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ORIGINAL ARTICLE

Factors affecting food selection in Canadian population

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Objective: To establish health-related reasons behind Canadian food choices, and how variables such as education, income, gender, ethnicity and age may affect food selection.
Subjects: Approximately 98 733 Canadians responded to the 12 questions regarding food choices in the Canadian Community Health Survey (CCHS) cycle 2.1, conducted by the Canadian Government in 2003. These included 13 727 adolescents (12–19 years), 19 089 young adults (20–34 years), 31 039 middle-aged adults (35–54 years), 25 338 older adults (55–74 years) and 9580 elderly (75 + years).
Results: Approximately 70% of Canadian adolescents in the sample indicated that their food choices were independent of health concerns. Body weight management was a major concern for food selection by adolescents and adults, while the elderly stated heart disease as their main concern. Among all participants, females, and individuals with high levels of education and income reported the highest response to choosing or avoiding foods due to health concerns and food content.
Conclusions: Our data indicate that several factors significantly affect food choices for health-related reasons in the Canadian population. Among them, age- and gender-related gaps, particularly between adolescents and adults, are profound. This observation may urge authorities to implement effective strategies to educate Canadians, especially adolescents, that selection of appropriate foods may prevent chronic diseases.
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Keywords: Canadian; food; health; survey; socio-demographic

Introduction

A variety of reasons including taste, convenience, cost, weight management, disease prevention, culture, religion, food contents, food accessibility and many more contribute to food selection. Currently, Canadians are at high risk for many chronic diseases such as heart disease, diabetes and cancer; this suggests a strong need for nutrition education (Brown and Josse, 2002; Filate *et al*., 2003; Canadian Cancer Society, 2005; Statistics Canada—leading causes of death, 2005b). Identification of the reasons behind food choices could help professionals develop food plans that are acceptable and appealing to their target group (Glanz *et al*., 1998). Such strategies may reduce the burden of today's health-related problems.

Food can play an important role in disease prevention. For example, diets high in fibre may suppress appetite, improve blood lipid profile and help in weight management. Foods with low glycaemic index may help management of diabetes, while foods high in saturated and trans fat may cause cardiovascular disease (Holub, 2002; Mahan and Escott-Stump, 2004). Furthermore, low calcium intake in adolescence increases the risk of osteoporosis in later life (Story *et al*., 2002). High sodium intake may lead to hypertension, while dietary antioxidants may be beneficial against cancers (Mahan and Escott-Stump, 2004; Appel *et al*., 2006).

Food choices differ across the lifespan. People choose foods based on their experience and knowledge as well as their socio-economic status, including initiation of independency in adolescents, workforce conditions in young adults, financial security in middle-aged and older adults, and financial, physical and mental limitations in the elderly (Glanz *et al*., 1998; Story *et al*., 2002; Kuczmarski and Weddle, 2005).

The aim of the present study was to identify reasons behind Canadian food choices. Food selection due to

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health concerns such as body weight, heart disease, cancer and osteoporosis, and contents of foods including salt, fibre, fat, cholesterol and calories have been examined. Other relevant factors including highest level of education in household, total household income, gender, ethnicity, age, disease state and physical activity index have been also included.

Materials and methods

The Canadian Community Health Survey (CCHS) Cycle 2.1 was carried out by the Canadian Government in 2003. The objective of the CCHS was to assess the health status of Canadians and evaluate health care system utilization (Statistics Canada, 2003). Approximately 130 000 Canadians over the age of 12 completed this survey. Individuals who lived on Indian Reserves and Crown Lands, residents of institutions, full-time employees of Canadian Armed Forces and residents of some remote locations were excluded. Participants were chosen to complete the survey using 3 sampling frames; residential postal codes (50%), area frame (48%) and random digit dialing (2%).

