



New  Nouveau  
**Brunswick**  
C A N A D A  
Health and Wellness

# New Brunswick Nutrition Survey



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DE MONCTON

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NEW BRUNSWICK  **UNB**



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# New Brunswick Nutrition Survey

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## EXECUTIVE SUMMARY

This report presents the findings of the 1996-97 New Brunswick (NB) Nutrition Survey, which was the first major nutrition survey in the province since 1972. Results are based on interviews with 1,816 adults aged 18-74 years. Discussions focus on weight status, intake of nutrients and selected foods, the contribution of food groups to nutrient intakes, health and nutrition-related attitudes and behaviour, and food security.

The adult population in NB appeared to be meeting the recommended Dietary Reference Intakes (DRI) for percentage of energy from fat, carbohydrate, and protein. Overall, the percentage of calories derived from fat appears to have decreased since the 1972 study, and fell below the currently suggested DRI maximum of 35%.

The average NB food intake does not provide sufficient amounts of several vitamins and minerals. Folate intake was inadequate for almost all adults; intakes of vitamin A and vitamin C were poor for much of the population; and the majority of New Brunswickers were not getting enough magnesium or calcium. These findings highlight the importance of choosing whole grains over refined grain products, getting adequate amounts of low-fat fortified milk products, and increasing consumption of vegetables and fruit. Vitamin B<sub>12</sub> intake decreased with age, which is a further reason to promote an increase in the amount of lean meats and low-fat milk products consumed by the older population. Many women had intakes below the requirements for thiamin and zinc, and Vitamin B<sub>6</sub> intake was low for all adults over 50 years of age; these inadequacies may be addressed by recommending these groups make an effort to increase their intake of lean meats and emphasize whole grain products. The NB Nutrition Survey Report did not evaluate the use of vitamin and mineral supplements, although these data are available for study at a later date. Since this survey was completed in 1996-97, steps have been taken by Health Canada to improve the intake of certain nutrients in specific segments of the population. Mandatory supplementation of flour products with folic acid has been implemented, folic acid supplementation is being promoted for women of childbearing age, and vitamin B<sub>12</sub> supplementation is advised for adults over 50 years of age according to the new DRIs.

The "Other Foods" category from Canada's Food Guide to Healthy Eating includes high energy/low nutrient density foods such as added fats and sugars, sweetened drinks, chips, fried potatoes, and chocolate bars. These "Other Foods" provided the greatest percentage of energy, fat and sodium to the diets of NB adults. Grain Products were the greatest source of carbohydrate, fibre, magnesium, thiamin, and iron. The Vegetables and Fruit group provided over half of the vitamin C intake and also contributed the most vitamin A, folate, and potassium. Half of the calcium consumption came from the Milk Products group. Meat and Alternatives accounted for about half of the protein intake and provided the most vitamin B<sub>6</sub>, B<sub>12</sub>, phosphorus, and zinc. The individual food items contributing most to the intake of a wide variety of nutrients were red meat, fluid cow's milk, and vegetables.

Only 26% of men and 38% of women in the province had an acceptable body mass index. Less than 1% of men and 2% of women were underweight. Thus, the majority of the

population had excess weight, putting them at higher risk for developing chronic diseases. The Nutrition Survey found that a large proportion of adults in NB were inactive. More recent statistics show that the high rates of overweight and obesity determined by this survey in 1996/97 continue to be a concern. Similarly, recent more detailed studies of physical activity levels show that great numbers of New Brunswickers remain inactive.

Women in NB had a greater awareness of the links between nutrition and disease and were more likely than men to be implementing healthy eating recommendations. Overall, half the population claimed to choose or avoid foods based on nutrient content. Consuming a diet low in fat and high in vegetables and fruit were the most popular healthy eating measures recommended by New Brunswickers.

Energy, protein and fat intakes were similar regardless of household income. Intakes of folate, calcium, fibre and magnesium were low across all income levels. Those with the lowest incomes were at increased nutritional risk, as they had the lowest intakes of all micronutrients combined. The greatest proportion of adults in the lowest income group were 18-34 years old. Men and women over 65 years of age made up the greatest percentage of adults in the combined lowest/lower income categories and therefore are also at increased nutritional risk.

The NB Nutrition Survey showed that the food intake of most adults in the province satisfied the DRI for macronutrient intakes, but did not provide the required amounts of many micronutrients. This, combined with the alarming statistics on overweight and obesity, suggests that New Brunswickers are eating an adequate amount of food but their intake is not nutritionally balanced. Being overweight/obese, living an inactive lifestyle, and failing to get sufficient amounts of key micronutrients puts many NB adults at high risk for developing chronic diseases. These concerns must be addressed through the development and implementation of comprehensive prevention strategies for reaching and maintaining a healthy weight, being active, and making healthy food choices.

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## ACRONYMS

<b>AI</b>	Adequate Intake
<b>BBCA</b>	Bureau of Biostatistics and Computer Applications, Health Canada
<b>BF</b>	Butter Fat
<b>BMR</b>	Basal Metabolic Rate
<b>BMI</b>	Body Mass Index
<b>BNS</b>	Bureau of Nutritional Sciences
<b>CANDI</b>	Canadian Dietary Information software program
<b>CCHS</b>	Canadian Community Health Survey
<b>CI</b>	Confidence Interval
<b>CNF</b>	Canadian Nutrient File
<b>CVD</b>	Cardiovascular Disease
<b>DRI</b>	Dietary Reference Intake
<b>EAR</b>	Estimated Average Requirement
<b>EER</b>	Estimated Energy Requirement
<b>EI</b>	Energy Intake
<b>FAO</b>	Food and Agriculture Organization (of the United Nations)
<b>FFQ</b>	Food Frequency Questionnaire
<b>LICO</b>	Statistics Canada's Low Income Cut-Off
<b>MUFA</b>	Monounsaturated Fatty Acid
<b>NB</b>	New Brunswick
<b>NBMRR</b>	New Brunswick Medicare Resident Registry
<b>NPHS</b>	National Population Health Survey
<b>PAL</b>	Physical Activity Level
<b>PEI</b>	Prince Edward Island
<b>PFA</b>	Polyunsaturated Fatty Acid
<b>SFA</b>	Saturated Fatty Acid
<b>SSC</b>	Survey of Smoking in Canada
<b>TEE</b>	Total Energy Expenditure
<b>UNU</b>	United Nations University
<b>USDA</b>	United States Department of Agriculture
<b>WC</b>	Waist Circumference
<b>WHO</b>	World Health Organization

# 1 INTRODUCTION

The New Brunswick (NB) Nutrition Survey was conducted in 1996-1997 to describe the dietary practices, distribution of nutrient intakes, and the nutrition knowledge and attitudes of adult New Brunswickers. The investigators included partners representing the Department of Health and Wellness, Université de Moncton, University of New Brunswick, the NB Association of Dietitians, NB Division of the Canadian Heart and Stroke Foundation, NB Division of the Canadian Cancer Society, and NB Division of the Canadian Diabetes Association. A peer-reviewed standardized protocol was used, which was originally developed for the Nova Scotia Nutrition Survey and has been used by five other provinces (Alberta, Saskatchewan, Quebec, Prince Edward Island, and Newfoundland). The NB data were collected primarily by community health nurses and dietitians through in-home interviews. A probability sample of approximately 2,000 non-institutionalized New Brunswickers aged 18-74 years was drawn from the NB Medicare Resident Registry (NBMRR), with sampling design conducted by Statistics Canada. Health Canada's Bureau of Biostatistics and Computer Applications Food Directorate provided technical expertise regarding validation and processing of the food intake and questionnaire data.

## 1.1 RATIONALE

Risk factors for developing cardiovascular disease (CVD) and other chronic diseases include unhealthy eating, smoking, physical inactivity, being overweight, high blood pressure, and diabetes (Heart and Stroke Foundation of Canada, 2003). According to the NB Heart Health Survey (1989) as many as two out of three adults in the province have at least one risk factor for CVD. New Brunswickers may be at greater risk of developing chronic illnesses because of higher levels of physical inactivity, the large number of smokers, and inadequate intakes of vegetables and fruit (Statistics Canada, 2000 in Heart and Stroke Foundation of Canada, 2003). Over the past several decades, a growing body of observational and experimental evidence have demonstrated that nutrition plays a key role in the etiology of chronic diseases, including CVD, certain forms of cancer, diabetes, and obesity. Investing in the prevention of chronic diseases and reversing the obesity epidemic could result in major financial savings and positive health impacts for the province (GPI Atlantic, 2001). The Heart and Stroke Foundation of Canada (2003) states that addressing health risk factors through community interventions could prevent many chronic diseases, and warns that failing to act will allow the epidemic of CVD to continue. Implementation of effective nutrition strategies is essential to a public health approach to CVD prevention and health promotion. This is not possible without an accurate description of the dietary practices of New Brunswickers. The results of the NB Nutrition Survey can be used to: develop credible professional and public education programs; support collaborative programs with the voluntary and private sector; provide a basis for monitoring relevant provincial health goals; and enhance partnerships between government and non-governmental organizations.

## 1.2 BACKGROUND

Although the rate of deaths from CVD continues to decline (Heart and Stroke Foundation, 2003), it remains the leading cause of morbidity and mortality for both men and women in Canada. According to Health Canada (1999a), CVD accounts for 36.0% of deaths in the country. The Heart & Stroke Foundation (2003) predicts that the number of CVD cases will increase over the next 20 years due to our aging population and unhealthy lifestyles. Despite the decline in mortality rates, the economic costs of CVD are increasing with efforts to improve quality of care and quality of life (Health Canada, 1997). The financial burden of CVD in Canada is estimated to be in excess of eighteen billion dollars a year (Heart and Stroke Foundation of Canada, 2003). Diseases of the circulatory system are the leading cause of mortality in New Brunswick according to 1994-1998 data (New Brunswick Epidemiology Report, 2003b). The mortality rate from CVD in New Brunswick is higher than the national average at 37.3% (Health Canada, 1999a). Factors such as elevated blood cholesterol, high blood pressure, obesity, and diabetes increase the risk of developing CVD. According to Statistics Canada (2000), 6.5% of New Brunswick adults over 20 years of age have high blood pressure, which is almost 2% more than the national average. Healthy eating can play an important role in managing the risk factors for heart disease. Recent studies, for example, suggest that replacing saturated fats with monounsaturated and polyunsaturated fats may help prevent heart disease, and that intakes of certain B vitamins appear to be inversely associated with the risk of developing CVD (Dietitians of Canada and The American Dietetic Association, 1999).

About 40% of men and 35% of women will develop cancer during their lifetime (Health Canada, 2001). Health Canada statistics indicate that cancer is the cause of 27% of deaths in NB and the percentage for Canada overall is higher at 28.6% (Health Canada, 1999a). While New Brunswick has seen a decrease of about 2% in deaths from circulatory diseases between 1994-1998, the number of deaths from cancer during the same time period has increased by 11.3% (New Brunswick Department of Health and Wellness, 2002). Cancer was the second leading cause of death in New Brunswick for the period of 1994-1998 (New Brunswick Department of Health and Wellness, 2003a). It is estimated that at least 20% of deaths from cancer are associated with poor nutrition and alcohol consumption (Health Canada, 2003a). The Canadian Cancer Society states that about 30-40% of cancers could be prevented through good nutrition, regular physical activity, and maintaining a healthy body weight (American Institute for Cancer Research, 2002; Canadian Cancer Society, 2002; GPI Atlantic, 2001). High fat intakes can increase the risk for developing colon cancer (Health Canada, 2001; Dietitians of Canada and the American Dietetic Association, 1999). Regular and adequate consumption of a variety of plant-based foods including whole grains, vegetables and fruits has been shown to reduce the risk of certain types of cancers (American Institute for Cancer Research, 2002; Dietitians of Canada and the American Dietetic Association, 1999).

More than two million Canadians have diabetes with an estimated 60,000 new cases diagnosed each year, and 40% of these people will develop long-term complications (Health Canada, 2003a). These statistics likely underestimate the prevalence of diabetes

and about one-third of all cases go undiagnosed (Health Canada, 2002b). Other negative contributing consequences of diabetes include reduced life expectancy, increased stress on individuals and families, increased work/school absenteeism, and personal difficulties (Health Canada, 2003a). Nationally diabetes is cited as the cause of 3.6% of deaths, while in New Brunswick diabetes is the cause of 2.8% of deaths (Health Canada, 1999a). It is important to note that these data only represent cases where diabetes is listed as the underlying cause of death, and not those for which diabetes-related complications are named as the primary cause (Health Canada, 2002b). Studies suggest that the mortality rate from diabetes may be as much as five times higher than estimates obtained by using the Statistics Canada mortality database (Health Canada, 2002b). The national economic burden of diabetes is estimated to be approximately nine billion dollars per year (Health Canada, 2003a). Research has demonstrated that Type 2 diabetes, which accounts for 90% of cases, can be delayed or prevented by using healthy eating and regular physical activity to achieve a healthier body weight (Health Canada, 2003a).

Health Canada (2003b) and the World Health Organization (2003) defines overweight as a BMI of 25.0-29.9 and obesity as a BMI  $\geq 30$ . Being overweight can increase the risk for asthma, arthritis, back problems, hypertension, stroke, diabetes, thyroid problems, restriction of activity, and repetitive strain injuries (Gilmore, 1998 in GPI Atlantic, 2001; Health Canada, 2003b). The percentage of people who are overweight is higher in the Atlantic Provinces than the rest of Canada (GPI Atlantic, 2001). According to the Canadian Community Health Survey, 34.7% of the NB population is overweight compared to the national average of 32.5% (Statistics Canada, 2000/01). The percentage of overweight people has more than doubled in Canada since 1985, and the rate of increase of overweight in the New Brunswick population is the highest in the country (GPI Atlantic, 2001). In addition to being a health concern on its own, obesity is a major risk factor in the development of CVD, diabetes, high blood pressure, osteoarthritis, and some forms of cancer (GPI Atlantic, 2001). Recent health statistics indicate that 20.7% of adults in NB are obese, compared to the national average of 14.9% (Statistics Canada, 2000/01). People who are obese are 50-100% more likely to die prematurely from any cause than individuals at a healthy weight (GPI Atlantic, 2001). GPI Atlantic (2001) states that obesity is the second-leading preventable cause of death, second only to smoking. Obesity-related health conditions pose a major financial burden on the province, costing an estimated \$96 million in direct expenses annually (GPI Atlantic, 2001). When the cost of lost productivity is added, the financial cost increases to about \$200 million per year (GPI Atlantic, 2001). It is expected that with the decrease in smoking and the increase in the rate of obesity in New Brunswick, the economic impact of obesity will soon exceed that of smoking (GPI Atlantic, 2001).

Economic and social changes in recent years have resulted in large numbers of Canadians being unable to meet their daily food needs, which has increased the demand for emergency food aid. The number of Canadians using food banks doubled between 1989-1999 (Gord, 1999). People living in poverty are often deprived of material things necessary for good health, including adequate amounts of nutritious foods (Raphael, 2002). According to Statistics Canada (2001a) in 1998-99, 35% of those living in low income

households faced food insecurity and 30% believed that their nutritional status was compromised because of this. Many individuals of lower economic status have a greater number of health risk factors than other Canadians, putting them at greater risk for CVD (Heart & Stroke Foundation, 2003; International Heart Health Conference, 1992). According to the Canadian Community Health Survey, people with lower incomes are more likely to smoke daily and be physically inactive, are less likely to eat adequate amounts of vegetables and fruit, and have a greater incidence of high blood pressure (Heart & Stroke Foundation of Canada, 2003). A number of studies, including the National Public Health Survey (Statistics Canada, 2001a), have shown that obesity rates are higher for Canadians and Americans who live in food insecure households. This may be a result of choosing higher energy foods at times when food is available (Statistics Canada, 2001a). Lower income groups have higher rates of diabetes, which further increases their risk of developing heart disease (Heart & Stroke Foundation of Canada, 2003). There has not been any provincial data available to estimate the prevalence of food insufficiency, defined as an inadequate amount of food intake due to lack of money or resources (Briefel & Woteki, 1992). In addition to an insufficient quantity of food available, another concern that can affect food insecure households is limited access to foods of good nutritional quality (Tarasuk, 2001). This type of information is critical to the design of effective health promotion programs targeting low-income populations.

New Brunswick's mortality rate and incidence of CVD, cancers, diabetes and obesity are some of the highest in the country. Many of these chronic diseases have the potential to be prevented or alleviated through good nutrition. Until now, no major data have been available regarding Canadian nutritional intakes since the Nutrition Canada Survey was completed in 1972 (Nutrition Canada, 1973). The Nutrition Canada Survey is now more than 30 years old; it does not reflect current dietary habits and is no longer valid for use as a health promotion tool. Through the detailed assessment of the nutrition habits of a large random sample of the population, the recent NB Nutrition Survey provides essential data for the design and evaluation of health promotion programs. The NB Nutrition Survey results also constitute an important step towards establishing a national database of dietary intake data. The information gathered may also provide an opportunity to relate food sufficiency to dietary measures of dietary adequacy.

### 1.3 GOALS

The goals of the New Brunswick Nutrition Survey were:

- a) to assess the food consumption patterns of New Brunswickers, more specifically to estimate the distribution of dietary intakes of macro/micro nutrients and the contribution of major food groups to nutrient intakes;
- b) to identify groups at nutritional risk based on dietary intakes which would constitute a priority for intervention;
- c) to assess the extent and nature of knowledge and attitudes pertaining to the role of food

and nutrition in health, nutrient composition of foods and general health concern;

- d) to assess the prevalence of food insufficiency attributable to inadequate resources among New Brunswickers.

#### 1.4 COLLABORATION AND FUNDING

The project was a federal-provincial collaboration, funded jointly through the National Health Research and Development Program (NHRDP), the Health Protection Branch of Health Canada, and the New Brunswick Department of Health and Wellness.

The research was completed through a partnership between the New Brunswick Department of Health and Wellness, the Université de Moncton, and the University of New Brunswick.

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## Chapter 1

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## 2 METHODOLOGY

The New Brunswick (NB) Nutrition Survey used a similar protocol to provincial nutrition surveys conducted previously; these include the surveys used in Newfoundland and Labrador, Prince Edward Island, Nova Scotia, Québec, Saskatchewan and Alberta.

### 2.1 SAMPLE

The NB Nutrition Survey focussed on men and women between 18 and 74 years because the NB Heart Health Survey (1989) revealed a high prevalence of modifiable risk factors in this age group. Due to unique dietary requirements or small numbers, New Brunswickers who were pregnant, lactating, institutionalized or hospitalized, and those living in First Nations communities were excluded from the survey. The sampling frame was the NB Medicare Resident Registry (NBMRR), which includes all New Brunswickers eligible for provincial Medicare health insurance coverage. Table 2.1 presents a comparison of the sample frame and 1996 census estimates, demonstrating that the count was within 0.3 % overall (the maximum difference by age-gender group was 3.7%). The sample frame size was greater than the census estimate in the 18-29 year and 30-39 year age groups for both genders (the difference was twice as much for women as for men). This discrepancy was most likely a result of the transient nature of people in these age groups (i.e. they may still be registered as being eligible for NB Medicare coverage, but had moved out of the province for work or school and therefore not counted as residents in the provincial census). Some of the discrepancy may be due to deaths.

