self-efficacy**

6. I would be very upset if I developed heart disease.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- **Perceived severity**
- Cues to action
- Self-efficacy

7. If I knew of health benefits of fruits and vegetables, I would increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- **Cues to action**
- Self-efficacy

8. I do not eat fruits and vegetables since it takes too long for me to prepare them.

- Perceived benefits
- **Perceived barriers**
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

9. I would be more likely to gain weight if I eat fruits and vegetables.

- Perceived benefits
- **Perceived barriers**
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

10. I am not confident that I could increase my fruit and vegetable intake each day.

- Perceived benefits
- Perceived barriers

- Perceived susceptibility
- Perceived severity
- Cues to action
- **Self-efficacy**

11. Eating fruits and vegetables would make me fat.

- Perceived benefits
- **Perceived barriers**
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

12. I would be very concerned if I have an unhealthy diet. I'm not sure how this question fits the HBM.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

13. I am not confident that I could increase my 100% juice intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- **Self-efficacy**

14. If there were more fruits and vegetables available in the school cafeteria, I still would not increase my fruit and vegetable intake. I guess you mean this to be a cue to action that doesn't work? I'm not very knowledgeable about the "cues to action" concept, having read in some studies that it's not very strong as a concept. I'm not sure I would include it in the study, so I hesitate to "validate" this question and all the other questions that I can see you mean to be "cues to action."

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

15. When I search the Internet, I sometimes read something that causes me to want to eat more fruits and vegetables. This question is almost identical to the one about watching TV.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

16. I do not like the way fruits and vegetables feel in my mouth.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

17. People who eat more fruits and vegetables may have an increased chance of getting cancer. Again, as in question 2, I'm not sure whether this is a barrier, or susceptibility.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

18. People in my family do not like eating fruits and vegetables so I do not eat them very often. Not sure whether this really fits into the HBM as a construct – I see it as a barrier to eating fruits and vegetables, but you may see it as another failed cue to action.

- ☐ Perceived benefits
- ☐ Perceived barriers
- ☐ Perceived susceptibility
- ☐ Perceived severity
- ☐ Cues to action
- ☐ Self-efficacy

19. I am confident that I could eat fruits and vegetables when eating away from home.

- ☐ Perceived benefits
- ☐ Perceived barriers

- Perceived susceptibility
- Perceived severity
- Cues to action
- **Self-efficacy**

20. It would not be a problem for me if I gained weight. A negative perceived barrier (a facilitator).

- Perceived benefits
- **Perceived barriers**
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

21. I like the taste of fruits and vegetables. Another negative perceived barrier.

- Perceived benefits
- **Perceived barriers**
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

22. I would be more likely to get heart disease if I did not eat fruits and vegetables. I see it as a (negative) perceived benefit, but you may see it as a (negative) perceived susceptibility.

- **Perceived benefits**
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

23. My friends do not like eating fruits and vegetables so I do not eat them very often. Similar comment to the family question #18.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

24. I do not like the look of fruits and vegetables.

- Perceived benefits
- **Perceived barriers**
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

25. I am not confident that I could ask my parents to buy more fruits and vegetables for me. Negative self-efficacy

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- **Self-efficacy**

26. If my parents told me to eat more fruits and vegetables, I would increase my fruit and vegetable intake. I would see this as a negative “barrier” i.e., a facilitator, maybe you see it as a cue to action?

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

27. When I read newspapers and magazines, I never see anything that makes me think about eating fruits and vegetables. Same as the questions about TV and the internet.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- **Cues to action**
- Self-efficacy

28. People who eat more fruits and vegetables are less likely to get heart disease. A perceived benefit? Or a lowered perceived susceptibility?

- **Perceived benefits**
- Perceived barriers
- Perceived susceptibility
- Perceived severity

- Cues to action
- Self-efficacy

29. My diet would be an unbalanced diet if I eat fruits and vegetables. A perceived barrier to eating fruits and vegetables? Or a perceived susceptibility to an unbalanced diet?

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

30. I like the smell of fruits and vegetables. A negative barrier (i.e., a facilitator).

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

31. I am confident that I could eat the recommended (5) servings of fruits and vegetables each day.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

32. Fruits and vegetables, including juices, do not provide many of the vitamins and minerals which I need to be healthy.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

33. If there were more fruits and vegetables available at home, I would increase my fruit and vegetable intake.

- Perceived benefits

- Perceived barriers
- Perceived susceptibility
- Perceived severity
- **Cues to action**
- Self-efficacy

34. I would not be worried if I was diagnosed with cancer.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- **Perceived severity**
- Cues to action
- Self-efficacy

35. People who eat more fruits and vegetables are more likely to have an unbalanced diet.

- Perceived benefits
- **Perceived barriers**
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

Thank you very much for completing this form.