Twelve questions from the CCHS addressing food choices were included for analysis as dependent variables in the present study. These questions were divided into three groups: (a) Canadians choose or avoid foods based on health concerns, which included body weight, heart disease, cancer and osteoporosis; (b) Canadians choose foods for their nutrient contents (calcium, fibre and lower fat); and (c) Canadians avoid foods due to their nutrient content (fat content, type of fat, salt, cholesterol and calories). Answers for these questions were in a 'yes' or 'no' format. Participants responding 'yes' to any of the questions within a group were collectively considered as a 'yes' to the grouped question. Furthermore, participants omitting a question in a group were not included in the grouped question.

The participant's food choices were cross-tabulated with many variables including highest level of education in household, total household income, gender, ethnicity, age, disease status and physical activity levels. Participants were divided into the following five age groups for analysis of factors influencing food choices: adolescents (ages 12–19 years), young adults (20–34 years), middle-aged adults (35–54 years), older adults (55–79 years) and the elderly (75+ years). Disease states included heart disease, cancer, diabetes and concomitant diseases (more than one disease). Physical activity index is grouped as 'active', 'moderately active' and 'inactive', based on energy expenditure estimated from the amount of time spent on a number of activities, including walking, cycling, soccer, basketball and others.

Statistical Program for Social Sciences (SPSS) 11.5 for Windows, independent sample *t*-test and χ^2 test were used for statistical analysis. Significance was considered at $P<0.05$. Binary logistic regression was used to determine significance while adjusting for other factors such as age, gender, income and education. Before performance of statistical analyses, normalized weights were applied to the sample population to partially account for the survey sample design. Normalized weights were obtained by calculating the mean of the master weights supplied by Statistics Canada and then dividing the master weight of each participant by the mean master weight value to give the normalized weight for each individual. The master weights are the number of Canadians represented by each survey participant, which in turn can estimate responses of the whole Canadian population.

Results

Canadian participants were composed of several age groups including adolescents ($n=13\,727$, 14%), young adults ($n=19\,089$, 19%), middle-aged adults ($n=31\,039$, 31%), older adults ($n=25\,338$, 26%) and elderly ($n=9580$, 10%). Figure 1 summarizes the responses of adolescent participants for choosing foods based on health concerns, food contents or avoiding foods based on their contents. Figure 1 shows that the majority of Canadian adolescents seem to make their food choices regardless of health-related benefits.

Association between chooses or avoids foods due to health concerns and socio-demographic factors

Concerns with body weight was a basis for food choices in 26% of adolescents, 45% of young adults, 49% of middle-aged adults, 48% of older adults and 31% of the elderly. In addition, heart disease was the second main concern for food choices as reported by 9% of adolescents, 27% of young adults, 42% of middle-aged adults, 47% of older adults and 31% of the elderly. Concerns about cancer and osteoporosis had less effect on food selection in any age group of the participants. Approximately 70% of adolescent participants reported to choose foods regardless of their impact on their health; adolescents were not concerned with heart disease, cancer and osteoporosis as compared to the other age groups. These data are demonstrated in Figure 2.

Individuals that completed higher levels of education were significantly more likely to make healthier food choices than those with lower levels of education regardless of income (Table 1). Table 1 also demonstrates the association between the levels of income and food choices based on health concerns or food contents. Our data revealed a significant positive correlation between household income and food choices based on health concerns when adjusting for education.

Gender also appears to play an important role in determining food choices among Canadians (Table 1). Approximately 45% of men and 65% of women of all age groups responded to choosing foods because of health concerns. In contrast, ethnicity had no significant effect on food choices as judged by responses from Caucasians and visible minorities (Table 1). Visible minority is defined as non-Caucasian, non-First Nation's people.