Table 2.1 1996 NB Population Counts, by Age-Gender Strata

Stratum Number	Age-Gender Strata	Sample Frame <sup>1</sup>	Census Estimate <sup>2</sup>
1	Male 18-29	69,514	68,814
2	Male 30-39	65,721	64,894
3	Male 40-49	58,024	59,129
4	Male 50-59	37,052	38,151
5	Male 60-69	27,224	27,606
6	Male 70-74	10,982	11,400
7	Female 18-29	68,354	66,827
8	Female 30-39	65,899	64,335
9	Female 40-49	57,433	58,840
10	Female 50-59	36,070	37,382
11	Female 60-69	29,906	30,141
12	Female 70-74	13,911	14,174
<b>TOTAL</b>		<b>540,090</b>	<b>541,693</b>

<sup>1</sup> NBMRR, 1996

<sup>2</sup> Statistics Canada, July 1, 1996

A stratified single-stage random sampling design was used to select individuals from each of the NBMRR using twelve age-gender strata (males, females: ages 18-29, 30-39, 40-49, 50-59, 60-69, 70-74). The data provided included Health Region, gender, date of birth, name, address, and phone number. The survey was conducted in two phases: September 1996 - January 1997 (fall) and April - July 1997 (spring). In order to have a probability sample of 2,000 people, a sample of 4,449 was drawn (2,423 in the spring and 2,076 in the fall). The original sample size was based on the assumption that 20% of the addresses on the NBMRR would be out of date, and 80% of the people selected would agree to participate in the survey (Nargundkar, 1996). Eight replicates were drawn from each stratum for each phase. The purpose of the last four replicates was to serve as backup in case there were not enough respondents to allow for reliable estimates to be made. One-third of the samples were randomly selected for the repeat 24-hour recall. In an effort to cover all days of the week, individuals were assigned a specific day to be interviewed. Chapter 3 provides a detailed description of the sampling results.

## 2.2 SURVEY INSTRUMENTS

The NB Nutrition Survey used the following instruments: a 24-hour dietary recall; a food frequency questionnaire; a nutrition and health questionnaire; and a demographic profile questionnaire. All provincial Nutrition Surveys used similar forms for the 24-hour recall, food frequency, and demographic information, however the nutrition and health questionnaire varied.

All survey instruments were reviewed by an Expert Advisory Committee. Members of this committee included:

- Dr. B. Christofer Balram - Principal Investigator, NB Department of Health and Wellness
- Dr. Lita Villalon - Co-Investigator/Director, École de nutrition et d'études familiales, Université de Moncton
- Penny Ericson - Co-Investigator/Dean, UNB Nursing School
- Gisèle McCaie-Burke – Nutrition Consultant, NB Department of Health and Wellness
- Dr. Denis Allard - Chief Medical Health Officer, NB Department of Health and Wellness
- Heather Erb-Campbell - Executive Director, NB Division of the Canadian Cancer Society
- Bev Day - President, NB Association of Dietitians
- Jacqueline Alain - Executive Director, NB Division of the Canadian Diabetes Association

The committee reviewed the survey instruments used in Newfoundland, PEI, Alberta, Nova Scotia, Quebec and Saskatchewan and advised on modifications needed for use of the survey tools in NB. They were then submitted to Health Canada for approval.

### 2.2.1 24-Hour Recall

The most common method used to assess dietary intakes in population surveys is the 24-hour recall because of its cost-effectiveness and ease of use (Thompson & Byers, 1994). The 24-hour recall employed in the NB Nutrition Survey (Appendix A) used the same methodology and format as the NS and PEI Survey. The actual weights of foods eaten and details of recipes used, were documented whenever possible. Portion-size food model kits were used to facilitate interviewers' estimates of respondents' descriptions of amounts of other foods eaten. To assist respondents with providing the most accurate information possible, the Multiple Pass Method was used (Guenther, DeMaio, Ingwersen and Berlin, 1996). Three distinct steps were conducted: 1) obtaining a list of all foods and beverages consumed in the past 24-hour period; 2) using the list to probe for descriptive details of each eating occasion, each food, specific amounts, and for other foods and beverages that may have been left out during the initial step; and 3) conducting a final review to discover any further foods or details that may have been forgotten. Recipes were requested and used as part of the assessment if possible.

### 2.2.2 Food Frequency

The Survey used a Food Frequency Questionnaire (FFQ), to determine patterns of intakes over a longer period of time. The FFQ used in the NB Nutrition Survey (Appendix A) was similar to that used in Newfoundland, PEI, Nova Scotia and Alberta. Chapter 7 provides a more detailed description of the FFQ. This questionnaire was administered following the 24-hour recall. Respondents were asked to recall how frequently in the past month they ate the specific foods listed. Many of the questions included on the FFQ focussed on fat intakes. The last section of this instrument addressed whether respondents chose to eat or avoid particular foods based on possible health concerns.

### 2.2.3 Nutrition And Health Questionnaire

The Nutrition and Health Questionnaire (Appendix A) investigated respondents' general health, health and nutrition-related behaviour, and individual/family food security concerns. Chapter 8 discusses the Nutrition and Health Questionnaire in greater detail.

### 2.2.4 Demographic Profile

The Demographic Profile form (Appendix A) included questions about marital status, education, and household income. See Chapter 4 for details of the NB Nutrition Survey demographic profile.

### 2.2.5 Anthropometric Assessment

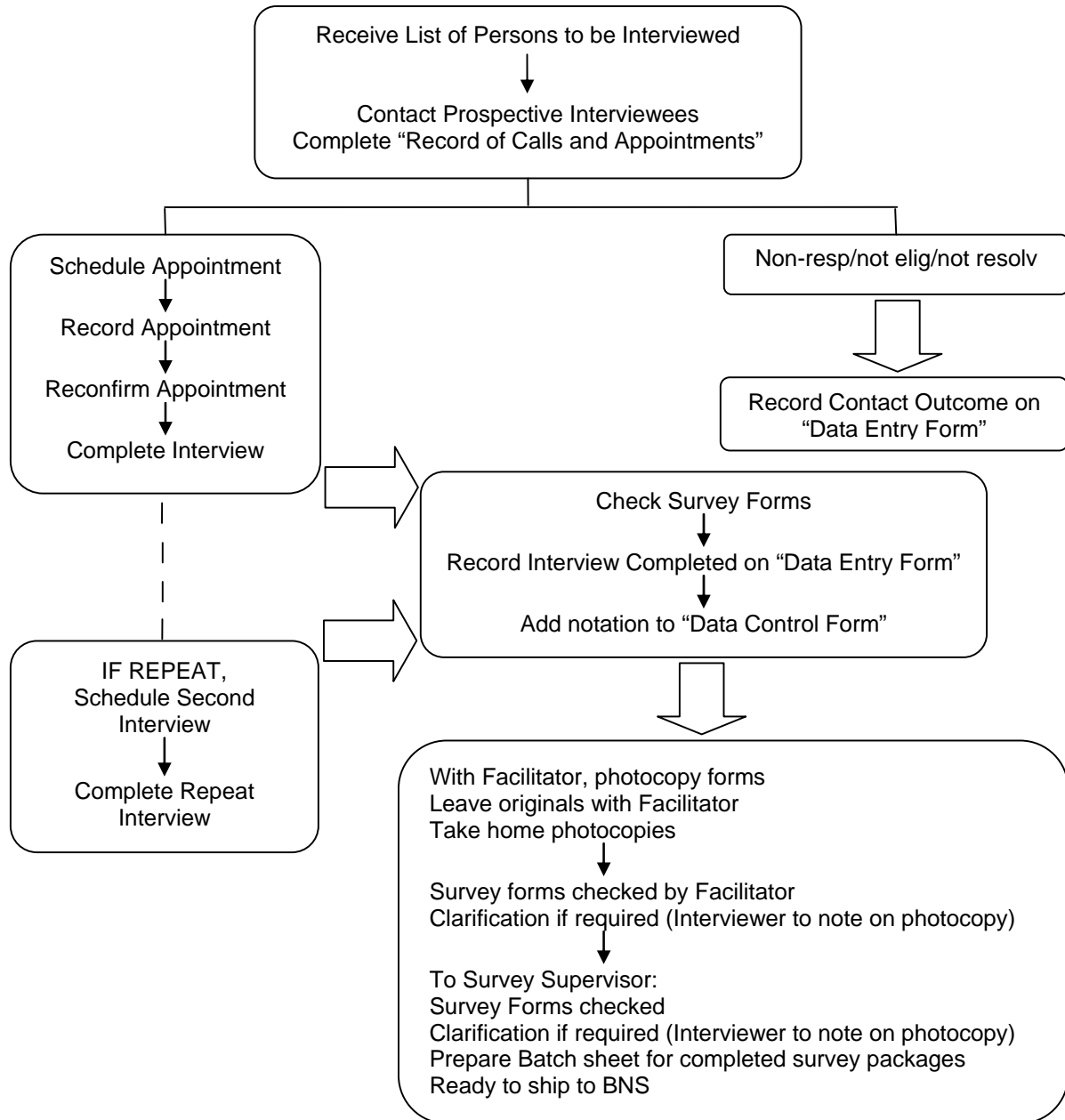
Interviewers conducted anthropometric assessments on each respondent, which consisted of measuring weight, height and waist and hip circumference. See Chapter 6 for a description of the methods used.

## 2.3 DATA COLLECTION

Prior to commencement of data collection, prospective respondents were sent a letter signed by the principal investigators, indicating they had been selected for the Survey and encouraging them to participate. A press release was developed by members of the NB Nutrition Survey Team and advertisements were published in local newspapers and displayed on local cable channels, encouraging selected individuals to respond if approached to participate in the survey. Approximately half the interviews occurred during the fall phase (September 1996 - January 1997) and the other half were completed during the spring phase (April - July 1997). Names of potential participants were assigned to interviewers according to geographical regions. Interviewers phoned potential participants to explain the survey, encouraged involvement, and scheduled a date for a home visit if permission was granted. If possible the interview was scheduled for the day assigned to that individual. At least five attempts were made to contact each prospective respondent, at different times of the day and on different days of the week. Contact attempts were recorded on the Record of Calls & Appointments Form (Appendix C). Letters were used as a last measure. Interviewers were asked to document reasons for being unable to contact an individual if this was determined. Interviewers completed the Non-Response Form for those who refused to participate (Appendix D, Form A-2) to assess whether nonparticipants' eating habits were different from those who agreed to be interviewed.

The completed surveys were reviewed several times within a few days of the actual interview to maintain quality control. The interviewer verified the information while at the participants' homes and then again upon returning to her office or home. The surveys were submitted afterward to the facilitators for additional review. Photocopies of the surveys were stored at the Université de Moncton, and the originals were sent by courier to Ottawa for data input. Figure 2.1 illustrates the flow of the data collected.

Figure 2.1 Survey Data Flow\*



## 2.4 QUALITY CONTROL

### 2.4.1 Interviewer Training

Twenty-five interviewers, consisting of community-based public health nurses and dietitians, were trained with ten days of intensive workshops. Sessions were conducted by Danielle Brulé (a specialist in nutrition surveys), Dr. Jennifer Taylor (Prince Edward Island Nutrition Survey), and Marielle Degrâce (Survey Supervisor). See Appendix B for a detailed summary of the training schedule.

The NB Nutrition Survey “Project Resource and Training Manual” (see Appendix B for list of contents) was developed using Alberta’s Nutrition Survey Manual. Interviewers learned how to use the survey instruments to provide accurate data and how to complete the administrative forms. Training techniques included lectures, practice exercises, watching videotaped interviews, and mock interviews. Evaluations ensured that the interviewers were able to use the survey instruments effectively. A refresher session was held for the interviewers prior to commencement of the second phase of the Survey in the spring.

### 2.4.2 Data Control Forms

Several administrative forms were used to ensure data quality:

1. Interviewee Profile Form and Record of Calls
2. Data Entry Form A-1
3. Master Tally Sheet
4. Data Control Form

A computer generated label containing information such as name, address, phone number and date of birth was attached to each Interviewee Profile Form (Appendix C). This form provided interviewers with potential participants’ contact information. The Record of Calls table on the back of the form allowed the interviewer to document the details of contact attempts.

The "Data Entry Form A-1" (Appendix C) was used to track respondents and facilitate quality control checks. Reasons for non-response were coded into the appropriate category. Non-response was indicated if the person refused the interview, did not attend, or could not speak French or English. Every effort was made to find the individual, including talking with other family members or neighbours if necessary. Unresolved was indicated on the form if the individual could not be located for an interview. Non-eligible status was noted on the forms of people who were deceased (outdated sample frames), pregnant or nursing, had moved out-of-province, was hospitalized or living in an institution, or living in First Nations communities.

The Master Tally Sheet (Appendix C) provided interviewers with a list of all potential interviewees in their area. The form was used to track the contact status of each participant. The Master Tally Sheet was submitted by the interviewer to her facilitator and then to

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headquarters on a weekly basis. The form used to track the progress of the survey, and determine whether additional names would be needed to attain the target of 1,000 interviews per season.

The Data Control Form (Appendix C) was used to track each survey package from the start of the response/non-response review process, to the date when it was finalized and sent to the Bureau of Nutritional Sciences (BNS) in Ottawa. The first section of the form was completed by the interviewers, the second by the facilitators, and the last part by the survey supervisor.

### 2.4.3 Edit Procedures

There were six facilitators from across the province. The facilitators were available to provide direct support to the interviewers in their area. Facilitators were responsible for verifying the completeness, coding, and legibility of each form.

The coordinator and survey supervisor were responsible for quality control. Weekly conference calls were made between the coordinator, supervisor, facilitators and interviewers to discuss data collection procedures and response rates, and to ensure the quality of the data. The supervisor's tasks included answering food recording questions from facilitators, liaising with survey investigators on technical issues, forwarding interview packages to BNS, and following up on data checks requested by BNS. Both facilitator and supervisors documented their review findings on the Data Control Form.

The interviewers were required to do reviews of the forms with the participant and again upon returning to the office/home. The forms were then submitted to the facilitator for further review. As required, the facilitator phoned the interviewer regarding missing or insufficient information, and the interviewer called the respondent in order to obtain the needed data. Once updated, the facilitator passed the forms onto the supervisor, who in turn reviewed the information and requested the facilitator gather any additional missing details from the appropriate interviewer. The coordinator conducted the final check before the supervisor sent the survey packages to the BNS in Ottawa by courier.

Batch sheets were faxed to the BNS to use as a comparison for ensuring all records had been received. Upon arrival of the forms, basic identifying data entered in NB were confirmed, inconsistencies were clarified as needed, and additional information relating to data management in Ottawa was entered. This allowed for a cumulative record of the status of all forms to be available at either location on a continuous basis.

### 2.4.4 Tracking Database

A computer program was developed to manage and track survey forms and identifying data on each individual selected for the survey. This program, developed by the principal investigator with computer expertise within the Food Directorate, was used to prepare tabulations of responses and non-responses. Ongoing entry of data submitted by individual



interviewers permitted access to information on percentage rates of respondents and non-respondents, and daily breakdowns for first and second interviews at any stage of the survey. Input of data into the system began in NB and was completed and verified at the BNS on a weekly basis.

#### 2.4.5 Performance Feedback

Interviewers were required to be in contact with their facilitators regularly for support, review, and feedback. The facilitators were in turn in regular contact with the quality control supervisor and they held meetings once per week. If any problems were discovered, these were recorded along with suggested solutions. This information was then reported immediately to the survey supervisor to share with other facilitators and interviewers. Administrative data was regularly monitored by the principal investigator and co-investigator, and the supervisor was asked to speak to the facilitators and interviewers if there were any concerns. A bilingual newsletter was designed by Co-Investigator Dr. Lita Villalon and Survey Supervisor Marielle Degrâce, to provide interviewers with feedback, encouragement, and suggestions for improving performance.

### 2.5 DATA INPUT

The most time-consuming methodology in this survey was the data input. All survey instruments were submitted to BNS by July 1997 and the data entry was completed in 2001. The data was entered and immediately checked for errors and uniformity using custom computer programs upon being received at BNS. Data from all forms except the 24-hour recall was entered twice. An interactive process was used to enter the 24-hour recall. A key name for a food was entered, and the exact or best match was selected from a list of foods or mixed dishes. Existing computerized recipes were used for mixed dishes, which allowed ingredient substitution and recipes could be added if necessary. Quantities were entered by weight, volume, or coded portion-size model. Data on nutrient supplements were entered using the Drug Identification Number (DIN) or by the food name and/or nutrient content.

Problems and questions identified during data entry were relayed to NB for clarification or correction before input was completed. Professional staff at the BNS made a final manual data input check by comparing a printed copy of each individual's computer recorded data with the information on the original field form. All errors were immediately corrected and the final report was then filed.

#### 2.5.1 Canadian Dietary Information (CANDI)

CANDI is a custom-designed software programme, developed by research staff at the BNS to facilitate the entry, processing, storage and retrieval of the data on the nutrient composition of the 24-hour recall. The system is designed to be flexible for both input and output. Individual foods, meals, recipes, one-day or several-day records can be entered. Examples of information that can be obtained from the data include the frequency of intakes of all foods, of one food, or of one food group and the nutrient intakes for individuals or for

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user-defined physiological, demographic or socio-economic groups within survey populations. The system is flexible and user-friendly but maximum efficiency demands that survey methodologies and form layouts are designed in close collaboration with those who can "tailor-make" the system for specific applications.

The survey data was entered into CANDI by experienced data entry clerks familiar with food descriptions, who received training on the specifics of the survey. Custom-designed displays were used in the entry of data from pre-coded survey forms. An automatic checking system was built in to ensure consistency and data quality in certain questionnaires. It demanded that these questionnaires be entered twice to ensure accuracy. Entry of data from the 24-hour recall involved a mechanism for locating foods in the data base. In addition, 3,000 existing recipes could be adapted and new recipes created so that recorded detail about foods could be captured. Amounts consumed were entered as weight or volume. Through access to the Canadian Nutrient File (see Section 2.5.2 below), CANDI calculated the nutrients provided in each food as it was entered. Professional staff at the BNS advised and supervised the data entry clerks on a daily basis so that quality work was assured.

### 2.5.2 Canadian Nutrient File

The Canadian Nutrient File (CNF) is a computerized database, compiled at the BNS, on the nutrient values of foods. The primary source of the data is the extensive revisions of the U.S. Department of Agriculture's (USDA) Agriculture Handbook No. 8, adapted to reflect the Canadian food supply and enrichment and marketing practices. The CNF is continuously updated to include new and revised food composition data as they become available in Canada and from the USDA. The 1991 version of the CNF was used in the New Brunswick Nutrition Survey. Local foods and recipes native to New Brunswick were added to the database as required. The descriptors used to define foods in the CNF dictate the level of detail that must be recorded on the survey forms completed in the field. Information that will allow close matching of foods requires that interviewers become familiar with the types of options available.

## 2.6 STATISTICAL ANALYSIS

Once the data were entered into CANDI, it was transferred to files for the statistical software SAS, by the Bureau of Biostatistics and Computer Applications (BBCA), Food Directorate, and Health Canada. The BBKA used SUDAAN, a survey data analysis program for multi-stage sample designs, for estimating variances from complex surveys. Additional analyses were conducted in NB using STATA v.7, a statistical analysis software, to incorporate sample weights, sample design, and the pooled age-gender strata. It was necessary to use specialized software which took the survey design into account, in order to avoid underestimating variability.

### 2.6.1 Demographic and Food Frequency Questionnaire (FFQ) Data

Sample weight and design were considered in the calculation of means, proportions and confidence intervals of the demographic and FFQ data.