I don't consider myself to be an expert on the Health Belief Model. I found it difficult to place quite a few of these statements into a particular construct of the HBM. Good luck and I'm sorry I couldn't be of more assistance.

Assessing the Construct Validity of the Attitude/Behaviour Questionnaire

Below are statements regarding factors affecting adolescents' fruit and vegetable intake. This questionnaire was developed based on Health Belief Model. Key constructs of Health Belief Model include perceived benefit, perceived barrier, perceived susceptibility, perceived severity, self-efficacy and cues to action. The definitions of these constructs are as below:

Perceived benefits: One's belief in the efficacy of the advised action to reduce risk or seriousness of impact

Perceived barriers: One's belief about the tangible and psychological costs of the advised action.

Perceived susceptibility: One's belief regarding the chance of getting a condition

Perceived severity: One's belief of how serious a condition and its sequelae are

Cues to action: Strategies to activate one's "readiness"

Self-efficacy: One's confidence in one's ability to take action

Please indicate whether you think below statements in this questionnaire reflected key constructs of Health Belief Model, i.e. perceived benefit, perceived barrier, perceived susceptibility, perceived severity, self-efficacy or cues to action. If so, please indicate which construct you think the statement reflected. If not, could you tell me why and how to make changes? You could either underline the construct or change the font color of the construct; or use other symbols that you would prefer. I would also welcome any comments regarding this questionnaire.

Please note: In this questionnaire, the perceived benefits are referred to health-related ones and perceived barriers are referred to personal and environmental ones.

Thanks so much for completing this questionnaire and help me out in advance.

Example:

If you think the statement "it is expensive to eat fruits and vegetables" reflect the construct "cues to action", you probably would choose the construct "cues to action"

1. It is expensive to eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action

- Self-efficacy

1. It is expensive to eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

2. I would be at risk for getting cancer if I eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

3. Fruits and vegetables are good sources of fibre.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

4. When I watch TV, I sometimes see something that makes me think about increasing my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

5. I am confident that I could shop for a variety of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action

- Self-efficacy
6. I would be very upset if I developed heart disease.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility
 - Perceived severity
 - Cues to action
 - Self-efficacy
7. If I knew of the health benefits of fruits and vegetables, I would increase my fruit and vegetable intake.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility
 - Perceived severity
 - Cues to action
 - Self-efficacy
8. I do not eat fruits and vegetables since it takes too long for me to prepare them.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility
 - Perceived severity
 - Cues to action
 - Self-efficacy
9. I would be more likely to gain weight if I eat fruits and vegetables.
- Perceived benefits
 - Perceived barriers? I'm a little unsure about which one I'd chose for this question.
I also thought about perceived susceptibility??
 - Perceived susceptibility
 - Perceived severity
 - Cues to action
 - Self-efficacy
10. I am not confident that I could increase my fruit and vegetable intake each day.
- Perceived benefits
 - Perceived barriers
 - Perceived susceptibility
 - Perceived severity

- Cues to action
- Self-efficacy

11. Eating fruits and vegetables would make me fat.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

12. I would be very concerned if I have an unhealthy diet.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

13. I am not confident that I could increase my 100% juice intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

14. If there were more fruits and vegetables available in the school cafeteria, I still would not increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

15. When I search the Internet, I sometimes read something that causes me to want to eat more fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility

- Perceived severity
- Cues to action
- Self-efficacy

16. I do not like the way fruits and vegetables feel in my mouth.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

17. People who eat more fruits and vegetables may have an increased chance of getting cancer.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

18. People in my family do not like eating fruits and vegetables so I do not eat them very often.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

19. I am confident that I could eat fruits and vegetables when eating away from home.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

20. It would not be a problem for me if I gained weight.

- Perceived benefits
- Perceived barriers

- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

21. I like the taste of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

22. I would be more likely to get heart disease if I did not eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

23. My friends do not like eating fruits and vegetables so I do not eat them very often.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

24. I do not like the look of fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

25. I am not confident that I could ask my parents to buy more fruits and vegetables for me.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility

- Perceived severity
- Cues to action
- Self-efficacy

26. If my parents told me to eat more fruits and vegetables, I would increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

27. When I read newspapers and magazines, I never see anything that makes me think about eating fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

28. People who eat more fruits and vegetables are less likely to get heart disease.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

29. My diet would be an unbalanced diet if I eat fruits and vegetables.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

30. I like the smell of fruits and vegetables.

- Perceived benefits
- Perceived barriers

- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

31. I am confident that I could eat the recommended (5) servings of fruits and vegetables each day.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

32. Fruits and vegetables, including juices, do not provide many of the vitamins and minerals which I need to be healthy.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

33. If there were more fruits and vegetables available at home, I would increase my fruit and vegetable intake.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

34. I would not be worried if I was diagnosed with cancer.

- Perceived benefits
- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

35. People who eat more fruits and vegetables are more likely to have an unbalanced diet.

- Perceived benefits

- Perceived barriers
- Perceived susceptibility
- Perceived severity
- Cues to action
- Self-efficacy

Thank you very much for completing this form.