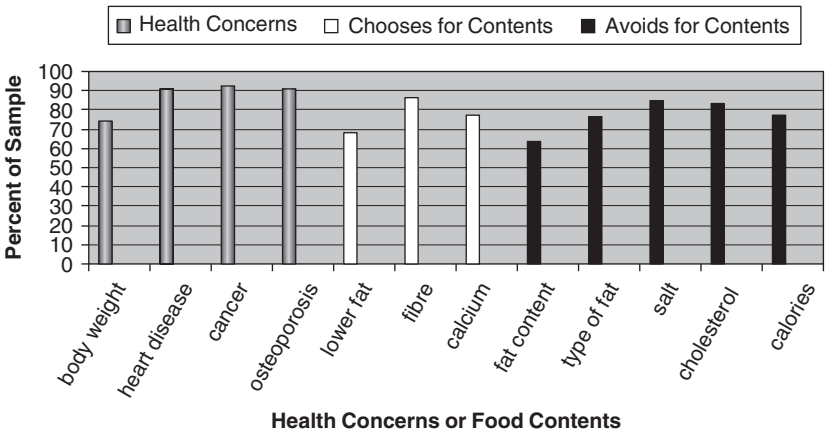

Figure 1 Percentage of adolescents in the sample size that responded 'no' to choosing or avoiding foods based on health concerns and food contents.

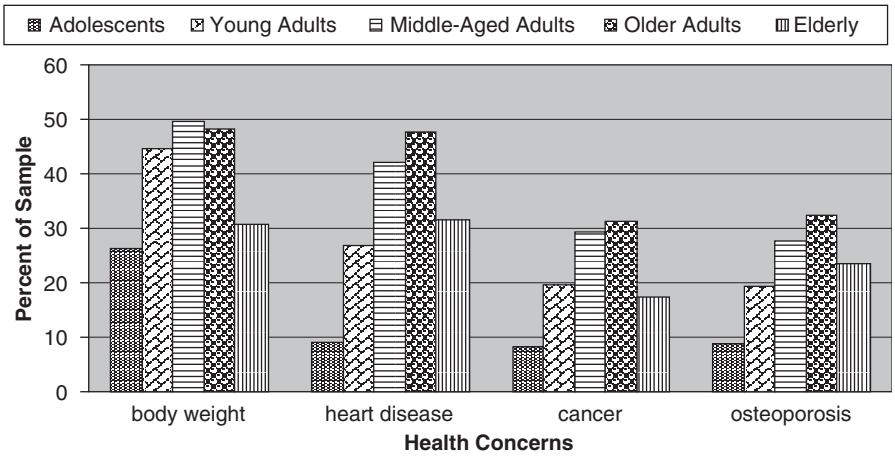

Figure 2 Percentage of participants in the sample size that responded 'yes' to choosing or avoiding foods based on health concerns. χ^2 test showed significant ($P<0.05$) association between age and choosing foods for health concerns regarding body weight, heart disease, cancer and osteoporosis.

Moderately active Canadians were significantly more likely to choose foods based on health concerns than active and inactive Canadians (62% compared to 58 and 52%, respectively) (Figure 3). Participants with either heart disease, or diabetes or cancer were significantly more likely to choose foods based on health concerns as compared to those without the disease (Table 2). Table 2 also shows that Canadians with concomitant diseases (two or more of heart disease, cancer and diabetes) were more likely to choose foods based on health concerns than those without concomitant diseases.

Association between chooses foods for content reasons and socio-demographic factors

More participants from all age groups reported to choose low fat as influencing their choice for selecting foods than any other food content. However, the response of the elderly to these questions was lower than that of older adults and higher than that of adolescents and young adults. For example, the response to choosing foods based on their fibre content among adolescents, young adults, middle-aged adults, older adults and elderly was 14, 38, 57, 67 and 60%, respectively. Similar patterns were seen for the other two parameters namely, low-fat and calcium contents; these findings are illustrated in Figure 4. Older adults consistently had the highest percentage and adolescents had the lowest percentage of responding 'yes' to choosing foods based on fibre, calcium or low-fat contents. More than 55% of adolescents reported to not choose or avoid foods for their contents.