### 2.6.2 Mean Nutrient Intake

The mean nutrient intakes of the population were determined using the 24-hour recall data. Both inter-individual and intra-individual variations can be estimated (Beaton, Milner, McGuire, Feather and Little, 1983). The BBCA provided mean nutrient intakes and nutrient intakes as a proportion of caloric intakes by the pooled age-gender strata (Laffey, Junkins and Nguyen, 2001), using standard analytical procedures. Additional analyses were conducted in NB.

### 2.6.3 Usual Nutrient Intake

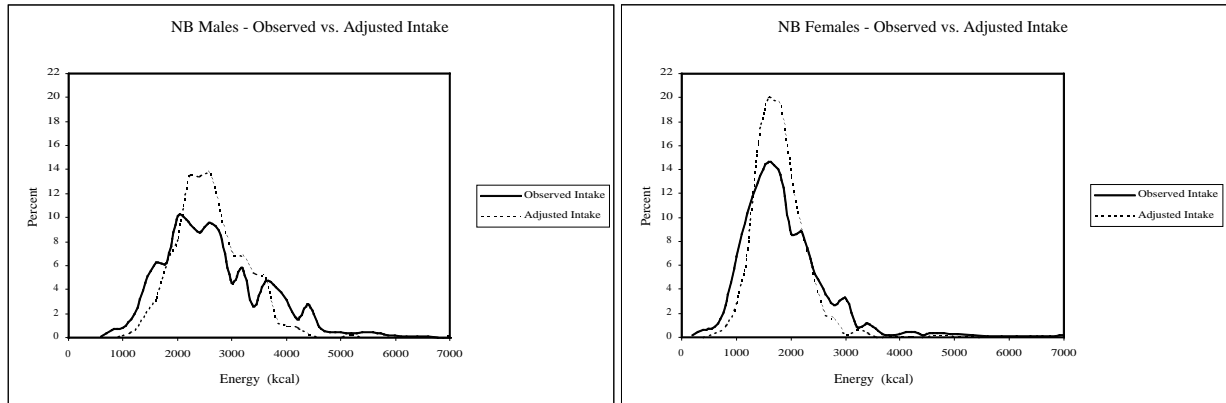
It is essential that analyses take into account both the variation that occurs between individuals and the variation within the intake of each individual on different days. If only single day intakes are used to determine population intakes, this can give a misleading result with an exaggerated number of results appearing in the extremes/tails of the distribution (Beaton et. al., 1979). Thus, it was necessary to use a method which could estimate the distribution of usual intakes by considering both the initial and the repeat 24-hour recalls. This method involved a two-step process: first a normalizing transformation was identified, which required removing 0.74% of the data as outliers; and then a linear transformation was used to remove intra-individual variability (Laffey, Junkins and Nguyen, 2001). Pooling of adjacent age-gender groups to give a total of 6 groups further stabilized the variance components. In cases where the method resulted in negative or close to zero values for inter-individual variability for nutrients (causing an extremely large inter to intra-variability ratio), a graphical review was used to repeat identification and removal of outliers to stabilize the variance components (Laffey, Junkins and Nguyen, 2001).

This method of adjustment was used for all of the nutrients discussed in this report, with the exception of alcohol, caffeine, and carotene. It was not possible to adjust for usual intakes of these three substances due the large percentage of the population who had zero intake. All tables in this report using adjusted intakes are labelled as “adjusted for intrasubject variability.” These include the nutrient percentiles, categories of macronutrient consumption, and dietary reference intakes. These tables were produced by the BBCA and variances estimated using SUDAAN (Junkins et al, 2001b). The adjusted data cannot be used to estimate an individual’s usual intake.

The following graphs (Figure 2.2, 2.3, and 2.4) taken from the NB Nutrition Survey Methodology for Estimating Usual Intake Report demonstrate that adjusting for usual intakes provided a distribution with the same shape and median as the original variable, but the tails on either side were reduced (Laffey, Junkins and Nguyen, 2001).

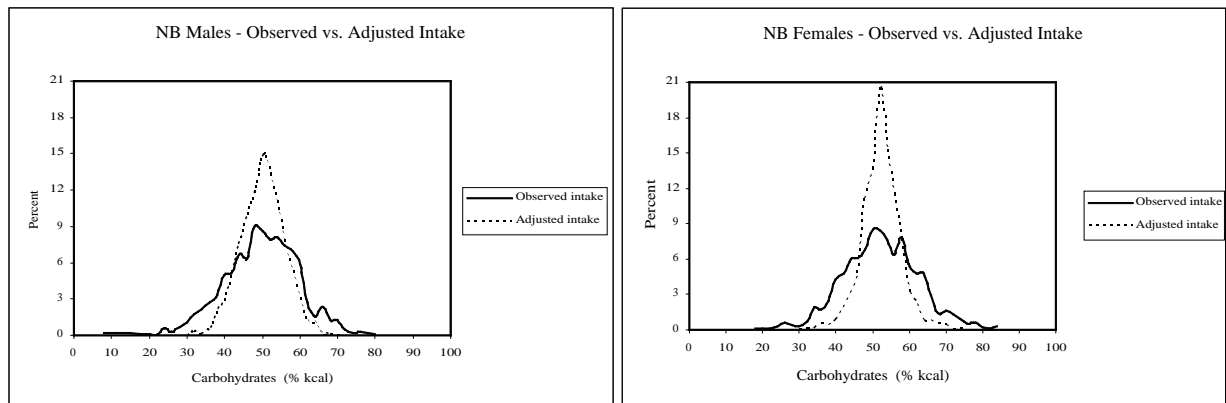
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Figure 2.2 Caloric Intake from Energy: Observed vs. Adjusted



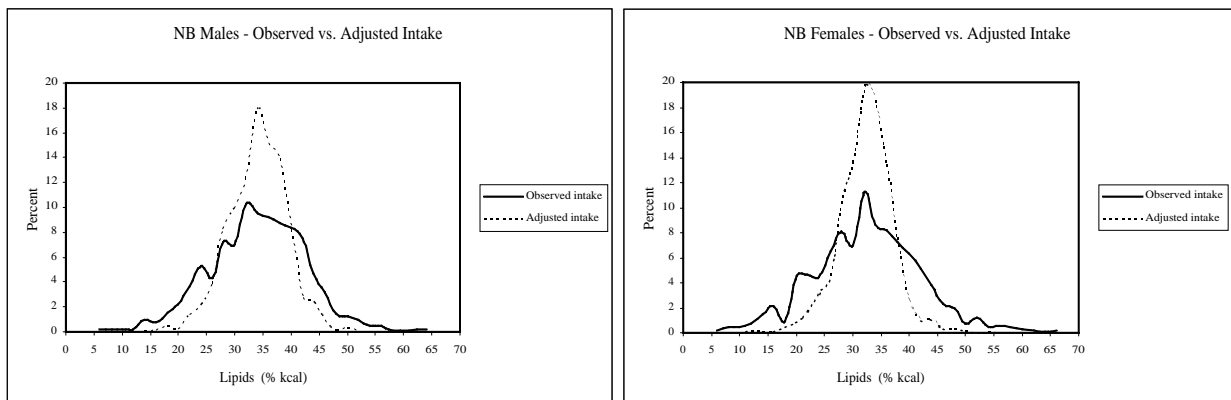
Source: BBCA EA451311-009

Figure 2.3 Carbohydrate Intake: Observed vs. Adjusted



Source: BBCA EA451311-009

Figure 2.4 Lipid Intake: Observed vs. Adjusted



Source: BBCA EA451311-009

#### 2.6.4 Other Analyses

The databases generated from this survey can be used for in-depth analyses of inter-relationships between variables, nutrients, and various other concerns related to health and nutrition. Analysts were cautioned that failure to account for the design might seriously underestimate the sampling error, and contribute to erroneous conclusions when comparing subgroups.

#### 2.7 EXPERT REVIEW PANEL

Prior to publication, each provincial survey is subject to review by a panel of experts as a condition of the funding contribution by Health Canada. The Expert Review Panel for the NB Nutrition Survey included:

Dr. Susan Whiting	University of Saskatchewan
Dr. Kathy Gray-Donald	McGill University
Dr. Marielle Ledoux	Université de Montréal

The Review Panel was provided with a draft of the report. Their comments were taken into consideration in preparing the final report; see chapter 11.1 Future Directions

# **3** RESPONSE AND NON-RESPONSE

Sources of bias can distort survey results. Potential sources of bias include the choice of estimator, erroneous answers by respondents, sampling errors, and non-response (Nguyen, Weston and Junkins, 2001). It is possible that those who chose not to participate in the NB Nutrition Survey were different from those who did participate. This chapter discusses the Bureau of Biostatistics and Computer Application (BBCA) analyses of the magnitude of bias due to response and non-response.

## **3.1 SAMPLE RESULTS**

The New Brunswick (NB) Nutrition Survey employed a single-stage sampling design with 12 age-gender strata. To achieve a reliable estimate of prevalence for characteristics of 15% of the population to within 10%, 95% of the time, a goal of 2,000 initial responses was required (Nargundkar, 1996). See Table 3.1 for sampling results according to age-gender groups.

A total of 1,816 New Brunswickers completed the initial interview. An acceptable initial interview required that the 24-hour recall and Food Frequency Questionnaire (FFQ) were completed and contained reliable data according to Bureau of Nutritional Science (BNS) standards. Six initial surveys were determined to be unuseable.

The original sampling plan was designed to include repeat 24-hour recalls for approximately one-third of the respondents. In reality, repeat recalls were conducted with 29.5% [535/1816] of participants. As a result of assigning repeat interviews before participants were identified, the repeats were not evenly distributed for each combination of age, gender, geographic region, and season. Specific examples of this include: during the spring phase there were only 7 repeat recalls from the initial 43 for 70-74 year olds, with no repeats in this age group in Edmundston, Campbellton, and Bathurst; and in the fall phase there were only 17 repeat interviews of the initial 74 males in the 30-39 year-old age group in Campbellton, and no repeats for males 30-39 and females 60-69 years of age in this area (Nguyen, Weston and Junkins, 2001). Results such as these must be considered when weighting the survey data (Nguyen, Weston and Junkins, 2001).

Table 3.1 Results of Sampling by Age-Gender Group, Both Seasons

Age-gender group	NB Total			Fall 1996		Spring 1997	
	Sample Design	First Interviews	Repeats	First Interviews	Repeats	First Interviews	Repeats
Males 18-29	200	108	35	52	17	56	18
Males 30-39	200	137	36	74	17	63	19
Males 40-49	200	165	56	84	29	81	27
Males 50-59	200	178	44	92	24	86	20
Males 60-69	200	176	48	87	24	89	24
Males 70-74	100	89	19	46	12	43	7
Females 18-29	200	115	37	53	21	62	16
Females 30-39	200	172	51	76	26	96	25
Females 40-49	200	190	56	84	22	106	34
Females 50-59	200	200	64	98	31	102	33
Females 60-69	200	208	62	92	28	116	34
Females 70-74	100	78	27	30	9	48	18
TOTAL	2200	1816	535	868	260	948	275

Source: BBCA 451311-009 NB

The sample plan was designed to provide an even distribution of 24-hour recalls for each day of the week (i.e. 14.3% per day). See Table 3.2 for the actual distribution. Recall for a food intake on Saturday and Sunday was under-represented as a result of many respondents' unwillingness to be interviewed on the weekend. The same pattern was noted in other provinces; for example, Saturday intake accounted for only 9% of interviews in Quebec and Saskatchewan and 8% in PEI.

Table 3.2 Distribution of Interviews by Day of the Week

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
First Interview	%	6%	17%	19%	20%	18%	12%	8%
	n	106	311	342	363	320	229	151
Repeat Interview	%	9%	14%	19%	18%	18%	13%	9%
	n	51	76	102	95	98	70	46

## 3.2 RESPONSE CATEGORIES

Form A-1 (Appendix C) was used to categorize the response/non-response outcome of each interview attempted. To minimize sampling bias, the NB Nutrition Survey used a tracking system to ensure that interviews were attempted with 100% of the drawn sample of 4,449 individuals. Additional information on response categories is provided in Appendix F, including a flow chart description and counts by age-gender groups.

### 3.2.1 In Scope Rate

Individuals were considered out of scope (not eligible for the survey) if they were deceased, pregnant, nursing, hospitalized, living in an institution, moved out of province, living in a First Nations Community, or suffering from a severe health problem that prevented them from being able to complete the interview for themselves (eg. stroke or severe illness). Of the individuals who were located and contacted, 92% were within the scope of the survey. The in scope rates were similar between geographic areas and consistent for males and females. The lowest rate occurred in the youngest age group (18-29), however this result was not unexpected as this group includes pregnant women and young people, who tend to move more often (Nguyen, Weston and Junkins, 2001). Numbers dropped off for the older groups, which is likely due to higher rates of severe illness and seasonal residency (Nguyen, Weston and Junkins, 2001).

### 3.2.2 Resolved Rate

Interview outcomes were categorized as unresolved if the individual could not be located by letter, a visit to the home, or at least five phone call attempts. If it was determined that the person had moved to another region of the province, the responsibility for contacting that individual was transferred to the interviewer covering that area. There was a 75% success rate for locating and attempting to interview individuals (Nguyen, Weston and Junkins, 2001). Resolved rates were consistent between genders, but were higher for the oldest age group than for the youngest age group, who tend to be more transient (Nguyen, Weston and Junkins, 2001).

### 3.2.3 Refusal Rate

Approximately 32% of the in scope persons refused to participate in the survey. The rate varied widely between regions, being lowest in Campbellton and the Miramichi at 28% and highest in Bathurst at 38% (Nguyen, Weston and Junkins, 2001). Females had a slightly lower refusal rate, with the exception of the 70-74 year old females who showed a greater rate of refusal overall, and during the initial fall phase had a 12% higher refusal rate than all other age groups (Nguyen, Weston and Junkins, 2001).

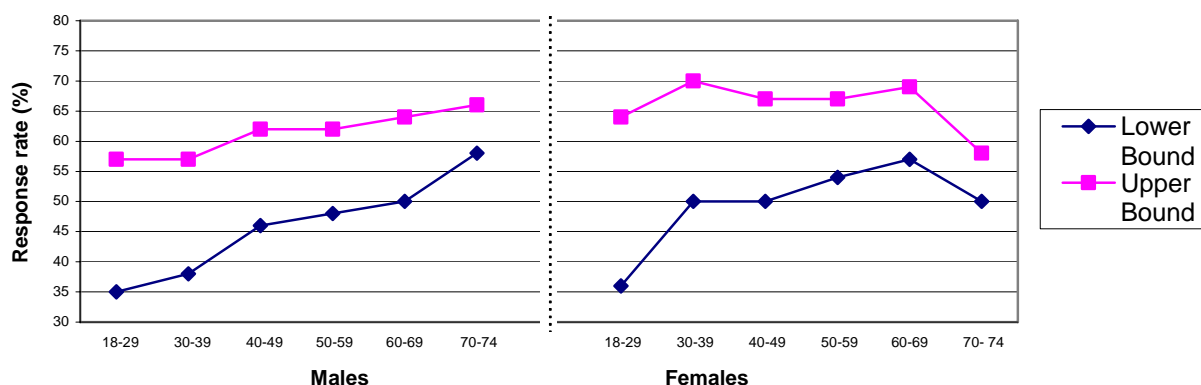


### 3.2.4 Response Rate

A category of non-response was selected if: individuals refused to participate (directly or indirectly); the interviewer was unable to make contact to determine eligibility status; interviewing conditions were considered unsafe; the person could not speak either official language; or the data collected was deemed unuseable by investigators. The 1,816 useable responses collected met 90.8% of the goal of 2,000 recommended by Nargundkar (1996). Response rates were based on a report created for the NB Nutrition Survey by the Bureau of Biostatistics and Computer Applications (BBCA), and observations made were based on the understanding that response rates were calculated similarly for each province. The overall response rate for the NB Nutrition Survey was estimated to be between 47% (if unresolved cases were counted as within scope) or 64% (if unresolved cases are assumed to be out of scope). The Nova Scotia, Quebec and Prince Edward Island surveys had higher response rates of 69-80%, however the NB rate was higher than those of Saskatchewan (46%) and Ontario (29%). The lower response rate of the NB Nutrition Survey, compared to that of some other provinces, may limit how accurately the results represent the habits of the entire population of the province.

See Figure D.1 (Appendix D) for the flow of response categories. A number of region, age, gender, and season combinations required pooling due to low numbers of individuals. Combining data from different geographic areas would contribute to bias because the probability of responding or refusing varied greatly between regions. Because response and refusal rates within gender and season were similar between most adjacent age groups, investigators were able to pool results using this method without significantly adding to bias (Nguyen, Weston and Junkins, 2001). Figure 3.1 shows response rates by age stratum for each gender.

Figure 3.1 Response Rates by Age and Gender



Source: BBCA 451311-009 NB

### 3.3 NON-RESPONSE QUESTIONNAIRE

If the nutritional characteristics of respondents and non-respondents are similar, the impact of non-responses will be minimal. To determine this, those who chose not to participate in an interview were asked to answer a short questionnaire (Form A-2 in Appendix D). The questions related to bread, milk, and vitamin/mineral supplement intake and smoking.

Approximately 73% of people who did not participate in the detailed interview process completed the non-response questionnaire. It is not possible to determine the types or magnitude of differences that might exist for those who refused to complete both the interview and the non-response questions. It is possible there could be differences in the remaining 27% of non-responders that could change the results used to represent the entire group.

The responders and non-responders did not differ in regard to past and present smoking status and number of cigarettes smoked daily. There was no observable difference in the use of vitamin/mineral supplements. The type and quantity of milk consumed was found to be similar in the two groups, with the exception of female responders in the 18-29 year old age group and the responders of both genders in the 50-59 year old age group, who consumed significantly higher amounts of milk than non-responders. Patterns of bread consumption differed in regard to type of bread only. Responders were significantly more likely to eat white bread, while non-responders preferred whole wheat bread. This suggests that the results of this study may underestimate the amount of whole wheat bread consumed (Nguyen, Weston and Junkins, 2001). See Table D.4 in Appendix D for a summary of the results.

### 3.4 COMPARISON OF RESPONDERS TO POPULATION PROFILES

To determine whether responders were representative of the general NB population, certain characteristics that can affect dietary habits were compared to existing provincial statistics. These characteristics included smoking, marital status, and level of education.

The results of the NB Nutrition Survey for daily smoking were compared to the 1996-97 National Population Health Survey (NPHS) and the 1995 Survey of Smoking in Canada (SSC). There were no significant differences observed in daily smokers between the NPHS and the NB Nutrition Survey for females, males, and overall, although the NPHS showed a significantly lower proportion of male smokers in the 40-49 year age group. No significant differences were seen in comparing the SSC to the Nutrition Survey for daily smoking among females, males, and overall, with two exceptions; in the SSC there were more smokers in the 30-39 year age group and fewer women smoking in the 60-69 year age group. These results indicate that the prevalence of daily smokers estimated by the NB Nutrition Survey is comparable to both the NPHS and SSC surveys, and thus is unlikely to contribute to bias (Nguyen, Weston and Junkins, 2001).

The proportions of NB Nutrition Survey participants in various marital status categories were compared to the general NB population using the same categories from the 1996 Census. There were significantly more married people and significantly fewer separated/divorced individuals in the Nutrition Survey versus the Census. These findings were consistent for most age- groups. The NB Nutrition Survey included significantly more widowed women and less widowed men than the Census, especially for the 60-69 and 70-74 year age groups (Nguyen, Weston, and Junkins, 2001). These discrepancies could bias the results depending on how each marital status may affect nutritional intakes.