We would like to know the factors that influence your fruit and vegetable intake and your attitudes toward eating these foods. Please complete this questionnaire.

Below are statements regarding factors relating to fruit and vegetable intake. Please indicate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

Examples

Pretend that you don't like eating fruit very much. If that was true, you'd probably "disagree" with the statement "I like eating fruit."

I like eating fruits.

- ☐ Strongly Disagree
 - ☒ Disagree
 - ☐ Neutral
 - ☐ Agree
 - ☐ Strongly Agree
 - ☐ Don't know
-

Perceived Benefits

1. Eating fruits and vegetables would make me fat.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. Fruits and vegetables, including juices, do not provide many of the vitamins and minerals which I need to be healthy.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. Fruits and vegetables are good sources of fibre.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. People who eat more fruits and vegetables may have an increased chance of getting cancer.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. People who eat more fruits and vegetables are less likely to get heart disease.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. People who eat more fruits and vegetables are less likely to have an unbalanced diet.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Perceived Barriers

1. It is expensive to eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. People in my family do not like eating fruits and vegetables so I do not eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. My friends do not like eating fruits and vegetables so I do not eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. I do not eat fruits and vegetables since it takes too long for me to prepare them.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. I like the taste of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. I do not like the look of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

7. I like the smell of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

8. I do not like the way fruits and vegetables feel in my mouth.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Perceived Susceptibility

1. I would be at risk for getting cancer if I eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. I would be more likely to get heart disease if I did not eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. My diet would be more likely to be an unbalanced diet if I eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. I would be more likely to gain weight if I did not eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Perceived severity

1. I would be very upset if I developed heart disease.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. I would be very concerned if I have an unhealthy diet.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. I would not be worried if I was diagnosed with cancer.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. It would not be a problem for me if I gained weight.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Cues to action

1. If I knew of the health benefits of fruits and vegetables, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. When I watch TV, I sometimes see something that makes me think about increasing my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. When I read newspapers and magazines, I never see anything that makes me think about eating fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. When I search the Internet, I sometimes read something that causes me to want to eat more fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. If there were more fruits and vegetables available at home, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. If my parents told me to eat more fruits and vegetables, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

7. If there were more fruits and vegetables available in the school cafeteria, I still would not increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Self-efficacy

1. I am not confident that I could increase my fruit and vegetable intake each day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. I am confident that I could eat the recommended (5) servings of fruits and vegetables each day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. I am not confident that I could increase my 100% juice intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. I am confident that I could shop for a variety of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. I am not confident that I could ask my parents to buy more fruits and vegetables for me.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. I am confident that I could eat fruits and vegetables when eating away from home.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Thank you very much for completing this form.

Name: _____ **Date:** _____

We would like to know the factors that influence your fruit and vegetable intake and your attitudes toward eating these foods. Please complete this questionnaire.

Below are statements regarding factors relating to fruit and vegetable intake. Please indicate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

Example:

Pretend that you don't like eating fruit very much. If that was true, you'd probably "disagree" with the statement "I like eating fruit."

I like eating fruits.

- ☐ Strongly Disagree
 - ☒ Disagree
 - ☐ Neutral
 - ☐ Agree
 - ☐ Strongly Agree
 - ☐ Don't know
-

1. It is expensive to eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. I would be at risk for getting cancer if I eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. Fruits and vegetables are good sources of fibre.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. When I watch TV, I sometimes see something that makes me think about increasing my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. I am confident that I could shop for a variety of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. I would be very upset if I developed heart disease.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

7. If I knew of the health benefits of fruits and vegetables, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

8. I do not eat fruits and vegetables since it takes too long for me to prepare them.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

9. I would be more likely to gain weight if I did not eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

10. I am not confident that I could increase my fruit and vegetable intake each day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

11. Eating fruits and vegetables would make me fat.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

12. I would be very concerned if I have an unhealthy diet.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

13. I am not confident that I could increase my 100% juice intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

14. If there were more fruits and vegetables available in the school cafeteria, I still would not increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

15. When I search the Internet, I sometimes read something that causes me to want to eat more fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