Approximately 60% of male participants and 80% of female participants of all age groups reported that they choose or avoid foods based on their contents (Table 1). The percentage of male participants responding 'yes' to each one of the three questions was significantly lower than the percentage of female participants (Table 1). This gender-related difference in food selection was seen in all of four age groups (Table 3). Further analysis showed that women are

Table 1 Percentage of responses of 'yes' to choosing or avoiding foods based on health concerns, choosing foods for content reasons, and avoiding foods for content reasons by groups of education, income, gender and ethnicity[a]

Groups	*Health concerns*	*Chooses foods for content reasons*	*Avoids foods for content reasons*
Education[b]			
< Than secondary school	42.0	54.6	59.1
Secondary school graduate	54.5	67.3	70.0
Some post-secondary school	58.2	71.2	72.3
Post-secondary graduate	66.5	78.6	80.0
Income[c]			
< $15 000	52.2	66.7	69.8
$15 000—$29 999	54.4	68.7	71.3
$30 000—$49 999	56.1	69.0	71.4
$50 000—$79 999	58.3	70.1	72.3
$80 000 +	62.4	73.1	75.0
Gender[d]			
Male	45.6	58.4	62.0
Female	65.0	77.0	78.5
Ethnicity			
Caucasian	56.6	69.2	71.4
Visible minority	52.4	63.7	68.2

[a]Details regarding health concerns, choosing food for content reasons and avoiding food for content reasons are located in the text.
[b]After adjusting for income, education had a significant impact on choosing foods with regard to all of three categories.
[c]After adjusting for education, income had a significant impact on choosing foods with regard to all of three categories.
[d]Significant ($P<0.05$) differences were observed between genders in all three categories of food choices.

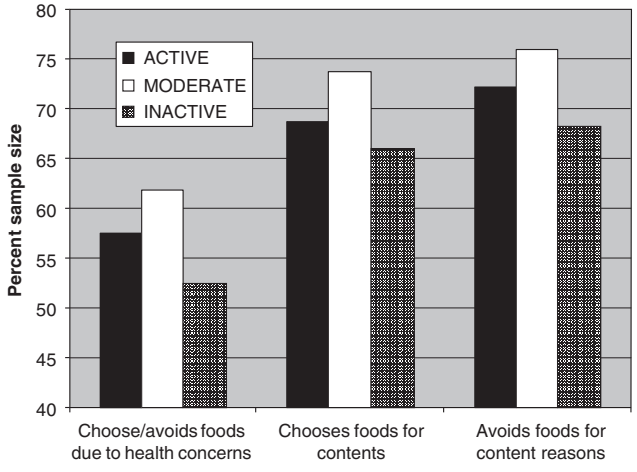

Figure 3 Percentage of participants in the sample size that responded 'yes' to choosing or avoiding foods based on health concerns and food contents. χ^2 test showed significant ($P<0.001$) association between physical activity index and choosing foods for health concerns, choosing food for their contents, and avoiding foods for their contents.

more likely to choose or avoid foods based on body weight concerns rather than osteoporosis concerns or calcium intake concerns (Table 4). It is interesting to note that more participants choose foods for their calcium content, but have a lower desire to select foods for their concern with osteoporosis (Table 4).

Similar patterns of response for choosing food based on health concerns were observed when determining the association between choosing food for content reasons and total household income, highest household education, ethnicity, physical activity, heart disease, cancer, diabetes and concomitant diseases (Tables 1 and 2; Figure 3).

Association between avoids foods for content reasons and socio-demographic factors

Adolescents and older adults consisted of the lowest and highest, respectively, of participants who responded 'yes' to avoid foods based on their contents. Thirty-six percent of adolescents, 58% of young adults, 66% of middle-aged adults, 70% of older adults and 59% of the elderly reported avoiding foods for their fat contents. Similar patterns of response according to age were seen for avoiding foods because of their type of fat, salt, cholesterol and calorie contents (Figure 5).

Again, similar patterns of response for choosing food based on health concerns were observed when determining the association between avoiding food for content reasons and gender, total household income, highest household education, ethnicity, physical activity, heart disease, cancer, diabetes and concomitant diseases (Tables 1 and 2; Figure 3).