The levels of education of those participating in the NB Nutrition Survey were compared to the general NB population using the same categories as the 1996 Census. The Nutrition Survey respondents included a significantly lower proportion of individuals with secondary school or college/trade education and significantly more people with at least some university education, for most age-gender groups. An exception to this was that there were more females aged 18-29 with college/trade education in the NB Nutrition Survey. A greater proportion of NB Nutrition Survey participants had completed a university degree than indicated by the Census, with the exception of males 18-49 and females 30-74 years of age for which there was no significant difference. Differences between education levels of those interviewed versus the general population could introduce bias to the Nutrition Survey.

Some of the population comparisons made for smoking, marital status, and education level can be seen in Table 3.3 below.

Table 3.3 1996 NB Population Profile Comparisons, Weighted by Age and Gender

	Males						Females					
	18-29y	30-39y	40-49y	50-59y	60-67y	All Ages	18-29y	30-39y	40-49y	50-59y	60-67y	All Ages
<b>Proportion of Daily Smokers:</b>												
NB Nutrition Survey	0.31	0.28	0.33	0.30	0.21	0.30	0.28	0.28	0.28	0.25	0.16	0.26
NB Population <sup>1</sup>	0.43	0.35	0.16	0.29	0.29	0.31	0.29	0.25	0.36	0.20	0.22	0.28
NB Population <sup>2</sup>	0.22	0.43	0.32	0.23	0.14	0.30	0.26	0.51	0.42	0.14	0.08	0.31
	Males						Females					
	18-29y	30-39y	40-49y	50-59y	60-69y	70-74y	18-29y	30-39y	40-49y	50-59y	60-69y	70-74y
<b>Proportion Married:</b>												
NB Nutrition Survey	0.33	0.81	0.83	0.86	0.84	0.76	0.42	0.79	0.82	0.83	0.67	0.57
NB Population <sup>3</sup>	0.26	0.66	0.72	0.75	0.62	0.55	0.18	0.62	0.74	0.77	0.78	0.80
<b>Proportion with Bachelors degree or higher:</b>												
NB Nutrition Survey	0.17	0.17	0.18	0.19	0.06	0.10	0.20	0.12	0.16	0.13	0.05	0.05
NB Population <sup>3</sup>	0.14	0.15	0.14	0.04	0.01	0.10	0.10	0.13	0.13	0.11	0.09	0.08

<sup>1</sup> NPHS 1996-97 (Note: different age subsets)

<sup>2</sup> SSC 1995

<sup>3</sup> NB Census 1996

Source: BBCA 451311-009 NB

### 3.5 SAMPLING WEIGHTS

Sample weights account for probabilities of selection, non-response rates, and over/under representation in the sampling frame, and are used to determine whether estimates provide a reliable reflection of population parameters.

As the sample design was identical, the BBCA implemented the same methods for calculating sampling weights provided by Statistics Canada for use in the PEI Nutrition Survey. In order to adjust for over and underestimations, the 1996 and 1997 NB postcensal population estimates were used for each age-gender group in each season (Nguyen, Weston and Junkins, 2001). Extreme sample weights can give inaccurate estimates by lending too much influence to a small number of unusual observations. It was not necessary to trim any sample weights for the NB Nutrition Survey as they were all relatively stable, with none above three (Nguyen, Weston and Junkins, 2001). Table 3.4 summarizes the calculated weights.

Table 3.4 Sampling Weights, by Season

Fall 1996			Spring 1997		
Age-Gender Group	Population Weight	Sample Weight	Age-Gender Group	Population Weight	Sample Weight
Male 18-29	618.45	2.11	Male 18-29	627.21	2.13
Male 30-39	413.75	1.41	Male 30-39	530.79	1.81
Male 40-49	332.97	1.13	Male 40-49	377.12	1.28
Male 50-59	198.79	0.68	Male 50-59	232.25	0.79
Male 60-69	150.28	0.51	Male 60-69	160.44	0.55
Male 70-74	115.49	0.39	Male 70-79	134.94	0.46
Female 18-29	575.55	1.96	Female 18-29	537.35	1.83
Female 30-39	398.39	1.36	Female 30-39	344.46	1.17
Female 40-49	332.7	1.13	Female 40-49	287.95	0.98
Female 50-59	183.38	0.63	Female 50-59	192.43	0.65
Female 60-69	154.73	0.53	Female 60-69	134.03	0.46
Female 70-74	221.7	0.75	Female 70-74	151.33	0.52

Source: BBCA 451311-009 NB

### 3.6 SUMMARY OF SURVEY LIMITATIONS

The NB Nutrition Survey had an overall response rate of 47% to 64% (depending on the categorization of unresolved samples). The rate was comparable to other Federal-Provincial Nutrition Surveys, which ranged from 46% to 85%. The number of useable responses

collected met 90.8% of the goal (1,816 responses with a goal of 2,000). It is important to note, however that a number of groups, such as the 18-29 year age group and residents in the Bathurst and Saint John areas, may be under-represented due to lower response rates (Nguyen, Weston and Junkins, 2001). High numbers of non-response in certain age-gender and geographical groups creates potential sources of bias, which must be kept in mind when interpreting the results.

The characteristics of respondents and non-respondents were similar in terms of smoking and vitamin/mineral supplement use. A greater preference for whole wheat bread by non-respondents and a higher intake of milk products by some groups of respondents may introduce bias to the results. Because a number of people did not agree to either the interview or the non-response survey, it is not possible to get a precise understanding of the types or magnitude of differences between those who agreed to participate in the actual survey and those who did not.

The NB Nutrition Survey sample was comparable to the general population with regard to proportion of daily smokers. Married people were over-represented and single and separated/divorced individuals were under-represented. The education levels of certain groups were significantly different from those of the general population. As marital status and level of education can influence nutrition behaviours, these differences may bias the results of the study.

To address non-response effects, pooling and weighting of data was conducted. Larger age-gender strata were created where necessary with little bias, due to lack of significant differences between combined groups. Sample weighting was employed during the analysis of the data to provide a more accurate reflection of the age and gender parameters of the NB population.

Overall, non-response is expected to have had a minimal effect on the results of the NB Nutrition Survey. Thus, in most cases the data from the NB Nutrition Survey provide a reasonable estimate of the nutritional intake of New Brunswickers.

## **4** DEMOGRAPHIC CHARACTERISTICS

This chapter discusses the demographic characteristics of the New Brunswick (NB) population studied in the Nutrition Survey, including geographic region, age, gender, marital status, smoking, education, and income. Results were compiled according to information collected using the Demographic Profile form (Appendix A).

### 4.1 GEOGRAPHIC REGION

The NB Nutrition Survey was conducted in seven geographic regions:

1. Moncton
2. Saint John
3. Fredericton
4. Edmundston
5. Campbellton
6. Bathurst
7. Miramichi

Table 4.1 shows the NB Nutrition Survey sample sizes according to geographic regions. The smaller sample sizes available for some regions are likely to result in larger variances and reduced accuracy of estimates made for these areas. The probabilities of refusal, response, and being resolved showed significant interactions between geographic regions and season, which indicates potential for bias (Nguyen, Weston and Junkins, 2001).

Table 4.1 Sample Size by Geographic Region and Season

Season	Moncton	Saint John	Fredericton	Edmundston	Campbellton	Bathurst	Miramichi
Fall	216	189	170	80	38	102	73
Spring	235	215	250	78	31	72	67
Total	451	404	420	158	69	174	140

### 4.2 AGE AND GENDER

The sample design for the NB Nutrition Survey used twelve age-gender strata, which were pooled into eight strata for most analyses. Pooling allowed more accurate estimates to be made in addition to providing consistency with previous provincial nutrition survey reports. Table 4.2 describes the maximum sample size by these eight age-gender strata. For questions where the response rate was less than 100%, further pooling of age-gender strata was conducted. Because adjacent age groups were found to have homogeneous response mechanisms, pooling could be done without significantly adding to bias (Nguyen, Weston and Junkins, 2001).

### 4.3 MARITAL STATUS

Table 4.2 describes marital status by the eight age-gender strata. Marital status is also described according to the twelve age-gender strata in Chapter 3. Overall, approximately 70% of respondents were married or living common law.

### 4.4 SMOKING

Respondents to the Demographic Profile questionnaire were asked a series of smoking questions (see Form E, Appendix A). Table 4.2 describes daily smokers by the eight age-gender strata. Overall, 25% of survey participants were daily smokers. According to the Report on the Health of Canadians (1996) as many as 31% of New Brunswickers smoked at least one or more cigarettes daily.

### 4.5 EDUCATION

Respondents to the Demographic Profile questionnaire were asked about their highest level of education attained (see Form E, Appendix A). The analysis presented here reduced the categories to three:

- elementary (any schooling that did not involve completion of secondary school)
- secondary (completion of secondary school, and/or some college or university)
- post-secondary (completion of at least one college diploma or university degree)

The education question was completed by 100% of the NB Nutrition Survey sample. Table 4.2 describes education by the eight age-gender strata. Education is also described with different age-gender strata in Chapter 3. Overall, 31% of respondents had at least a secondary school education. The NB Nutrition Survey found that 32% of New Brunswickers did not complete secondary school. This result is identical to the percentage of New Brunswickers who did not complete a high school education according to the Report on the Health of Canadians (1996). The percentage of adults completing a university degree was 13% according to the Report on the Health of Canadians (1996), which is much lower than the 29% who completed either a college diploma or university degree according to the NB Nutrition Survey.

Table 4.2 NB Nutrition Survey Demographic Characteristics  
(Population Percent, by Age and Gender)

	Males				Females			
	18-34y (n) (163)	35-49y (247)	50-64y (260)	65-74y (183)	18-34y (194)	35-49y (283)	50-64y (297)	65-74y (189)
<b>Marital Status</b> married or common law	47	84	86	80	58	81	79	58
<b>Smoking</b> daily smoker	29	32	27	15	28	28	22	16
<b>Education</b> elementary	10	21	38	71	12	17	35	52
secondary	54	43	32	19	50	48	36	29
post-secondary	36	35	29	10	38	35	29	19

#### 4.6 INCOME ADEQUACY

The Demographic Profile questionnaire (see Form E, Appendix A) asked respondents to indicate which letter represented their total 1995 household income before taxes. Household size was also asked.

The income ranges were:

- A. Less than \$ 5,000
- B. \$ 5,001 - \$10,000
- C. \$10,001 - \$20,000
- D. \$20,001 - \$30,000
- E. \$30,001 - \$40,000
- F. \$40,001 - \$50,000
- G. \$50,001 - \$60,000
- H. \$60,001 and more
- I. Don't know

Figure 4.1 shows the income categories determined by Statistics Canada in 1995 for the 1996-97 National Population Health Survey (NPHS). Low income households are further divided into lower and lowest income adequacy levels. Because of the different ranges used in the NB Nutrition Survey questionnaire, modifications were made to the income level ranges. Figure 4.2 shows the adjusted income ranges used in this report. The major change made was that for households of 1-2 people, where the income of \$15,000 used to separate lower from middle income was increased to \$20,000 (this change was also made for the lowest adequacy level for households of 5 or more people). This means that in Table 4.3 the number of New Brunswickers counted as low income is overestimated and the



percentage in the middle income group is underestimated. According to the NB Nutrition Survey (Table 4.3), an average of 6% of males and 11% of females were living in the lowest income households; 17% of males and 15% of females were in the lower income group; 29% of males and 25% of females were in the middle income group. About half of both the male and female population were in the upper middle to highest income groups. As expected, the percentage of people living in low income households using the NB Nutrition Survey ranges, is greater than determined by the Census for the same time period using Statistics Canada's Low Income Cut-Offs (LICO). According to the 1996 Census 19% of New Brunswickers were living in low income households in 1995 (Statistics Canada, 1996).

See Chapter 10 for discussion of mean nutrient intakes in relation to income adequacy.

Figure 4.1 National Population Health Survey 1996-97 Income Groups

Household Size	Lowest Income	Lower Income	Middle Income	Upper Middle	Highest
1 or 2 people	less than \$10,000	\$10,000-\$14,999	\$15,000-\$29,999	\$30,000-\$59,999	at/above \$60,000
3 or 4 people	less than \$10,000	\$10,000-\$19,999	\$20,000-\$39,999	\$40,000-\$79,999	at/above \$80,000
5 or more people	less than \$15,000	\$15,000-\$29,999	\$30,000-\$59,999	\$60,000-\$79,999	at/above \$80,000

Source: Statistics Canada, National Population Health Survey Overview 1996-97

Figure 4.2 NB Nutrition Survey Modified Income Groups

Household Size	Lowest Income	Lower Income	Middle Income	Upper Middle to Highest Income
1 or 2 people	\$10,000 and under	\$10,000 - \$20,000*	\$20,001*-\$30,000	\$30,001 and over
3 or 4 people	\$10,000 and under	\$10,000-\$20,000	\$20,001-\$40,000	\$40,001-and over
5 or more people	\$20,000* and under	\$20,000*-\$30,000	\$30,001-\$60,000	\$60,001-and over

\* Income of \$15,000 changed to \$20,000 to accommodate range used for NB Nutrition Survey Demographic Profile questionnaire.

Table 4.3 Income Adequacy  
(Population Percent, by Age and Gender)

	Males				Females			
	18-34y (163)	35-49y (247)	50-64y (260)	65-74y (183)	18-34y (194)	35-49y (283)	50-64y (297)	65-74y (189)
Lowest Income	12	2	5	4	16	7	8	11
Lower Income	9	12	13	32	13	10	11	27
Middle Income	30	32	22	30	25	28	24	22
Upper Middle to Highest Income	49	53	60	34	46	54	58	41

# **5** ENERGY AND NUTRIENT INTAKES

The purpose of this chapter is to present a profile of energy and nutrient intakes of male and female New Brunswickers and to identify dietary inadequacies in population subgroups. The results of the New Brunswick (NB) Nutrition Survey are compared to those of the other provincial nutrition surveys and to the statistics from the Atlantic Canada Region sample of the National Nutrition Survey completed in 1972 (Nutrition Canada, 1973). These discussions are based on observational comparisons only.

The version of the Canadian Nutrient File (CNF) used in the NB Nutrition Survey did not contain the vitamin E content of all foods and vitamin D was only listed for fortified foods. Thus, the intake of these two nutrients would have been underestimated and consequently they are not discussed in this report.

The intake of nutrients discussed here includes only the amounts derived from food and does not consider supplement intakes (the data collected on supplement use is available for study at a later date but was not included in this report).

## 5.1 MEASURING NUTRIENT INTAKES

Dietary information was collected for one day using the 24-hour recall (see Chapter 2.2.1). Mean nutrient intakes from food sources and confidence intervals are presented in Tables 5.1 and 5.2.

### 5.1.1 Differences by Gender

Energy intakes for males were much higher than for females in all age groups according to both mean and median intakes (Tables 5.1-5.4). Mean fibre intake for people aged 65-74 years and mean Vitamin B12 intakes for those aged 18-34 years, which were similar for males and females. See Table E.1 (Appendix E) for total energy and nutrient intakes by sex.

When nutrient intakes were related to energy (Tables 5.5, 5.6), women had nutrient density intakes similar or higher to men's for most nutrients. Men's intakes were higher in nutrient density for zinc, while women consumed greater nutrient densities of carbohydrate, fibre, calcium, vitamin A, riboflavin, niacin, folate, vitamin C, and caffeine. Women's intake of alcohol and fat (including total fat, saturated fatty acids, polyunsaturated fatty acids, monounsaturated fatty acids, and cholesterol) made up lower proportions of their energy intakes. The density of vitamin B<sub>12</sub> intake was higher for men of all age groups except for those aged 18-34 years, and the proportion of iron to calories was higher for men in the 65-74 year age group only.

### 5.1.2 Differences by Age

Intakes of macronutrients, including energy, protein, carbohydrates and fats (total fat, saturated fatty acids, polyunsaturated fatty acids, monounsaturated fatty acids) decreased with age for both males and females when both mean and median intakes were compared (Tables 5.1-5.4). Cholesterol intakes were similar across age groups for both genders.

Because of the variations in energy consumption with age, nutrient density is a useful parameter for estimating changes in foods consumed. In both men and women (Table 5.5, 5.6), dietary density of many nutrients appeared to be similar across age groups and some increased with age. Nutrients consumed in higher densities for both men and women as they aged included fibre, magnesium, iron, vitamin A, riboflavin, and folate. Men's dietary density of vitamin B<sub>12</sub> appeared to increase with age, while for women it showed an overall decrease. The nutrient density of women's vitamin C intake showed an overall increase with age, while men's nutrient density intake of this nutrient peaked at 50-64 years of age. The density of alcohol and caffeine intakes were highest in the 35-49 year age group for both males and females.

### 5.1.3 Differences by Geographic Region

Nutrient intakes by geographic region are shown in Appendix E.8 (see Appendix E). Intakes of selected nutrients are discussed in Chapter 5. Nutrient intakes were similar across all NB geographic regions. Some noticeable differences included: vitamin A intakes were over 25% higher in the Bathurst area than in Edmundston, although the Estimated Average Requirement (EAR) was still met; vitamin C intakes were over 50% higher in Edmundston than in the Miramichi, where the mean intake fell just below the EAR for males; alcohol was almost five times higher in the Campbellton area than in the Edmundston area; and mean caffeine intake in Campbellton was about 100 mg lower per day compared to Edmundston. These differences may be related to the fact that Edmundston, the Miramichi, and Campbellton especially, had the smallest sample sizes.

### 5.1.4 Differences by Level of Education

Nutrient intakes by NB adults of different education levels are provided in Table E.9 (see Appendix E); additional details on nutrient intakes are provided in Chapter 5. Generally, nutrient intakes were similar among individuals with differing levels of education. A few exceptions observed included: mean alcohol intakes appeared to be almost five times lower for those individuals with an elementary education compared to those with more education; sodium intakes were almost 500 mg higher for those in the higher educational level versus those in the lowest; folate intakes were about 20 µg higher for people with a post-secondary education than for those with less education (although none of the groups met the EAR for folate); and vitamin C intakes were over 20% higher for people with post-secondary education than for the groups with less education (although all groups met the EAR for this vitamin). The differences in sample size must be considered, however, and firm conclusions cannot be made regarding the association between education level and dietary intakes without using more sophisticated statistical analysis.