16. I do not like the way fruits and vegetables feel in my mouth.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

17. People who eat more fruits and vegetables may have an increased chance of getting cancer.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

18. People in my family do not like eating fruits and vegetables so I do not eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

19. I am confident that I could eat fruits and vegetables when eating away from home.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

20. It would not be a problem for me if I gained weight.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

21. I like the taste of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

22. I would be more likely to get heart disease if I did not eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

23. My friends do not like eating fruits and vegetables so I do not eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

24. I do not like the look of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

25. I am not confident that I could ask my parents to buy more fruits and vegetables for me.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

26. If my parents told me to eat more fruits and vegetables, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

27. When I read newspapers and magazines, I never see anything that makes me think about eating fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

28. People who eat more fruits and vegetables are less likely to get heart disease.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

29. My diet would be more likely to be an unbalanced diet if I eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

30. I like the smell of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

31. I am confident that I could eat the recommended (5) servings of fruits and vegetables each day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

32. Fruits and vegetables, including juices, do not provide many of the vitamins and minerals which I need to be healthy.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

33. If there were more fruits and vegetables available at home, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

34. I would not be worried if I was diagnosed with cancer.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

35. People who eat more fruits and vegetables are more likely to have an unbalanced diet.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Thank you very much for completing this form.

We would like to know the factors that influence your fruit and vegetable intake and your attitudes toward eating these foods. Please complete this questionnaire.

Below are statements regarding factors relating to fruit and vegetable intake. Please indicate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

Examples

Pretend that you don't like eating fruit very much. If that was true, you'd probably "disagree" with the statement "I like eating fruit."

I like eating fruits.

- ☐ Strongly Disagree
 - ☒ Disagree
 - ☐ Neutral
 - ☐ Agree
 - ☐ Strongly Agree
 - ☐ Don't know
-

Perceived Benefits

1. Eating fruits and vegetables would make me fat.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. Fruits and vegetables, including juices, do not provide many of the vitamins and minerals which I need to be healthy.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. Fruits and vegetables are good sources of fibre.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. People who eat more fruits and vegetables have an increased chance of getting cancer.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. People who eat more fruits and vegetables are less likely to get heart disease.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. People who eat more fruits and vegetables are more likely to have a balanced diet.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Perceived Barriers

1. It is expensive to eat fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. People in my family do not like eating fruits and vegetables so I do not eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. My friends do not like eating fruits and vegetables so I do not eat them very often.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. I do not eat fruits and vegetables since it takes too long for me to prepare them.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. I like the taste of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. I do not like the look of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

7. I like the smell of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

8. I do not like the way fruits and vegetables feel in my mouth.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Cues to action

1. If I knew of the health benefits of fruits and vegetables, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. When I watch TV, I sometimes see something that makes me think about increasing my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. When I read newspapers and magazines, I never see anything that makes me think about eating fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. When I search the Internet, I sometimes read something that causes me to want to eat more fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. If there were more fruits and vegetables available at home, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. If my parents told me to eat more fruits and vegetables, I would increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

7. If there were more fruits and vegetables available in the school cafeteria, I still would not increase my fruit and vegetable intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Self-efficacy

1. I am not confident that I could increase my fruit and vegetable intake each day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

2. I am confident that I could eat the recommended (5) servings of fruits and vegetables each day.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

3. I am not confident that I could increase my 100% juice intake.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

4. I am confident that I could shop for a variety of fruits and vegetables.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

5. I am not confident that I could ask my parents to buy more fruits and vegetables for me.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

6. I am confident that I could eat fruits and vegetables when eating away from home.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ Don't know

Thank you very much for completing this form.

Appendix 9

Name: _____

Date: _____

Short Survey for Food Frequency Questionnaire

1. Was it easy to fill out this questionnaire? Please explain why or why not.

2. Do you like the look of this questionnaire? Please explain why or why not.

3. How long did it take for you to finish this questionnaire?

4. Are the questions easy to understand? Are any questions confusing, unclear or difficult to understand? If yes, which ones? Do you have any suggestions to make these questions easier to understand?

5. Do you have any comments or suggestions to improve this questionnaire?

Thank you very much for completing this form.

Name: _____

Date: _____

Short Survey for Attitude Questionnaire

1. Was it easy to fill out this questionnaire? Please explain why or why not.

2. Do you like the look of this questionnaire? Please explain why or why not.

3. How long did it take for you to finish this questionnaire?

4. Are the questions easy to understand? Are any questions confusing, unclear or difficult to understand? If yes, which ones? Do you have any suggestions to make these questions easier to understand?

5. Do you have any comments or suggestions to improve this questionnaire?

Thank you very much for completing this form.