Discussion

In this study, we have reviewed the answers Canadians provided regarding 12 questions of why they choose or avoid foods; these questions were included in a national survey conducted by the government of Canada in 2003. Our data showed that majority of adolescents aged 12–19 years have the lowest concern for choosing foods for health reasons, choosing or avoiding foods due to their contents (Figures 2, 4, and 5). Interestingly, many adolescents choose or avoid foods based on their contents, but do not choose foods based on health concerns. Perhaps, adolescents desire to be healthy by choosing healthy foods or avoiding unhealthy foods, but seem not necessarily to be concerned with their health outcomes at this point in their lives because their health is not likely compromised. It should be mentioned that these three portions (health concerns, choosing foods or avoiding foods) are independent of each other in the questionnaire. A recent study (Striegel-Moore *et al*., 2006) evaluated the food habits of 2371 girls aged 10–19 years, and discovered that milk consumption decreased by more than 25% during the course of the 10-year study, while soda intake nearly tripled, becoming the number one beverage consumed by the older

Table 2 Association of food choices with disease state in Canadians age 12 and older

Disease state	*Health concerns*		*Choose food contents*		*Avoid food contents*	
	Percent sample size	*Odds ratio*[a]	*Percent sample size*	*Odds ratio*	*Percent sample size*	*Odds ratio*
Cancer						
Yes	63.4	1.323[b]	74.2	0.992[b,c]	77.0	0.968[b,c]
No	55.9	(1.107, 1.582)	68.4	(0.836, 1.178)	70.9	(0.793, 1.182)
Heart disease						
Yes	68.7	2.761[b]	80.2	1.865[b]	84.7	2.194[b]
No	55.2	(2.450, 3.112)	67.7	(1.624, 2.140)	70.1	(1.888, 2.550)
Diabetes						
Yes	65.8	1.646[b]	80.3	1.663[b]	85.3	1.792[b]
No	55.5	(1.465, 1.850)	67.8	(1.450, 1.907)	70.2	(1.549, 2.073)
Concomitant diseases[d]						
Yes	71.8	NA	82.4	NA	87.4	NA
No	55.8		68.3		70.7	

NA, statistical analysis not applicable.
[a]Odds ratio (95% confidence interval) after adjusting for age, gender, income and education.
[b]$P<0.001$ as analysed by χ^2 test.
[c]No longer significant after adjusting for age, gender, income and education.
[d]Defined as answering 'yes' to two or more of cancer, heart disease or diabetes.

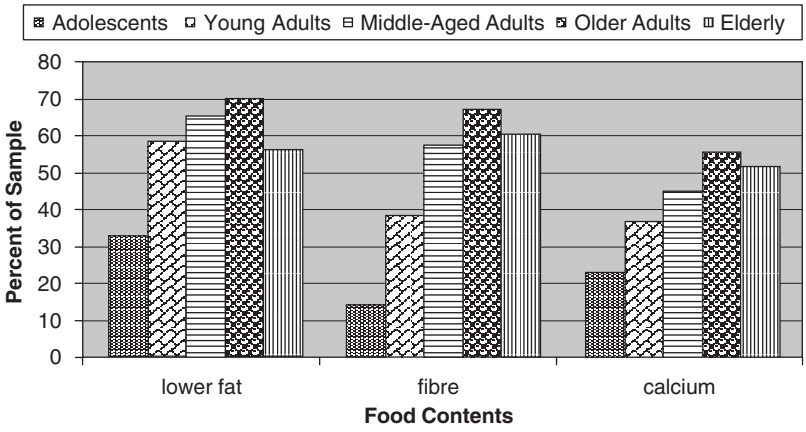

Figure 4 Percentage of participants in the sample size that responded 'yes' to choosing foods based on contents. χ^2 test showed significant ($P<0.05$) association between age and choosing foods for their lower fat, fibre and calcium contents.

girls. Data from the present study shows that only 35% of female and 18% of male adolescents choose foods due to calcium content (Table 4). This is a low value and could potentially cause health problems for these individuals in the future, including osteoporosis, of which concern for was also low.