## LIST OF TABLES DISCUSSED IN SECTION 5.1

## Measuring Nutrient Intakes

Table 5.1	Nutrient Intakes of NB Males (Mean and 95% Confidence Interval by Age)
Table 5.2	Nutrient Intakes of NB Females (Mean and 95% Confidence Interval by Age)
Table E.1	Nutrient Intake, by Gender: Means and 95% Confidence Intervals
Table 5.3	Percentiles of Nutrient Intake of NB Males by Age
Table E.2	Nutrient Intake, Males: Medians and 95% Confidence Intervals
Table 5.4	Percentiles of Nutrient Intake of NB Females by Age
Table E.3	Nutrient Intake, Females: Medians and 95% Confidence Intervals
Table 5.5	Nutrient Density of NB Males' Intake (Mean Intake per 1,000 kcal by Age)
Table E.4	Nutrient Density, Males: Means and 95% Confidence Intervals
Table 5.6	Nutrient Density of NB Females' Intake (Mean Intake per 1,000 kcal by Age)
Table E.5	Nutrient Density, Females: Means and 95% Confidence Intervals

Table 5.1 Nutrient Intakes<sup>1</sup> of NB Males  
(Mean and 95% Confidence Interval by Age)

	18-34 yr		35-49 yr		50-64 yr		65-74 yr	
	(n)	(163)	(247)	(260)	(183)	Mean	[95% CI]	
	Mean	[95% CI]	Mean	[95% CI]	Mean	[95% CI]	Mean	[95% CI]
Energy (kcal)	2837	[2744,2930]	2597	[2380,2814]	2315	[2216, 2415]	2135	[2092,2179]
Protein (g)	108	[105,112]	107	[96.0,117]	93.2	[89.4,96.9]	85.4	[83.4,87.5]
Carbohydrate (g)	350	[339,361]	305	[286,323]	288	[271,305]	270	[263,277]
Total Fat (g)	107	[104,110]	99.5	[90.6,108.4]	86.5	[82.9,90.2]	77.2	[72.5,81.9]
Saturated Fatty Acids (g)	37.3	[36.3,38.4]	34.6	[30.9,38.2]	29.1	[28.0,30.2]	26.8	[24.1,29.5]
Polyunsaturated Fatty Acids (g)	17.4	[16.9,17.8]	15.8	[14.2,17.3]	15.0	[13.1,16.9]	12.5	[12.0,13.1]
Monounsaturated Fatty Acids (g)	42.7	[42.4,43.0]	40.5	[36.5,44.5]	34.8	[33.5,36.2]	30.0	[27.3,32.6]
Cholesterol (mg)	355	[334,377]	401	[386,416]	342	[325,359]	302	[269,334]
Dietary Fibre (g)	16.1	[15.2,17.0]	16.3	[16.1,16.6]	17.8	[15.8,19.9]	16.6	[15.0,18.2]
Sodium (mg)	3995	[3739,4250]	3570	[3123,4018]	3186	[3109,3263]	2871	[2737,3006]
Potassium (mg)	3476	[3372,3580]	3334	[3126,3543]	3234	[3058,3411]	3143	[3030,3255]
Calcium (mg)	943	[897,989]	868	[781,954]	739	[737,741]	725	[676,773]
Phosphorus (mg)	1611	[1588,1634]	1532	[1408,1655]	1378	[1303,1455]	1320	[1251,1390]
Magnesium (mg)	329	[308,350]	323	[296,350]	316	[292,339]	285	[267,302]
Iron (mg)	17.0	[16.3,17.6]	16.7	[15.6,17.8]	16.4	[14.7,18.1]	15.7	[14.9,16.5]
Zinc (mg)	14.2	[12.6,15.8]	13.8	[12.4,15.3]	12.9	[10.9,14.9]	11.2	[11.0,11.4]
Vitamin A (RE)	1205	[850,1559]	1191	[955,1426]	1225	[1110,1342]	1447	[1338,1556]
Thiamin (mg)	1.85	[1.77,1.93]	1.76	[1.62,1.89]	1.68	[1.53,1.84]	1.58	[1.52,1.63]
Riboflavin (mg)	2.17	[2.01,2.32]	2.11	[1.98,2.24]	1.97	[1.77,1.97]	1.77	[1.67,1.87]
Niacin (eq)	46.3	[44.4,48.3]	46.5	[41.0,52.0]	41.0	[39.1,42.9]	37.3	[35.4,39.2]
Vitamin B <sub>6</sub> (mg)	2.09	[1.99,2.19]	2.01	[1.84,2.19]	1.87	[1.76,1.97]	1.85	[1.76,1.94]
Vitamin B <sub>12</sub> (µg)	6.71	[5.49,7.93]	7.57	[5.97,9.17]	6.65	[5.47,7.82]	7.84	[4.23,11.5]
Pantothenic Acid (mg)	5.73	[5.45,6.01]	5.58	[5.22,5.94]	5.16	[4.89,5.43]	5.04	[4.65,5.44]
Folate (µg)	242	[212,271]	241	[230,252]	244	[218,271]	225	[212,239]
Vitamin C (mg)	112	[102,122]	102	[91.1,113]	94.8	[97.9,102]	87.5	[68.9,106]
Caffeine (mg)	141	[127,156]	270	[222,319]	243	[235,251]	176	[151,201]
Alcohol (g)	7.99	[4.53,11.5]	9.91	[4.88,14.9]	4.82	[2.43,7.22]	5.57	[-0.18,11.3]

<sup>1</sup> intakes based on single day recalls from food sources only

Table 5.2 Nutrient Intakes<sup>1</sup> of NB Females  
(Mean and 95% Confidence Interval by Age)

	18-34 yr		35-49 yr		50-64 yr		65-74 yr	
	(n)	(194)	(283)	(297)	(189)			
	Mean	[95% CI]	Mean	[95% CI]	Mean	[95%CI]	Mean	[95% CI]
Energy (kcal)	1903	[1781,2025]	1662	[1601,1723]	1609	[1501,1717]	1605	[1479,1731]
Protein (g)	73.0	[67.9,78.1]	68.9	[64.4,73.3]	68.0	[63.7,72.3]	66.7	[57.9,75.5]
Carbohydrate (g)	241	[227,256]	208	[206,211]	211	[198,225]	218	[199,238]
Total Fat (g)	71.6	[69.4,73.8]	61.5	[58.3,64.8]	55.8	[51.2,60.3]	53.9	[52.3,55.5]
Saturated Fatty Acids (g)	25.7	[25.1,26.4]	21.0	[20.4,21.7]	19.8	[18.6,20.9]	18.4	[17.1,19.7]
Polyunsaturated Fatty Acids (g)	11.6	[9.4,13.8]	10.5	[9.8,11.2]	9.2	[8.33,10.0]	9.5	[8.7,10.4]
Monounsaturated Fatty Acids (g)	27.7	[26.6,28.9]	24.4	[23.3,25.5]	21.5	[19.6,23.4]	20.6	[19.5,21.7]
Cholesterol (mg)	246	[179,313]	220	[188,249]	223	[210,237]	208	[183,233]
Dietary Fibre (g)	11.7	[10.7,12.6]	12.5	[11.5,13.5]	14.0	[13.5,14.5]	16.4	[15.0,17.9]
Sodium (mg)	2799	[2698,2900]	2435	[2234,2356]	2376	[2248,2504]	2310	[2188,1434]
Potassium (mg)	2421	[2341,2502]	2402	[2241,2562]	2564	[2435,2694]	2615	[2416,2814]
Calcium (mg)	776	[737,741]	660	[672,880]	661	[607,714]	598	[523,674]
Phosphorus (mg)	1157	[1025, 1145]	1020	[968, 1071]	1023	[974, 1073]	952	[897, 1007]
Magnesium (mg)	242	[219,264]	233	[220,246]	248	[239,257]	254	[231,277]
Iron (mg)	12.1	[10.7,15.5]	11.5	[10.3,12.6]	12.0	[11.5,12.5]	12.2	[10.8,13.6]
Zinc (mg)	9.15	[7.84,10.5]	8.70	[7.82,9.57]	8.50	[7.82,9.16]	8.39	[7.78,9.00]
Vitamin A (RE)	1158	[322,1994]	878	[632,1123]	1168	[1015,1321]	1367	[1145,1589]
Thiamin (mg)	1.24	[1.19,1.28]	1.21	[1.10,1.33]	1.27	[1.31,0.19]	1.39	[1.21,1.57]
Riboflavin (mg)	1.68	[1.40,1.96]	1.44	[1.31,1.57]	1.44	[1.36,1.52]	1.44	[1.28,1.60]
Niacin (eq)	31.8	[29.4,34.2]	20.2	[28.7,31.6]	29.7	[28.0,31.3]	30.1	[24.5,35.7]
Vitamin B <sub>6</sub> (mg)	1.38	[1.28]	1.35	[1.24,1.45]	1.47	[1.38,1.57]	1.57	[1.28,1.86]
Vitamin B <sub>12</sub> (µg)	6.51	[-0.739,13.8]	3.89	[3.03,4.75]	3.91	[3.39,4.43]	3.50	[2.19,4.80]
Pantothenic Acid (mg)	4.14	[3.62,4.61]	3.70	[3.27,4.13]	3.97	[3.71,4.23]	4.13	[3.56,4.69]
Folate (µg)	187	[147,227]	186	[163,209]	201	[193,209]	204	[198,210]
Vitamin C (mg)	97.4	[94.9,99.9]	88.3	[56.9,120]	94.2	[86.0,102]	97.7	[83.1,112]
Caffeine (mg)	128	[110,146]	209	[196,222]	183	[172,193]	143	[114,173]
Alcohol (g)	3.12	[-1.58,7.83]	2.38	[1.63,3.13]	1.80	[1.24,2.37]	1.19	[0.751,1.62]

<sup>1</sup> intakes based on single day recalls from food sources only

Table 5.3 Percentiles of Nutrient Intake<sup>1</sup> of NB Males by Age

(n)	18-34 yr (163)			35-49 yr (247)			50-64 yr (260)			65-74 yr (183)		
	25 <sup>th</sup>	50 <sup>th 2</sup>	75 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th 2</sup>	75 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th 2</sup>	75 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th 2</sup>	75 <sup>th</sup>
Energy (kcal)	2233	2616	3166	2105	2461	2829	1894	2233	2608	1688	2020	2380
Protein (g)	87	98	107	87	97	108	77	91	102	70	81	91
Carbohydrate (g266)	266	338	404	244	294	339	224	283	335	205	257	316
Total Fat (g)	81	93	117	74	91	109	63	80	100	57	70	89
Saturated Fatty Acids (g)	27	33	40	25	32	37	20	26	35	17	23	30
Polyunsaturated Fatty Acids (g)	12	14	18	11	14	17	10	13	17	9	11	14
Monounsaturated Fatty Acids (g)	31	37	47	28	36	45	23	31	42	20	27	35
Cholesterol (mg)	223	289	433	247	320	447	214	284	387	190	245	316
Dietary Fibre (g)	10	14	18	11	14	19	11	16	22	11	14	19
Sodium (mg)	3172	3631	4035	2926	3327	3861	2421	3060	3604	2275	2711	3203
Potassium (mg)	2421	3135	3906	2668	3176	3736	2552	3113	3673	2402	2964	3646
Calcium (mg)	609	826	1047	562	768	1015	481	660	853	520	658	816
Phosphorus (mg)	1266	1495	1738	1218	1449	1706	1110	1313	1576	1035	1284	1454
Magnesium (mg)	238	298	378	255	300	361	239	306	360	218	272	334
Iron (mg)	13	15	19	13	15	18	13	15	18	12	14	17
Zinc (mg)	10	12	14	11	12	13	9	11	13	8	10	12
Vitamin A (RE)	525	667	991	608	781	989	608	775	1032	664	916	1330
Thiamin (mg)	1.3	1.7	2	1.3	1.6	2	1.2	1.5	1.9	1.2	1.5	1.9
Riboflavin (mg)	1.5	1.9	2.4	1.6	1.9	2.4	1.5	1.8	2.1	1.4	1.6	1.9
Niacin (mg)	36	42	48	37	41	48	34	39	45	29	35	41
Vitamin B <sub>6</sub> (mg)	1.5	1.9	2.2	1.6	1.8	2.2	1.5	1.8	2.1	1.3	1.8	2.1
Vitamin B <sub>12</sub> (µg)	3.1	3.9	5.3	3.2	4.0	5.0	2.4	3.3	4.4	2.6	3.3	4.5
Pantothenic Acid (mg)	4.1	5.0	6.4	4.3	5.1	6.0	4.2	4.8	5.7	3.9	4.8	5.6
Folate (µg)	174	217	269	180	219	272	178	227	277	184	210	246
Vitamin C (mg)	42	75	133	52	75	111	50	72	104	39	69	98

<sup>1</sup> intakes from food sources only, adjusted for intra-subject variability<sup>2</sup> 95% confidence intervals for median intakes found in Appendix G

Source: BBCA E451311-009BV2



Table 5.4 Percentiles of Nutrient Intake<sup>1</sup> of NB Females by Age

(n)	18-34 yr (194)			35-49 yr (283)			50-64 yr (297)			65-74 yr (189)		
	25 <sup>th</sup>	50 <sup>th 2</sup>	75 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th 2</sup>	75 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th 2</sup>	75 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th 2</sup>	75 <sup>th</sup>
Energy (kcal)	1471	1744	2017	1357	1572	1850	1344	1565	1791	1282	1500	1796
Protein (g)	54	66	78	54	66	75	55	65	75	52	63	72
Carbohydrate (g)	196	222	255	167	201	240	168	203	238	168	208	245
Total Fat (g)	54	60	67	47	56	66	43	53	62	40	48	57
Saturated Fatty Acids (g)	18	21	25	15	19	23	14	18	23	12	15	21
Polyunsaturated Fatty Acids (g)	7.5	9.2	11.0	7.0	8.8	11.0	6.6	8.3	10.0	6.4	8.1	10.0
Monounsaturated Fatty Acids (g)	20	23	26	18	21	26	16	20	24	14	17	22
Cholesterol (mg)	145	186	249	152	182	234	148	184	230	133	169	213
Dietary Fibre (g)	8.7	10.0	12.0	8.4	11.0	14.0	8.9	12.0	17.0	10.0	15.0	21.0
Sodium (mg)	2285	2519	2732	1845	2318	2708	1865	2240	2625	1661	2173	2614
Potassium (mg)	1825	2210	2634	1844	2286	2784	2003	2466	2981	1986	2452	3016
Calcium (mg)	445	648	865	416	568	747	445	578	758	426	528	721
Phosphorus (mg)	831	1047	1330	805	991	1195	848	1001	1222	810	994	1204
Magnesium (mg)	181	220	257	180	219	261	193	233	278	185	241	289
Iron (mg140)	9.4	11.0	13.0	9.0	11.0	13.0	9.5	11.0	13.0	9.4	12.0	14.0
Zinc (mg)	6.6	7.7	9.1	6.3	7.8	9.4	6.4	7.7	9.2	6.4	7.4	8.9
Vitamin A (RE)	443	552	698	451	579	829	541	696	1055	575	814	1204
Thiamin (mg)	1.0	1.1	1.3	0.9	1.1	1.4	0.9	1.2	1.4	0.9	1.2	1.6
Riboflavin (mg)	1.1	1.4	1.8	1.1	1.4	1.7	1.1	1.4	1.6	1.1	1.3	1.6
Niacin (eq)	23	29	35	23	28	33	24	28	33	23	28	32
Vitamin B <sub>6</sub> (mg)	1.0	1.3	1.5	1.0	1.3	1.6	1.1	1.4	1.7	1.1	1.5	1.8
Vitamin B <sub>12</sub> (µg)	1.7	2.3	3.5	1.8	2.4	3.1	2.0	2.5	3.0	1.8	2.3	3.0
Pantothenic acid (mg)	2.9	3.6	4.2	2.9	3.5	4.2	3.1	3.8	4.4	3.0	3.8	4.7
Folate (µg)	133	157	189	131	170	211	149	184	227	151	190	233
Vitamin C (mg)	40	62	104	33	58	104	40	72	109	47	78	120

<sup>1</sup> intakes from food sources only, adjusted for intra-subject variability

Source: BBCA E451311-009BV2

<sup>2</sup> 95% confidence intervals for median intakes found in Appendix G

Table 5.5 Nutrient Density of NB Males' Intake  
(Mean Intake per 1,000 kcal<sup>1,2</sup> by Age)

	<b>18-34yr</b>	<b>35-49yr</b>	<b>50-64yr</b>	<b>65-74yr</b>
(n)	(163)	(247)	(260)	(183)
Protein (g/1000 kcal)	38.6	42.4	41.6	41.3
Carbohydrate (g/1000 kcal)	124	119	126	128
Total Fat (g/1000 kcal)	38.7	39.2	36.8	35.7
Saturated Fatty Acids (g/1000 kcal)	13.0	13.1	12.1	12.2
Polyunsaturated Fatty Acids (g/1000 kcal)	6.10	5.90	6.30	5.90
Monounsaturated Fatty Acids (g/1000 kcal)	14.9	15.2	14.5	13.8
Cholesterol (mg/1000 kcal)	128	156	151	144
Dietary Fibre (g/1000 kcal)	5.81	6.81	8.00	8.31
Sodium (mg/1000 kcal)	1449	1415	1405	1418
Potassium (mg/1000 kcal)	1234	1357	1450	1552
Calcium (mg/1000 kcal)	333	343	328	351
Phosphorus (mg/1000 kcal)	574	610	616	643
Magnesium (mg/1000 kcal)	118	131	140	140
Iron (mg/1000 kcal)	6.09	6.66	7.31	7.81
Zinc (mg/1000 kcal)	5.02	5.54	6.01	5.40
Vitamin A (RE/1000 kcal)	484	486	545	731
Thiamin (mg/1000 kcal)	0.67	0.71	0.76	0.77
Riboflavin (mg/1000 kcal)	0.78	0.83	0.83	0.85
Niacin (eq/1000 kcal)	16.5	18.5	18.3	18.1
Vitamin B <sub>6</sub> (mg/1000 kcal)	0.75	0.81	0.84	0.91
Vitamin B <sub>12</sub> (µg/1000 kcal)	2.52	2.93	2.95	4.33
Pantothenic Acid (mg/1000 kcal)	2.05	2.23	2.30	2.47
Folate (µg/1000 kcal)	87.6	96.9	109	112
Vitamin C (mg/1000 kcal)	40.5	42.7	43.2	42.0
Caffeine (mg/1000 kcal)	53.5	122	113	92.6
Alcohol (g/1000 kcal)	2.5	3.1	2.1	1.5

<sup>1</sup> intakes based on single day recalls from food sources only

<sup>2</sup> 95% confidence intervals found in Appendix G

Table 5.6 Nutrient Density of NB Females' Intake  
(Mean Intake per 1,000 kcal<sup>1,2</sup> by Age)

	<b>18-34yr</b>	<b>35-49yr</b>	<b>50-64yr</b>	<b>65-74yr</b>
(n)	(194)	(283)	(297)	(189)
Protein (g/1000 kcal)	39.0	42.1	43.2	42.2
Carbohydrate (g/1000 kcal)	131	127	131	137
Total Fat (g/1000 kcal)	35.6	36.0	33.6	31.6
Saturated Fatty Acids (g/1000 kcal)	12.8	12.4	12.1	11.1
Polyunsaturated Fatty Acids (g/1000 kcal)	5.85	6.14	5.67	5.96
Monounsaturated Fatty Acids (g/1000 kcal)	13.8	14.3	13.2	12.5
Cholesterol (mg/1000 kcal)	129	133	142	131
Dietary Fibre (g/1000 kcal)	6.49	7.68	8.88	10.20
Sodium (mg/1000 kcal)	1529	1500	1534	1481
Potassium (mg/1000 kcal)	1348	1516	1641	1669
Calcium (mg/1000 kcal)	410	401	416	375
Phosphorus (mg/1000 kcal)	619	634	681	668
Magnesium (mg/1000 kcal)	133	148	159	161
Iron (mg/1000 kcal)	6.58	7.08	7.64	7.67
Zinc (mg/1000 kcal)	4.85	5.37	5.42	5.31
Vitamin A (RE/1000 kcal)	619	563	799	881
Thiamin (mg/1000 kcal)	0.68	0.75	0.81	0.87
Riboflavin (mg/1000 kcal)	0.91	0.87	0.92	0.90
Niacin (eq/1000 kcal)	17.2	18.7	19.0	19.0
Vitamin B <sub>6</sub> (mg/1000 kcal)	0.76	0.84	0.95	0.99
Vitamin B <sub>12</sub> (µg/1000 kcal)	3.62	2.43	2.66	2.22
Pantothenic Acid (mg/1000 kcal)	2.28	2.28	2.54	2.60
Folate (µg/1000 kcal)	106.0	115	131	132
Vitamin C (mg/1000 kcal)	57.2	54.0	59.8	62.2
Caffeine (mg/1000 kcal)	78.8	162	124	100.0
Alcohol (g/1000 kcal)	1.0	1.4	1.0	0.8

<sup>1</sup> intakes based on single day recalls from food sources only

<sup>2</sup> 95% confidence intervals found in Appendix G

## 5.2 SOURCES OF ENERGY INTAKE

Table 5.7 shows the mean percentages of energy intakes from protein, carbohydrate, fat, and alcohol, as well as from saturated, polyunsaturated, and monounsaturated fatty acids. Macronutrient intakes in grams/day were converted to energy provided using the appropriate Atwater factors (4 calories/g carbohydrate, 9 calories/g fat, 4 calories/g protein, and 7 calories/g alcohol) and divided by the total energy intake.

The proportion of energy from protein was constant across all age-gender groups. The proportion of energy from carbohydrates was similar across all ages for males, but increased with age for females. The percentage of fat was similar for all male age groups, but decreased slightly with age for females. The percentage of polyunsaturated fatty acids was consistent for all age-gender groups, while the intake of saturated and monounsaturated fatty acids tended to decrease with age. The percentage of energy consumed as alcohol was much lower for females than for males, and generally decreased with age for both genders.

Table 5.7 Nutrient Sources Contributing to Energy Intake<sup>1</sup>  
(Mean Percent of Calories by Age and Gender)

Nutrient (% of calories)	(n)	Males				Females			
		18 to 34 yr (163)	35 to 49 yr (247)	50 to 64 yr (260)	65 to 74 yr (183)	18 to 34 yr (194)	35 to 49 yr (283)	50 to 64 yr (297)	65 to 74 yr (189)
Protein		15.2	16.3	15.9	15.9	15.2	16.4	16.7	16.3
Carbohydrate		49.1	46.7	49.3	50.1	50.2	49.6	51.8	53.5
Total Fat		33.8	34.3	33.3	32.2	33.5	33.0	30.8	29.7
Saturated Fatty Acids		11.7	11.7	10.8	10.8	11.4	11.1	10.8	9.8
Polyunsaturated Fatty Acids		5.5	5.3	5.6	5.3	5.2	5.5	5.3	5.3
Monounsaturated Fatty Acids		13.4	13.6	13.0	12.3	12.3	12.7	11.7	11.1
Alcohol		2.0	2.7	1.4	1.8	1.1	1.0	0.8	0.5

<sup>1</sup> intakes based on single day recalls from food sources only

Source: BBCA E451311-009BV2

## 5.3 COMPARISON WITH RECOMMENDED NUTRIENT INTAKES

### 5.3.1 Macronutrient Recommendations

Table 5.8 includes a comparison of the macronutrient intakes with the Dietary Reference Intakes (National Academy of Sciences, 2002), which are the guidelines presently being used in Canada and the United States. Table 5.9 compares percentages of the New Brunswick population below, within, or exceeding certain levels of nutrients. Although the DRI guidelines differ from the Nutrient Recommendations, the same ranges used in the other provincial nutrition surveys were considered. This helped show how newer guidelines affected whether needs were assessed as being met or not, and also permitted comparisons to be made with the results of other provincial surveys.

For all age groups, the percentage of energy derived from protein fell within the guidelines set by the Dietary Reference Intakes (DRI). The Estimated Average Requirement (EAR) is the DRI component used in population studies to describe the amount estimated to meet the requirements of half the individuals in a group. All age groups of both genders have mean protein intakes well in excess of the EAR. An examination of the distribution of New Brunswickers' protein intakes (Table 5.9) indicated that less than 1% of the population had protein intakes equal to or below 10% of energy. The majority had intakes which supplied greater than 15% of energy from protein. The percentage of women consuming over 15% of energy as protein increased with age, and females aged 65-74 years had the greatest percentage of any age-gender groups with this higher level of protein intake (75%).

As shown in Table 5.8, all of the groups met the recently adopted DRI guideline of 45% to 65% of energy from carbohydrates. If the older Nutrient Recommendations (Health and Welfare Canada, 1990) were applied, which advised that 55% of energy should come from carbohydrates, all group mean intakes would have fallen below this value. Mean carbohydrate intakes for women were higher than for men in all groups except the 35-49 year age group. The distribution of carbohydrate intakes is shown in Table 5.9. A greater percentage of men than women fell below the minimum 45% of calories from carbohydrates and women in the 65-74 year age group had the highest percentage consuming over 55% of calories as carbohydrates. The greatest percentage of men consumed energy from carbohydrates in the range of 45-50%, while for women a greater percentage consumed 50-55% of their calories as carbohydrate.

The DRI recommendation for fat is to contribute 20-35% to energy intake. According to this recommendation, all groups were within the guidelines for fat consumption (Table 5.8). The previous Nutrient Recommendations (Health and Welfare Canada, 1990) set a limit of 30%. All age-gender groups' mean intakes fell above 30%, with the exception of females aged 65-74 years, whose mean fat intake fell just below this. Consumption of fat as a percentage of calories were higher for men than for women and decreased slightly between the youngest and oldest age groups for both genders. A more detailed analysis of the proportion of individuals at various levels of fat intake is found in Table 5.9. More women consumed greater than 35% of their energy as fat in all age groups, with the exception of

women aged 65-74 years. Overall the greatest percentage of men and women consumed somewhere between 30 and 35% of their energy as fat. A greater number of men consumed over 40% of their energy as fat. There is no guideline set for saturated fat, other than to minimize it; however, the previous guideline was to limit saturated fatty acids to no more than 10% of calories. With the exception of women aged 65-74 years, none of the groups consumed a mean intake of less than 10% of energy from saturated fat (Table 5.8). The greatest percentage of men and women consumed between 10-15% of energy as saturated fat. A much greater percentage of men than women consumed greater than 15% of their calories in the form of saturated fat.

Table 5.8 Comparison of Mean Intakes<sup>1</sup> of Macronutrients with Recommendations<sup>2</sup>

	DRI <sup>2</sup>	Males				Females			
		18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr	18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr
Protein (g/kg body wt)	EAR: 14-18 years: Boys 0.73 Girls 0.71 Adults 0.66	1.32	1.28	1.09	1.06	1.11	1.01	0.97	1.00
Protein (% of calories)	10-35%	15.4	16.9	16.5	16.4	15.5	16.7	17.1	16.6
Carbohydrate (% of calories)	45-65%	49.4	47.4	49.6	50.8	51.8	50.1	51.7	53.6
Fat (% of calories)	20-35%	33.5	33.6	32.4	31.8	32.0	32.2	30.5	29.2
Saturated Fat (% of calories)	None set (minimize)	11.7	11.7	10.8	10.8	11.4	11.1	10.8	9.8

<sup>1</sup> intakes based on single day recalls from food sources only

<sup>2</sup> dietary Reference Intakes, National Academy of Sciences, 2002

Table 5.9 Distribution of Macronutrient Intakes<sup>1</sup>  
(Percent of Individuals by Age and Gender)

	Males				Females				
	18 to 34 yr (n)	35 to 49 yr (163)	50 to 64 yr (247)	65 to 74 yr (260)	18 to 34 yr (183)	35 to 49 yr (194)	50 to 64 yr (283)	65 to 74 yr (297)	189
<b>Protein</b>									
≤10% of calories	0	0	<1	1	0	1	0	0	
>10 to ≤15% of calories	55	34	32	37	47	34	29	25	
>15% of calories	45	66	67	62	53	65	71	75	
<b>Carbohydrates</b>									
≤45% of calories	21	29	24	17	1	13	14	11	
>45 to ≤50% of calories	29	37	31	31	29	30	28	17	
>50 to ≤55% of calories	33	25	30	23	56	39	31	27	
>55% of calories	16	9	15	29	14	17	28	45	
<b>Total Fat</b>									
≤30% of calories	21	23	34	39	26	33	40	60	
>30 to ≤35% of calories	45	37	33	32	58	44	41	21	
>35 to ≤40% of calories	29	34	24	20	16	17	16	13	
>40% of calories	5	6	10	7	0	6	4	6	
<b>Saturated Fat</b>									
≤10% of calories	27	27	43	48	27	34	41	61	
>10 to ≤15% of calories	65	66	49	43	73	65	56	34	
>15% of calories	9	6	8	10	1	1	3	6	

<sup>1</sup>adjusted for intra-subject variability; based on food sources only

Source: BBCA E451311-009BV2

### 5.3.2 Micronutrient Recommendations

The Estimated Average Requirement (EAR) component of the Dietary Reference Intakes (DRI) was used to assess micronutrient status. The estimated prevalence of inadequacy for selected nutrients is presented in Tables 5.10 and 5.11. The confidence intervals and sample size for each age category are included in Tables E.6 and E.7 (see Appendix E). Age groups presented in Tables 5.10 and 5.11 were kept consistent with those used in the analyses conducted by the BBCA. The information presented here represents intakes of nutrients from food only. Although the NB Nutrition Survey collected data on supplement use, it is not included in this report but is available for study at a later date. The possible health implications of deficiencies and nutrition recommendations arising from the observations made in this section are discussed in greater detail in Chapter 11 and summarized in Chapter 12.

Almost all men had adequate intakes of niacin, phosphorus, iron, and zinc. New Brunswickers' major food sources of these nutrients are discussed in Chapter 8. At least

## Chapter 5

92% of males 19-34 years old met the EAR for riboflavin, vitamin B<sub>6</sub> and vitamin B<sub>12</sub>. Inadequate intakes of several nutrients increased with age for men, including magnesium, thiamin, vitamin B<sub>6</sub>, vitamin B<sub>12</sub>, and vitamin C. This is consistent with the observation throughout this report, that younger men tended to consume the greatest amounts of most foods compared to all other age-gender groups, and thus would be less likely to have insufficient intakes of more nutrients.

Most women had adequate intakes of niacin; over 90% met the EAR for phosphorus, and more than 85% met the EAR for riboflavin and iron. Few females over 50 years of age (2%) failed to meet the EAR for iron, however among females aged 50 years and under, the percentage of those not meeting the EAR was 13%. As shown in Chapter 8, Table 8.1, the primary source of iron for NB adults was enriched grain products. In order to enhance the absorption of this non-heme form of iron, it would be helpful to have a sufficient intake of vitamin C, which as discussed later, is a concern. In general more women than men failed to meet the EAR for a greater number of nutrients. While this was in part related to a lower energy consumption, it also reinforces that the nutrient density of the foods consumed by New Brunswickers was inadequate, especially for women.

The number of adults below the EAR appeared to decrease with age for vitamin A in both genders. Just over half of those in the 18-34 year age groups met the EAR for vitamin A. Along with information on food group intakes discussed in Chapters 7 and 8, this reinforces that overall, adults in NB were not consuming enough vitamin A rich vegetables. Although milk products are fortified with vitamin A and were a major source of intakes of this nutrient according to results of the 24-hour recall (see Chapter 8, Table 8.3), the amount was not enough to allow all groups to meet the EAR. From Table 7.3, it appears that younger adults consume more or a similar amount of milk as older adults of the same gender, which suggests that a greater percentage of older New Brunswickers ate higher amounts of vegetables. Vitamin A plays many important roles, including maintaining the health of the immune system, eyesight, intestinal and urinary tract. Intakes of vitamin A's best-known antioxidant precursor, beta-carotene, could not be evaluated due to the large percentage of the population who had a zero intake level of carotene. Mega-doses of vitamin A are not recommended due to possible toxicity, and supplementation of beta-carotene is potentially harmful to smokers. Thus, in addition to the many other benefits of getting nutrients through foods, it would be recommended that vitamin A and beta-carotene intakes be improved by increasing the variety of Vegetables and Fruit consumed, as well as getting adequate amounts of Milk Products fortified with vitamin A. The most consumed vegetable by most adults in NB was the potato (see Chapter 7, Section 7.2), which is not a source of vitamin A or carotenoids. Thus it is important to emphasize that vegetable consumption is increased by eating more of the colorful red, orange, dark yellow and dark green fruits and vegetables.

The number of men and women with inadequate intakes of Vitamin B<sub>6</sub> increased with age, although the status of this nutrient was assessed according to only two larger age groups for each gender (determined according to different nutrient needs for these particular age groups). Among adults over 50 years of age, 22% of men and 42% of women did not meet



the EAR for vitamin B<sub>6</sub>. About one-quarter of women under 50 years of age also did not meet the EAR for this vitamin.

Inadequate intakes of vitamin B<sub>12</sub> were more common among older adults, affecting 31% of women and 14% of men over 50 years. This reinforces the new DRI's recommendation that adults over 50 years of age consume foods fortified with crystalline vitamin B<sub>12</sub> or take vitamin B<sub>12</sub> supplements to improve their intake of this nutrient.

Many more women than men failed to meet the EAR for thiamin (22% versus 8%). Despite the enrichment of flour with thiamin, the amount consumed in bread is not sufficient for some adults to meet the EAR, especially among women in NB. The finding that a portion of the population's mean intake did not meet the EAR for thiamin reinforces the recommendation that New Brunswickers consume a greater amount of carbohydrate in the form of healthier choices rather than less nutrient dense "Other Foods" (see Chapter 8 for further discussion).

Approximately 42% of women and 52% of men had inadequate intakes of vitamin C. Poor vitamin C intake is a concern, as some key benefits of this anti-oxidant include maintaining the health of the immune system and lowering the risk of certain chronic illnesses, including heart disease. Vitamin C also enhances iron absorption, which could especially benefit women for whom iron intake is a concern. The finding that a large percentage of the population consumed insufficient amounts of vitamin C emphasizes the recommendation that New Brunswickers need to increase their intake of foods from the Vegetables and Fruit group.

A large percentage of adults did not meet the EAR for magnesium (70%). Magnesium contributes to bone health and may help reduce the risk of heart disease and high blood pressure. Magnesium is one of the many nutrients that New Brunswickers would get more of by increasing their overall low consumption of Vegetables & Fruit. Another recommendation to improve magnesium intakes, would be to increase the use of whole wheat and other whole grain breads versus refined white bread, which was the more popular choice among the participants of the NB Nutrition Survey.

The nutrient most lacking in NB adults' intake was folate, with 90% of males and 97% of females overall not meeting the EAR. It is important to note that this survey pre-dates the Food and Drug Regulations' mandatory fortification of flour of with folic acid. Until 1998, the addition of folic acid was optional and amounts added ranged from 0.04 to 0.15 mg (Health Canada, 1997), therefore the 1991 version of the Canadian Nutrient File used in this study evaluated intakes based on a lower level of fortification. This extra amount is expected to increase the average woman's daily intake by about 100 µg per day (Health Canada, 1999b), which would still give a mean intake of folic acid below estimated requirements. It is also recommended that women of childbearing age take a daily supplement containing 400 µg of folic acid to improve their intake of this nutrient.

Table 5.10 Male Prevalence of Micronutrient Inadequacy<sup>1</sup>

	EAR <sup>2</sup>	19 to 34 yr %	35-49 yr %	50 to 64 yr %	65 to 70 yr %
Folate	320 µg	88	91	86	96
Niacin	12 eq	0	0	0	0 <sup>4</sup>
Phosphorus	580 mg	0	0	0	1
Riboflavin	1.1 mg	8	5	2	5
Thiamin	1.0 mg	6	7	9	11 <sup>4</sup>
Vitamin A	625 µg	45	26	26	20 <sup>4</sup>
Vitamin B <sub>12</sub>	2 µg	3	6	13	14
Vitamin C	75 mg	50	50	52	57
Zinc	9.4 mg	0	0	0	0 <sup>4</sup>
	EAR <sup>2</sup>	19 to 30 yr %	31 to 50 yr %	51 to 70 yr %	71 to 74 yr %
Magnesium	330 mg (19-30 yr) 350 mg (31-70 yr)	62		72	
Vitamin B <sub>6</sub>	1.1 mg (19-50 yr) 1.4 mg (50+ yr)		2		22
Iron	6 mg <sup>3</sup>		1		1

<sup>1</sup> intake below EAR; intake adjusted for intra-subject variability and based on food sources only

<sup>2</sup> Estimated Average Requirement, DRI Reports 1997 to 2001

<sup>3</sup> probability approach used to assess inadequacy

<sup>4</sup> 65-74 years

Source: BBCA E451311-009BV2

Table 5.11 Female Prevalence of Micronutrient Inadequacy<sup>1</sup>

	EAR <sup>2</sup>	19 to 34 yr %	35-49 yr %	50 to 64 yr %	65 to 70 yr %
Folate	320 µg	98	98	95	98
Niacin	11 eq	0	1	1	0 <sup>4</sup>
Phosphorus	580 mg	7	7	5	10
Riboflavin	0.9 mg	9	11	8	14
Thiamin	0.9 mg	19	26	23	20 <sup>4</sup>
Vitamin A	500 µg	39	35	21	15 <sup>4</sup>
Vitamin B <sub>12</sub>	2 µg	36	33	26	35
Vitamin C	60 mg	47	50	40	31
Zinc	6.8 mg	29	35	34	34 <sup>4</sup>
	EAR <sup>2</sup>	19 to 30 yr %	31 to 50 yr %	51 to 70 yr %	71 to 74 yr %
Magnesium	255 mg (19-30 yr) 265 mg (31-70 yr)	73		73	
Vitamin B <sub>6</sub>	1.1 mg (19-50 yr) 1.3 mg (50+ yr)		24		42
Iron	8.1 mg (19-50 yr) 5 mg (50+ yr)		13		2

<sup>1</sup> intake below EAR; intake adjusted for intra-subject variability and based on food sources only

<sup>2</sup> Estimated Average Requirement, DRI Reports 1997 to 2001

<sup>3</sup> probability approach used to assess inadequacy

<sup>4</sup> 65-74 years

Source: BBCA E451311-009BV2

As insufficient data are available to determine an EAR for calcium, the Adequate Intake (AI) level was used. The AI is a less precise value based on approximations of intakes in healthy people. The AI can be used to assess dietary intakes in groups. However, it is not reliable for use as an estimate of the prevalence of inadequacy.

The AI and mean calcium intakes are presented in Table 5.12, along with the distribution of calcium intakes. Only a small proportion of adults over 50 years of age met the AI for calcium, with less than 12% of males and less than 9% of females in these older age groups achieving this level of intake. Although more men under 50 years of age reached amounts exceeding the AI, the proportion achieving this amount was still well under half of the population (31-40%). No mean calcium intake for any age-gender group met the AI. Mean calcium intakes decreased with age for both genders, despite the fact that the AI for calcium is higher for those over 50. Women's mean calcium intakes fell further below the AI's than men's calcium intakes. Although this demonstrates a greater possibility of inadequate intakes in these groups, there is no way to determine if this is actually the case as some adults may actually be meeting their calcium needs at intakes lower than the AI.