Education plays an important role in food choices and health, particularly with respect to literacy and obtaining nutritional information from foods via their food labels. Trudeau *et al*. (1998) found that having more years of education was associated with higher vegetable consumption. In addition, Georgiou *et al*. (1997) reported that individuals with lower education may be at a greater risk for developing chronic diseases later in life. Another study reported that organoleptic properties of foods were the most important determinants of food selection among young adults who had no post-secondary education (Stewart and Tinsley, 1995). Our data are in agreement with the above-mentioned observations.

Individuals with higher incomes and higher levels of education are expected to make healthier food choices as compared to their less educated counterparts also with lower income (Ricciuto *et al*., 2006). This is evident in the findings of the current study where there is approximately a 2.5% increase at each income level of making food choices based on health concerns (Table 1). The cost of eating healthy can

be high and some individuals may not be able to afford healthy foods, as they are often more expensive than less nutritious food (Turrell *et al*., 2002; Jetter and Cassady, 2005; Ricciuto *et al*., 2006). In low-income families, healthy eating may not be on the top of the priority list, as shelter, utility bills, and clothing are. High-income families not only can afford nutrient-dense foods, but also can obtain more health-related dietary information (Turrell *et al*., 2002; Jetter and Cassady, 2005; Ricciuto *et al*., 2006).

A study completed by Drewnowski *et al*. (1997) showed healthy older subjects (aged 60–75 years) with a high socio-economic status ate a diet with a higher variety of foods when compared with younger subjects (aged 20–30 years). This contributes to the selection of healthier and more nutritious foods in older persons as compared to younger ones (Glanz *et al*., 1998). Our data showed that middle-aged and older adults demonstrated to be the most health-conscious groups. One can speculate that this age group may be more aware of nutrition and tends to be more health conscious; therefore, they choose food wisely for the purpose of the prevention of disease, the management of an existing disease, or delaying the outcome of physical dependency (Blane *et al*., 2003). Another factor that may affect food selection in the elderly is food preparation by the elderly facilities (Kuczmarski and Weddle, 2005). Altogether, nutrition education can contribute to improvements in food intake, poor appetite, as well as other physical and environmental challenges in the elderly (Keller and McKenzie, 2003).

Table 3 Percentage of gender responding 'yes' to questions on health concerns, chooses foods for contents and avoids foods for contents[a]

Groups	*Health concerns*	*Chooses for contents*	*Avoids for contents*
Adolescents (ages 12–19 years)			
Male	23.6	31.7	36.2
Female	40.6	50.5	55.8
Young adults (ages 20–34 years)			
Male	44.3	54.0	58.7
Female	63.7	76.1	76.0
Middle-aged adults (ages 35–54 years)			
Male	53.0	65.8	69.2
Female	72.3	81.0	83.0
Older adults (ages 55–74 years)			
Male	58.3	72.1	76.3
Female	73.6	85.7	87.0
Elderly (ages 75 + years)			
Male	45.0	67.0	70.0
Female	53.3	76.0	76.4

[a]Details regarding health concerns, choosing food for content reasons and avoiding food for content reasons are located in the text.

Table 4 Percentage of gender responding 'yes' to choosing foods based on weight concerns, osteoporosis concerns and calcium content

Groups	*Weight concerns*	*Osteoporosis concerns*	*Calcium content*
Adolescents (ages 12–19 years)			
Male	17.7	5.0	18.1
Female	28.1	11.7	35.3
Young adults (ages 20–34 years)			
Male	26.2	9.5	34.6
Female	49.3	31.8	53.3
Middle-aged adults (ages 35–54 years)			
Male	30.3	12.8	42.6
Female	57.8	41.3	57.2
Older adults (ages 55–74 years)			
Male	41.5	17.9	43.9
Female	66.7	44.9	54.9
Elderly (ages 75 + years)			
Male	40.6	14.9	30.4
Female	58.3	28.3	31.3