Table 5.12 Distribution of Calcium Intake<sup>1</sup>  
(Percent of Individuals by Age and Gender)

	Males				Females			
	19 to 30 yr	31 to 50 yr	51 to 70 yr	71 to 74 yr	19 to 30 yr	31 to 50 yr	51 to 70 yr	71 to 74 yr
(n)	(163)	(247)	(260)	(183)	(194)	(283)	(297)	(189)
<400 mg	17	14	19	17	28	32	23	25
400 to <600 mg	16	21	24	25	16	22	28	31
600 to <800 mg	14	20	20	24	19	18	21	20
800 to <1000 mg	13	13	16	15	13	10	13	12
1000 to <1200 mg	14	12	10	9	7	6	6	9
≥1200 mg	26	19	12	10	17	11	9	3
AI <sup>2</sup> (mg)	1000	1000	1200	1200	1000	1000	1200	1200
Mean Calcium <sup>3</sup> (mg)	943	868	739	725	776	660	661	599

<sup>1</sup> adjusted for intra-subject variability; based on food sources only

<sup>2</sup> adequate Intake, Health and Welfare Canada, 1990

<sup>3</sup> intakes based on single day recalls from food sources only

### 5.3.3 Fibre

The distributions of dietary fibre intakes are shown in Tables 5.13 and 5.14. Dietary fibre intakes may be underestimated because the 1991 Canadian Nutrient File is incomplete for this dietary component. Prior to the development of the DRI's there was no consensus on the required daily intake of fibre. The new AI recommendations for fibre are based on 14 g of fibre per 1,000 calories of intakes. Only 1% of adult males and females under 50 years met the AI for fibre. Very few women 50 years and over met or exceeded the AI for fibre (5%). The greatest segment of the population achieving at least the daily AI for fibre were men 50 years and over, although the percentage was still low at 15%. As discussed in the explanation of AI in the previous section, although very few adults in NB meet the AI for fibre, it is possible that some people may actually be meeting their individual requirements for fibre without meeting the AI.

Table 5.13 NB Males: Distribution of Dietary Fibre Intakes<sup>1</sup>  
(Percent of Individuals by Age and Gender)

	Dietary Fibre Intake (n)	18-49 years (410)	50-74 years (443)
<b>AI</b>			
< 50 yr: 38 g/day	< 30 g/day	98	85
≥ 50 yr: 30 g/day	30-38 g/day	1	10
	≥ 38.0 g/day	1	5

<sup>1</sup> adjusted for intra-subject variability; based on food sources only

Table 5.14 NB Females: Distribution of Dietary Fibre Intakes<sup>1</sup>  
(Percent of Individuals by Age and Gender)

	Dietary Fibre Intake (n)	18-49 years (477)	50-74 years (486)
<b>AI</b>			
< 50 yr: 25 g/day	< 21 g/day	96	94
≥ 50 yr: 21 g/day	21-24 g/day	3	4
	≥ 25 g/day	1	1

<sup>1</sup> adjusted for intra-subject variability; based on food sources only

#### 5.4 COMPARISON WITH OTHER PROVINCIAL NUTRITION SURVEYS

All provinces completed nutrition surveys in the 1990's using adult populations aged 18 to 74 years and excluding persons living in institutions. Although it must be noted there is a large amount of time between when the first and last surveys were completed, results appear similar in most cases. This discussion considers the results from all provinces whose reports were available at the time the NB report was written, however to keep the comparisons within a two year time-frame, one may wish to compare the NB Nutrition Survey results only to those of Ontario and PEI. All provinces used 24-hour recall methodology with repeat interviews on a sub-sample to provide quantitative nutrient data. Means were used for comparison purposes since not all median values were available. The results are presented by age and gender groups, and were available for the following provinces:

- New Brunswick Nutrition Survey, conducted in 1996-97 (fall and spring) included 1,816 adults with a 64% response rate and 30% repeat interviews.
- The Ontario Nutrition Survey, conducted in 1997-98 (fall and spring) included 1,187 adults with a 29% response rate and 36% repeat interviews.
- Prince Edward Island Nutrition Survey, conducted in 1995 (spring and fall), included 1,995 adults with a 71% response rate and 29% repeat interviews.
- Saskatchewan Nutrition Survey, conducted in 1993 (spring and winter), included 1,798 adults with a 46% response rate and 20% repeat interviews (Stephen & Reeder, 2001). These results were not considered representative of the population.
- The Nova Scotia Nutrition Survey carried out in 1990 (spring and fall) involving 2,200 adults with an 80% response rate and 38% repeat interviews (Nova Scotia Department of Health, 1993).
- Québec Nutrition Survey, conducted in 1990 (fall), which surveyed 2,118 adults with a 69% response rate and 10% repeat interviews (Santé Québec, 1995).

Mean energy and selected nutrient intakes for the NB Nutrition Survey (NB) and five other provincial nutrition surveys conducted in Ontario (ON), Prince Edward Island (PE), Saskatchewan (SK), Nova Scotia (NS) and Québec (QC) are presented in Table 5.15. Mean energy intakes were comparable for all five provinces. One exception to this was that in ON and NB, the mean energy intake of women aged 65-74 years was higher than those in the other provinces. As discussed in more detail in Chapter 6, the level of under-reporting of energy intakes tends to rise as excess body mass increases (Braam, Ocké, Buene-de-Mesquita & Seidell, 1998). Between provinces the pattern of under-reporting and rates of overweight and obesity do not appear to be predictable, however. For example, women aged 65-74 years consume an average energy intake that is 200 Kcal/day higher than NS

women of this age, but the rates of overweight and obesity do not follow a pattern that corresponds to this comparison in energy intakes (NB: 44% overweight + 23% obese = 67% overall; ON: 33% overweight + 26% obese = 59% overall; NS: 38% overweight + 27% obese = 65% overall).

Table 5.16 shows the percentage of adults meeting defined levels of macronutrient and fibre intakes. The Report of the Ontario Food Survey was released while the NB Nutrition Survey was being completed. Ontario's publication did not present these findings in a similar manner to that presented in Table 5.16 (with the exception of total fat and saturated fat) and additional results were not available to NB at the time of our report, so most observations made here are between all other provinces. Few men in any province had energy intakes less than 1000 kcal. The distribution of energy intakes was fairly similar across all provinces. One of the few differences observed was that NB had a much greater percentage of women aged 65-74 years with energy intakes of 2000-2500 kcal than in any of the other provinces.

Ontario's population had the greatest percentage of adults in all age-gender groups with less than 30% of their energy intake coming from fat. With the exception of Ontario, the proportion of men with fat intakes less than the recommended 30% of energy was highest for the youngest group (aged 18-34 years) in both New Brunswick (21%) and Saskatchewan (22%) compared to the other provinces (PEI 15%; Québec 3%; and Nova Scotia 7%). For NB females, the proportion with fat intakes less than 30% of energy was comparable to other provinces. Table 5.15 shows that females aged 65-74 years in NB consumed less than 30% of their mean energy intake as total fat. Table 5.15 shows that adults in Ontario had the lowest mean percentage of energy from saturated fat in all age-gender groups, followed by New Brunswickers (with the exception of the 18-34 year old females). Ontario had the greatest percentages of adults with a mean percentage intake of saturated fat less than 10% (Table 5.16). NB had the greatest percentage of men consuming less than 10% of their energy as saturated fat in comparison to all other provinces except Ontario (Table 5.16).

Dietary fibre intakes overall were similar to those seen in other provinces, although the NB Nutrition Survey population had some men and women 18-34 years old attaining the low level of 15 g/day. The adequate intake for this age group for women is 25 g/day and for men, 38 g/day.

Mean intakes of select micronutrients were similar between provinces, with a few exceptions (Table 5.15). In most cases women's micronutrient intakes were lower in all age groups than men's. Patterns of micronutrient intakes across age groups were similar between provinces. Calcium intakes in NB were similarly low or lower than those of other provinces for both genders, and NB was the only province for which the mean calcium intake of males 18-34 years did not meet the AI. Iron intakes were comparable, although NB females 65-74 years of age had a much higher iron intake and higher folate intake than women of the same age category in other provinces, with the exception of Ontario (although it is important to remember that as shown in Table 5.11, 98% of New Brunswickers in this age-gender group did not meet the EAR for folate).

Table 5.15 Mean Nutrient Intakes<sup>1</sup> in Provincial Nutrition Surveys

	Prov	Males				Females			
		18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr	18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr
Energy (kcal)	NB	2837	2597	2316	2136	1903	1662	1609	1605
	ON	2582	2695	2340	2228	1947	1723	1622	1602
	PE	2859	2522	2311	2175	1789	1639	1609	1479
	SK <sup>2</sup>	3157	2721	2186	2116	1950	1767	1618	1423
	NS	3020	2343	2230	2025	1721	1571	1476	1394
	QC	2895	2632	2252	2143	1867	1727	1602	1512
Protein (% of calories)	NB	15.5	16.8	16.2	16.1	15.4	16.6	16.8	16.4
	ON	15.4	14.9	16.0	14.9	14.6	15.9	16.3	16.3
	PE	16.5	15.8	16.7	15.7	15.8	15.7	16.0	15.4
	SK <sup>2</sup>	15.9	16.7	16.4	16.0	14.8	15.9	16.1	16.0
	NS	16.0	16.0	17.0	16.0	16.0	17.0	17.0	17.0
	QC	15.9	15.9	16.5	16.3	16.1	16.6	16.4	16.6
Carbohydrate (% of calories)	NB	49.1	46.7	49.3	50.1	50.2	49.6	51.8	53.5
	ON	51.7	50.9	50.8	48.4	54.7	53.4	52.7	53.5
	PE	47.2	46.8	47.2	50.0	50.2	49.4	51.6	53.3
	SK <sup>2</sup>	50.1	47.2	48.4	48.2	52.9	48.7	51.1	52.1
	NS	46.9	45.3	47.4	49.7	51.8	48.4	49.3	52.0
	QC	46.0	46.0	46.1	49.3	47.5	47.1	50.3	51.3
Total Fat (% of calories)	NB	33.8	34.3	33.3	32.2	33.5	33.0	30.8	29.7
	ON	30.2	30.7	30.3	33.1	29.2	29.3	28.9	28.5
	PE	34.1	35.4	34.8	33.4	33.4	34.0	31.6	31.0
	SK <sup>2</sup>	33.5	35.6	34.5	32.8	31.4	34.4	33.7	31.1
	NS	36.0	35.0	35.0	33.0	35.0	35.0	33.0	32.0
	QC	35.4	34.7	33.9	31.6	34.9	33.4	31.6	31.8
Saturated Fat (% of calories)	NB	11.7	11.7	10.8	10.8	11.4	11.1	10.8	9.8
	ON	10.1	10.7	10.0	10.9	9.5	10.3	9.5	9.2
	PE	12.6	12.6	12.3	11.4	11.9	11.7	10.7	10.7
	SK <sup>2</sup>	11.9	12.3	12.5	11.2	11.0	12.0	11.1	10.1
	NS	13.0	13.0	13.0	12.0	13.0	12.0	12.0	12.0
	QC	13.3	12.9	12.7	11.8	13.1	12.2	11.4	11.6
Dietary Fibre (g)	NB	16.1	16.3	17.8	16.6	11.7	12.5	14.0	16.4
	ON	19.3	20.8	20.9	17.8	14.2	16.8	15.3	17.8
	PE	16.4	16.1	16.7	18.3	11.5	12.5	13.9	13.9
	SK <sup>2</sup>	17.5	17.4	17.2	18.0	12.6	13.0	14.4	14.7
	NS	16.0	15.2	15.9	17.0	9.6	11.6	12.6	13.3
	QC	16.9	16.2	16.2	18.7	12.6	13.6	16.3	14.4
Calcium	NB	943	868	739	725	776	660	661	599
	ON	1015	990	847	780	795	758	714	645
	PE	1151	838	791	785	714	637	600	547
	SK <sup>2</sup>	1251	994	793	812	822	761	651	633
	NS	1161	913	822	776	738	624	582	595
	QC	1114	922	736	771	788	658	622	574
Iron (mg)	NB	17.0	16.7	16.4	15.7	12.1	11.5	12.0	12.2
	ON	18.5	19.4	17.2	15.7	14.4	13.4	12.2	13.7
	PE	17.6	16.3	15.7	15.4	10.6	10.9	11.6	11.4
	SK <sup>2</sup>	18.6	17.4	15.4	15.2	12.1	11.6	11.5	10.4
	NS	17.7	15.0	14.9	15.0	10.7	10.7	10.7	10.2
	QC	18.0	16.9	14.9	15.6	11.9	11.7	11.9	10.4
Folate (µg)	NB	242	241	244	226	187	186	201	204
	ON	281	285	266	253	187	213	222	231
	PE	244	224	231	237	155	176	182	181
	SK <sup>2</sup>	290	260	243	243	200	197	207	188
	NS	263	238	234	243	162	176	189	182
	QC	272	246	235	254	203	189	205	180

<sup>1</sup> based on single day recalls from food sources only<sup>2</sup> not representative of the Saskatchewan population



Table 5.16 Distribution of Macronutrient and Fibre Intakes<sup>1</sup> in Provincial Nutrition Surveys (Percent of Individuals by Age and Gender)

	Prov	Males				Females			
		18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr	18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr
Energy <1000 kcal/d	NB	1	1	2	3	11	11	11	11
	ON <sup>3</sup>	-	-	-	-	-	-	-	-
	PE	<1	<1	<1	<1	6	7	8	7
	SK <sup>2</sup>	<1	<1	3	1	2	7	4	9
	NS	<1	1	2	1	7	9	13	19
	QC	1	1	2	3	8	10	15	16
Energy 1000 to <1500 kcal/d	NB	7	10	12	17	22	35	34	39
	ON <sup>3</sup>	-	-	-	-	-	-	-	-
	PE	3	3	6	10	28	36	41	48
	SK <sup>2</sup>	4	<1	10	14	18	33	42	50
	NS	4	9	7	15	31	41	50	51
	QC	5	7	13	14	25	35	32	42
Energy 1500 to <2000 kcal/d	NB	15	18	24	30	19	28	34	27
	ON <sup>3</sup>	-	-	-	-	-	-	-	-
	PE	6	18	30	37	38	41	40	39
	SK <sup>2</sup>	10	10	27	33	43	31	41	37
	NS	12	24	32	41	44	40	30	23
	QC	13	14	26	34	29	24	33	30
Energy 2000 to <2500 kcal/d	NB	20	25	26	27	21	14	16	16
	ON <sup>3</sup>	-	-	-	-	-	-	-	-
	PE	29	39	35	32	20	12	9	5
	SK <sup>2</sup>	19	34	30	35	27	23	11	4
	NS	23	31	34	29	15	9	5	4
	QC	19	22	26	24	22	20	14	7
Energy ≥2500 kcal/d	NB	57	46	36	23	17	11	6	3
	ON	-	-	-	-	-	-	-	-
	PE	62	40	29	21	8	3	3	1
	SK <sup>2</sup>	67	55	30	17	11	6	3	<1
	NS	61	35	25	14	3	1	2	3
	QC	62	55	34	25	16	12	7	5
Total Fat ≤30% of calories	NB	21	23	34	39	26	33	40	60
	ON <sup>4</sup>	-	-	-	-	-	-	-	-
	PE	15	17	23	36	26	32	38	46
	SK <sup>2</sup>	22	22	27	33	42	25	32	41
	NS	7	15	19	32	18	25	41	51
	QC	3	19	19	45	17	25	35	47
Saturated Fat ≤10% of calories	NB	27	27	43	48	27	34	40	54
	ON <sup>3</sup>	52	49	59	40	61	50	69	55
	PE	8	13	25	34	23	31	43	51
	SK <sup>2</sup>	22	13	26	41	37	24	40	55
	NS	7	17	20	32	16	22	35	44
	QC	8	13	17	39	16	25	32	38
Dietary Fibre ≥15 g	NB	41	48	57	46	8	19	36	48
	ON <sup>3</sup>	-	-	-	-	-	-	-	-
	PE	47	46	50	58	12	24	33	35
	SK <sup>2</sup>	50	56	54	32	26	24	37	39
	NS	43	42	44	52	9	15	24	33
	QC	56	54	54	60	33	40	57	48

<sup>1</sup> adjusted for intra-subject variability; based on food sources only

<sup>2</sup> not representative of the Saskatchewan population

<sup>3</sup> data not available from Report of the Ontario Food Survey

<sup>4</sup> data not available for comparison as Ontario used new DRI (< 35%)

## 5.5 COMPARISON WITH 1972 NUTRITION CANADA SURVEY

The first national survey of Canadian dietary habits, the Nutrition Canada survey, was conducted in 1970-1972 (Nutrition Canada, 1973). Table 5.17 includes a comparison of selected median nutrient intakes between the NB Nutrition Survey in 1996-97 and the Atlantic Canada sample of the Nutrition Canada Survey (Nutrition Canada, 1973). Although the sample populations were not identical, a comparison of the data in the present survey to Atlantic Canada data are relevant as it was the only detailed information that was available on the nutrient intake of New Brunswickers for use as a reference until now. The accuracy and types of comparisons which can be made with the Nutrition Canada survey are also restricted by methodological differences. Thus, variations in the methods and tools used to assess intakes in each of the two surveys likely accounts for some of the differences observed. It is also important to keep in mind that we do not know how much the extent of under-reporting differs between the two surveys. A study by Braam, Ocké, Buene-de-Mesquita & Seidell (1998) found that under-reporting of intake rises as people become more overweight and obese. If this is the case, then with the rise in levels of overweight and obesity that would have occurred between 1972 and 1996-97, it is possible a higher level of under-reporting may explain at least part of the observed decrease in intakes.

The energy intakes of all groups decreased from the 1972 study to the 1996-97 survey with the exception of the oldest age group for both genders, which had slightly increased mean energy intakes. The fat intake as a percentage of calories decreased among all age groups of both genders (a decrease of 7.7% overall). The mean grams of protein consumed decreased for both men and women in the 20-39 year age group, but was higher for the older two age groups. As percentage of energy intakes, protein increased for all age/gender groups, with the exception of women in the 20-39 year age groups which consumed a lower percentage of protein (equal to an overall increase of 1.8%). Mean grams of carbohydrate consumed increased in 1996-97 for women in all age groups and for men over 65, but was lower for men in the two younger age groups. The percentage of energy coming from carbohydrate increased for all age/gender groups (4.4% overall). Calcium intakes decreased, with the exception of women in the 20-39 and 40-64 year age groups, which showed a slight increase in intakes of this nutrient. Iron intakes remained fairly consistent, with only the oldest female group demonstrating a greater consumption of this mineral over time. Men aged 20-64 and women aged 20-39 years consumed less vitamin A than in 1972, while the older age groups of each gender increased their intake of this nutrient over the same time period. Vitamin C intake decreased for the youngest and oldest groups of men, but showed an increase for men in the 40-64 year age group and for all female age groups.

Thiamin intakes increased for all age-gender groups. The same result was seen in the PEI Nutrition Survey. The values used for content of thiamin in flour were similar for both studies (0.44 mg/100 g in the 1963 USDA Handbook No. 8 used for the 1972 Survey; 0.46 mg/100 g in the 1991 version of CNF used in the 1996-97 Survey). Carbohydrate intakes increased, however this could not explain the increase in thiamin intakes as the intake of other nutrients added to flour decreased. It is possible that there were more thiamin values missing for foods in the files used to assess the 1972 Survey, which would have been counted as zero content.