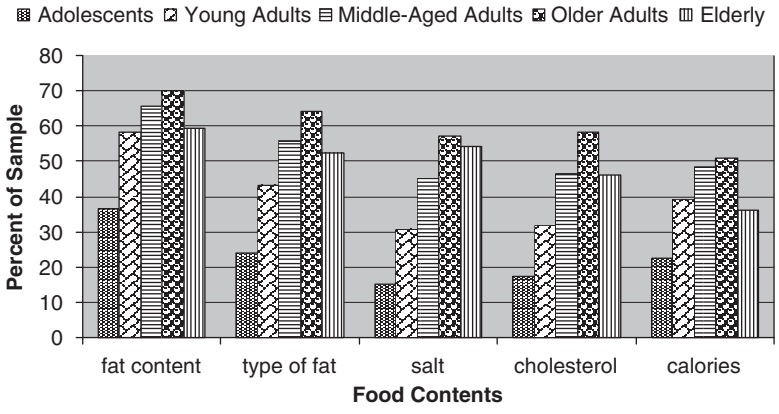

Figure 5 Percentage of participants in the sample size that responded 'yes' to avoiding foods based on contents. χ^2 test showed significant ($P<0.05$) association between age and avoiding foods for their fat content, type of fat, salt, cholesterol and calorie content.

Our data indicate that women are more likely than men to choose or avoid foods for concerns with health and choose or avoid foods due to their contents. However, Story *et al*. (2002) reported that it is more likely that adolescent girls have lower intakes of vitamins and minerals and consume fewer fruits, vegetables and dairy foods than adolescent boys. A possible reason for this gender-related variation could be that on average, adolescent boys consume more foods on a daily basis than girls do. Other reasons could include fad diets, weight concerns and eating disorders, which are more common in adolescent females. The life expectancy in Canada is 81 years for women and 75 years for men (Statistics Canada—life expectancy, 2005a). This 6-year gap may be a result of food selection between the two sexes. The current data suggest that women are approximately 60% more likely to consume foods due to health concerns or food contents.

Few Canadians choose or avoid foods due to health concerns. Of those with concerns, body weight was the most frequent reason for food selection from the majority of the age groups (Table 4; Figure 2). In addition, choosing foods for their low-fat characteristics or avoiding foods due to fat content was also common in most age groups. Cashel *et al*. (2000) examined influences on the type of milk consumed by Australian women. The younger (<50 years) and older (>50 years) women both agreed that eating foods low in fat was the most important habit for their health; eating foods for their fibre content was considered the second most important habit by the Australian women. Participants of the current study also reported that low-fat content was the main reason for choosing food followed by fibre content (Figure 4). This observation suggests that informing people of possible health risks of high-fat diets have been influential.

Canadians with diabetes, heart disease or cancer were significantly more likely to choose or avoid foods based on health concerns or food contents than Canadians without these diseases (Table 2). One explanation for this observation may be the impact of dietary consultation that is usually provided to many patients with chronic diseases (Stitzel, 2006).

It is also interesting to observe that moderately active Canadians are more likely to choose/avoid foods due to health concerns or for their content as compared to both active and inactive Canadians (Figure 3). Perhaps, active individuals feel that they may not need to follow a healthy dietary habit (Knowler *et al*., 2002). Inactive Canadians may be less likely to choose/avoid foods based on health concerns or food content most likely due to their lifestyle.

Conclusions

Education, income, gender, age, disease state and physical activity, may play a role in choosing or avoiding foods due to health concerns and food contents. Middle-aged and older adults, individuals with higher education, individuals with higher income, females, and those that are moderately active are most likely to make healthy food choices. Only a small percentage of Canadian adolescents seem to choose foods for health reasons. Many measures have been taken to educate Canadians on the benefits of eating healthier to prevent chronic diseases. For example, television programmes, news programmes, documentaries, newspaper and magazine articles, public workshops/seminars and health claims on food products have been initiated. However, it seems that additional efforts are needed to encourage Canadians, particularly adolescents, to make better food choices and reduce their risk for chronic disease.

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