Table 5.17 NB Nutrient Intake in 1996-97<sup>1</sup> and 1972 Atlantic Provinces Nutrient Intake<sup>2</sup> (Mean<sup>3</sup> Intake by Age and Gender)

	Year	Males			Females		
		20-39 yr	40-64 yr	65-74 yr	20-39 yr	40-64 yr	65-74 yr
Energy (kcal)	1996-97	2811	2432	2135	1817	1655	1605
	1972	3268	2905	2115	1911	1718	1513
Fat <sup>4</sup> (% of calories)	1996-97	33.4	33.2	31.8	32	31.6	29.2
	1972	40.5	41.5	37.9	40	40.3	36.9
Protein (g)	1996-97	109.4	100.0	85.4	71.2	69.1	66.7
	1972	115	99.0	73.0	84.0	60.0	49.0
Protein <sup>5</sup> (% of calories)	1996-97	15.6	16.4	16	15.7	16.7	16.6
	1972	14.1	13.6	13.8	17.6	14	13
Carbohydrate (g)	1996-97	343	291	270	230	211	218
	1972	351	306	257	219	198	194
Carbohydrate <sup>5</sup> (% of calories)	1996-97	48.8	47.9	50.6	50.6	51	54.3
	1972	43	42.1	48.6	45.8	46.1	51.3
Calcium (mg)	1996-97	958	784	725	739	658	598
	1972	1222	919	781	713	584	612
Iron (mg)	1996-97	16.9	16.8	15.7	11.8	11.8	12.2
	1972	16	16	15	12	11	10
Vitamin A (RE)	1996-97	1213	1202	1447	1114	1006	1367
	1972	1656	1314	1096	1535	866	849
Thiamin (mg)	1996-97	1.73	1.63	1.53	1.16	1.19	1.33
	1972	1.48	1.39	1.09	0.96	0.85	0.83
Vitamin C (mg)	1996-97	108.3	99.9	87.5	96.3	90.7	97.7
	1972	112	95	100	79	76	84

<sup>1</sup> NB Nutrition Survey

<sup>2</sup> Nutrition Canada Survey, Atlantic Provinces

<sup>3</sup> based on single day recalls from food sources only

<sup>4</sup> mean fat intake; Nutrition Canada Survey, Atlantic sample estimated as (mean fat g x 9) x 100 / mean energy intake

<sup>5</sup> protein and carbohydrate percentages estimated as (mean protein g x 4) x 100 / mean energy intake

# 6

## WEIGHT STATUS AND ITS DETERMINANTS

As discussed in the introduction to this report (see Chapter 1), obesity is a major health concern in NB. In addition to being a health concern on its own, obesity is also a risk factor for cardiovascular disease, diabetes, and some types of cancer. Weight gain occurs when energy intakes are greater than energy output. Thus, obesity occurs when a person consumes a greater amount of calories than what he/she requires for physical activity and metabolic functions. The Body Mass Index (BMI) is the most widely used tool for indicating the health risks associated with overweight and obesity (Health Canada, 2003). The BMI is a practical method for estimating health risk independent of height for most adults; however, there may be some limitations with using the BMI in groups such as those over 65 years of age and people with high levels of muscle mass, so this must be kept in mind when interpreting the data. Excess abdominal fat is associated with heart disease, hypertension, and diabetes (Health Canada, 2003). Waist circumference (WC) is a method for assessing abdominal fat, and can be used in combination with BMI or on its own as a health risk indicator (Health Canada, 2003).

This chapter addresses the weight status and fat distribution of NB adults, and how these factors compare to reported energy and fat intakes. There is also a discussion of physical activity levels according to the data collected from the Health Questionnaire conducted as part of the NB Nutrition Survey.

### 6.1 PROCEDURES

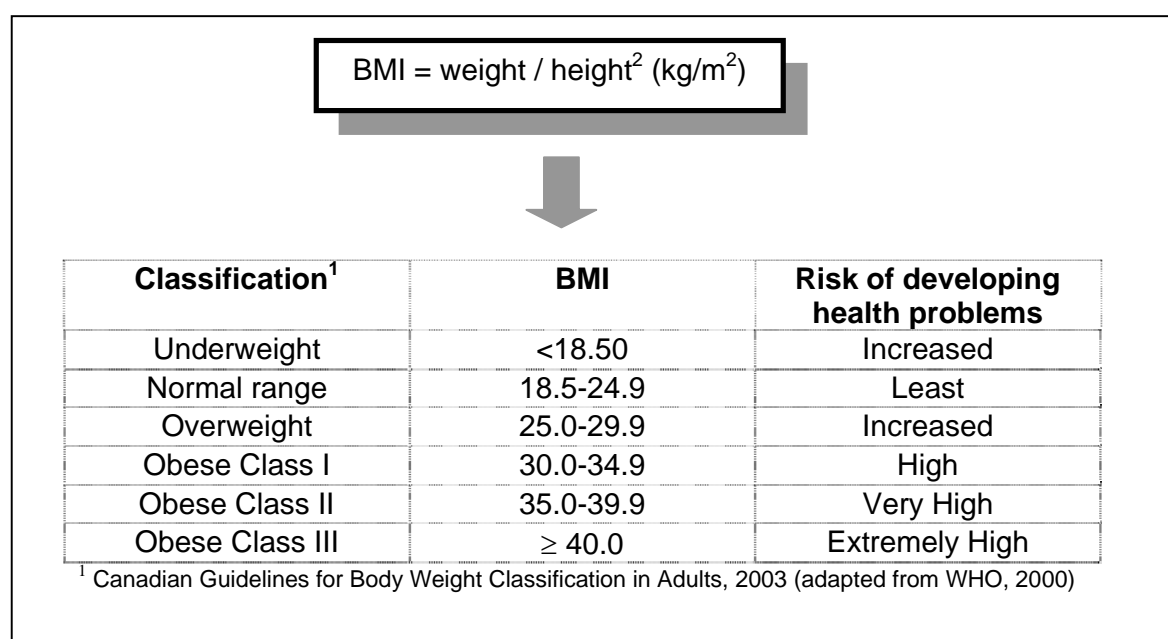
Energy intakes were assessed using the 24-hour recall method described (see Chapter 2). Basal metabolic rates (BMR) for each person were calculated using the Schofield equation which considers age, height and weight (Schofield, Schofield, and James, 1985).

Weight was assessed without heavy clothing using portable spring scales, which were calibrated weekly using a 20 kg weight. Interviewers followed a specified method using a measuring tape with a lock and stainless steel foot plate to determine height. In cases where it was not possible to obtain an individual's actual height or weight, the reason for this was noted on the form and self-reported measurements were recorded if the person was willing to provide this. Height and weight measurements were available for all 1,816 of the useable interviews, 84.5% of which were actual measurements and the remainder was self-reported. WC was taken at the point of noticeable waist narrowing or between the ribs and iliac crest. WC was calculated using the average of at least two measurements. Hip girth was also measured, as at the time the NB Nutrition Survey was conducted, hip-waist ratios were the tool used to predict health risk. Anthropometric measurements were recorded on the Demographic Profile questionnaire (see Appendix A).

## 6.2 BODY MASS INDEX

Body Mass Index (BMI) is the most commonly used tool to assess health risk according to weight status. This report uses the recently published Canadian Guidelines for Body Weight classification in Adults (2003b), which are based on the widely accepted system developed by the World Health Organization (2003). Figure 6.1 shows the BMI classification used for the NB Nutrition Survey.

Figure 6.1 Body Mass Index (BMI)



Body Mass Index (BMI) for the participants in the NB Nutrition Survey is described in Table 6.1, using the WHO categories described in Figure 6.1, as well as the mean BMI values by age and gender.

Approximately 32% of the NB adult population (26% of males and 38% of females) was at an acceptable body weight according to the NB Nutrition Survey results. Overall, a greater percentage of men than women were overweight or obese. The total proportion of individuals in NB considered overweight according to the Canadian and WHO standards was 41%, with 45% of males and 36% of females falling into this category. The rate of obesity was 27% overall, and the difference between the genders was smaller in this classification, with 28% of men and 25% of women falling into the obese categories. Thus, the percentage of people who were obese was similar to the percentage who were at an acceptable weight, with a difference of only 5%. Adults with a BMI < 18.5 are classified as underweight and are also at a higher risk level. Very few NB adults were underweight, with less than 1% of men and less than 2% of women in this category.

The percentage of overweight adults increased with age for both genders. A greater percentage of men than women were overweight in each age group, although the difference decreased with age. The percentage of overweight men aged 18-34 years was 14% greater than for women of the same age, while the difference between the percentage of overweight men and women aged 65-74 years was only 4%. The pattern for the rate of obesity differed from that of overweight. Table 6.1 shows that while a slightly greater percentage of men than women were mildly obese (obese class I), in the more severe categories of obesity (obese classes II and III) the percentage of women was slightly higher. The biggest differences in obesity rates between genders were for those aged 18-34 years, with 11% more men than women in this age group in obese class I, and a total of 7% more men in all three classes of obesity compared to women in this age group. Overall, the percentage of obese adults (BMI  $\geq$  30.0) increased with age for both genders, but it peaked at the 50-64 year age group (35% of men and 31% of women) and then decreased again by about 10% for the male and female groups aged 65-74 years. There may be a number of factors contributing to the drop in obesity rates observed in the oldest age group. It is possible that more obese people in the oldest age group suffered from severe illness (i.e. ineligible for the survey), that intake and weight may have declined with lower incomes or illness, or that the mortality rate was greater for people aged 65-74 years for whom both age and obesity were risk factors.

Table 6.1 NB Body Mass Index<sup>1</sup>, 1996-97  
(Population Percent by Age and Gender)

	Males				Females			
	18-34y (n)	35-49y (163)	50-64y (247)	65-74y (260)	18-34y (183)	35-49y (194)	50-64y (283)	65-74y (297)
% Underweight	1	<1	0	1	2	1	<1	2
% Normal	32	26	20	25	52	35	33	30
% Overweight	42	45	46	48	28	36	36	44
% Obese I	20	21	26	20	9	16	20	18
% Obese II	4	5	7	3	5	8	7	3
% Obese III	1	3	2	2	4	4	4	2
Mean BMI	27.2	28.0	28.7	27.8	26.0	27.8	28.2	27.5

<sup>1</sup> Canadian Guidelines for Body Weight Classification in Adults, 2003

The 1996/97 National Population Health Survey (NPHS) used the same BMI classification definitions (Statistics Canada, 1999a). The NPHS found that 38% of New Brunswickers were at an acceptable weight, compared to the overall 32% found in the NB Nutrition Survey. According to the NPHS, 40% of New Brunswickers were overweight, which is in agreement with the overall percentage of overweight adults determined by the NB Nutrition Survey (41%). The percentage of obese adults in NB was found to be 20% by the NPHS and this rate was found to be higher according to the NB Nutrition Survey (27%). A factor

that might explain the difference in the prevalence of obesity observed between the two surveys, is that the NB Nutrition Survey results were based mainly on anthropometric measurements taken by health professionals, while the NPHS relied entirely on self-reported heights and weights. Results based on self-reported data typically underestimate rates of overweight and obesity by about 10% (Statistics Canada, 1999a). Although the NB Nutrition Survey was conducted in 1996/97, recent statistics indicate that the rates of overweight and obesity remain high. According to self-reported data collected by Statistics Canada (2000/01), 34.7% of NB adults aged 20-64 years are overweight and 20.7% are obese. The results from Statistics Canada (2000/01) show that the percentage of overweight men in NB still exceeds the percentage of overweight women (41.2% versus 28.1%), while rates of obesity in NB are similar (20.6% for men and 20.8% for women).

### 6.3 WAIST CIRCUMFERENCE (WC)

In the past, waist to hip ratio was commonly used to determine fat distribution, however recent research has shown that WC is a better and more practical measurement (Health Canada, 2003b). High levels of abdominal fat, including both subcutaneous fat and visceral fat around internal organs, are associated with increased risk for heart disease and diabetes (Health Canada, 2003b). Thus WC, which indicates both total abdominal fat and visceral fat, can be used as an independent method for evaluating the risk of developing obesity-related health problems (Health Canada, 2003b). At the time of the NB Nutrition Survey the practice was to take WC at the point of noticeable narrowing at the waist or between the ribs and iliac crest (about two fingers before the iliac crest), however when using the newer recommendations the measurement is taken mid-way between the lower costal margin and the iliac crest. Figure 6.2 shows health risk classification according to waist circumference. In addition to the Canadian Guidelines for Body Weight Classification in Adults' cut-off points for WC, Figure 6.2 and Table 6.3 include lower cut-off points suggested by the World Health Organization (WHO), to reflect a continuum of health risk (Health Canada, 2003b).

As seen in Table 6.2, 28% of males and 24% of females had a WC measurement that placed them at an intermediate level of risk, which increased their risk of developing health problems according to WHO. Approximately 28% of males and 34% of females in NB had WCs above the highest cut-off points, indicating a substantially increased risk for developing chronic diseases according to the WHO classification system. The percentage of adults in both the intermediate and highest level of risk increased with age. When both levels of risk are considered together, just under 40% of men and women aged 18-34 years had WCs that put them at risk; the percentage then climbed steadily with age, up to 70% for men and women aged 65-74 years. Overall, over half the NB adult population is either at intermediate or high risk according to their WC measurements (55% of men and 58% of women).

All age-gender groups of New Brunswickers had a mean WC that was below the highest cut-off measurement, however only the youngest groups of males and females (aged 18-34 years) had mean WCs that were below the intermediate level of risk.

Figure 6.2 Health Risk Classification According to Waist Circumference (WC)<sup>1</sup>

For BMI's in the 18.5-34.9 range. For BMIs  $\geq 35$ , WC measurement does not provide additional information regarding level of risk.

WC Cut-Off Points	Health Risk
Men: $94 \text{ cm} \leq \text{WC} < 102 \text{ cm}$ Women: $80 \text{ cm} \leq \text{WC} < 88 \text{ cm}$	WHO Classification: Increased risk of health problems*
Men $\geq 102 \text{ cm}$ Women $\geq 88 \text{ cm}$	WHO Classification: Substantially increased risk of health problems Canadian Classification <sup>1</sup> : Increased risk of health problems

\* Risk for type 2 diabetes, coronary heart disease, hypertension

<sup>1</sup> Canadian Guidelines for Body Weight Classification in Adults, 2003 (adapted from WHO, 2000)

Table 6.2 NB Waist Circumference (WC), 1996-97  
(Population Percent by Age and Gender)

WC (n)	Males				Females			
	18-34y (163)	35-49y (247)	50-64y (260)	65-74y (183)	18-34y (-194)	35-49y (283)	50-64y (297)	65-74y (189)
Men: $94 \text{ cm} \leq \text{WC} < 102 \text{ cm}$ Women: $80 \text{ cm} \leq \text{WC} < 88 \text{ cm}$	19	26	31	34	17	22	28	29
Men: $\geq 102 \text{ cm}$ Women: $\geq 88 \text{ cm}$	20	22	35	34	22	31	40	42
Total	39	48	66	68	39	53	68	71
Mean WC (cm)	90.9	94.9	98.8	98.5	78.9	83.8	86.6	86.6

Figure 6.3 shows health risk level taking both BMI and WC into consideration. A high WC can indicate a higher level of health risk, despite an acceptable BMI. Only Obese Class I is included in this table, because for individuals with a BMI  $\geq 35$ , WC does not provide any further information regarding risk level. People who fall into the BMI categories of Obese Class II and III are at very high to extremely high risk independent of WC measurements. As seen in Table 6.3, approximately 26% of males and 38% of females were at the lowest risk level according to this method of assessment (the same as using BMI alone). The



greatest percentage of males (40%) were at an increased level of health risk. This is 5% less than using BMI alone, which means that the higher waist circumferences in this percentage of overweight men moved them to a higher level of health risk. Although fewer females fell into the category of increased risk, the numbers were still high with 26% of women having increased health risk according to their BMI and WC in combination. This is 10% less than was calculated using BMI alone, which suggests that this percentage of overweight women had a WC that moved them to a high level of risk. This pattern seems to continue with rising BMI, so that the very high risk category calculated by applying the BMI and WC together, includes about three times the percentage of men and women than if only BMI is considered (18% of men versus 5% using BMI only; 17% of women versus 6% using BMI only).

Figure 6.3 Health Risk Classification According to Body Mass Index and Waist Circumference<sup>1</sup>

Waist Circumference (WC)	Body Mass Index (BMI)		
	NORMAL	OVERWEIGHT	OBESE CLASS I <sup>2</sup>
< 102 cm (Males) < 88 cm (Females)	Least risk	Increased risk	High risk
≥ 102 cm (Males) ≥ 88 cm (Females)	Increased risk	High risk	Very high risk

<sup>1</sup> Canadian Guidelines for Body Weight Classification in Adults, 2003 (adapted from National Institutes of Health, National Heart, Lung and Blood Institute, 1998).

<sup>2</sup> Only Obese Class I is included, since for those with BMI ≥ 35, WC measurement does not provide additional information regarding level of risk (Obese Class II and Obese Class III are at very high to extremely high risk independent of WC).

Table 6.3 NB Health Risk According to BMI and Waist Circumference  
(Population Percent by Age and Gender)

Level of Health Risk (n)	Males (783)	Females (834)
Increased Risk (Underweight)	<1	2
Least Risk	26	38
Increased Risk	40	26
High Risk	14	13
Very High Risk	18	17
Extremely High Risk	2	4

#### 6.4 PHYSICAL ACTIVITY

The NB Nutrition Survey, Nutrition and Health Questionnaire (see Appendix A) included questions related to physical activity. Figure 6.4 and 6.5 show the results of two of these questions for male and females in each age group. The first bar of the chart shows the percentage of those who reported that they participate in low intensity physical activity for a minimum of 15 minutes, at least 3 times per week (including walking, golfing, gardening, bowling, etc.). The second bar of the chart shows the percentage who reported involvement in high intensity activity for a minimum of 15 minutes, at least 3 times per week (including brisk walking, tennis, jogging, swimming, cycling, basketball, aerobics, etc.). This frequency/duration of activity was used to make observations in this report, as it is similar to that used in other surveys in the past, however it is important to note the amount is low compared to Health Canada's recommendation. It is advised that at least 60 minutes of physical activity be accumulated each day for health benefits (Health Canada, 1998). For older adults, Health Canada advises a cumulative total of 30 to 60 minutes of activity most days (Health Canada, 1999). Because of the limited information provided by the NB Nutrition Survey's questions regarding physical activity, it was not possible to evaluate New Brunswickers' activity levels using the 60 minute/day guidelines. It is not possible to determine what percentage of those who indicated they were active for a period 15 minutes or more actually met the total goal of 60 minutes/day. For future studies it would be helpful to ask more precise questions about the frequency and intensity of physical activity, to make observations about the percentage of adults in NB who actually meet the Health Canada recommendation.

According to the data collected from the NB Nutrition Survey just over half of New Brunswickers participated in low intensity activity three times per week or more (52% of

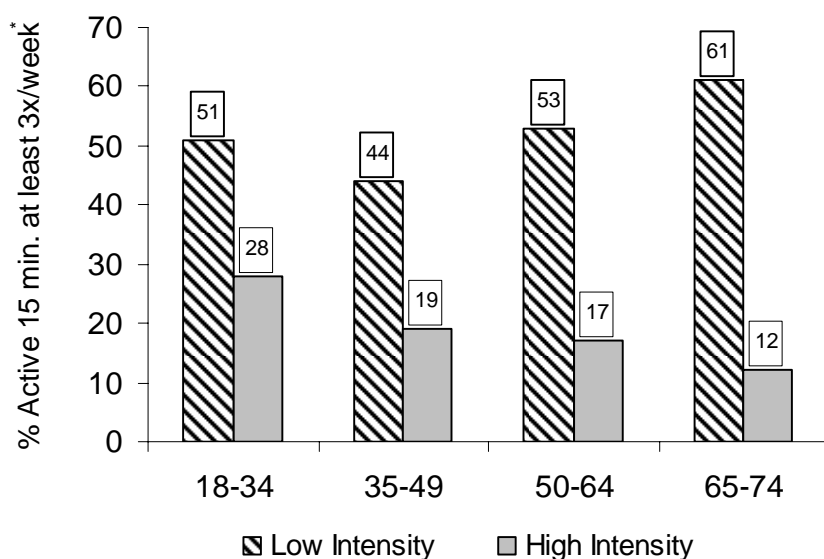
males and a slightly higher percentage of females at 56%). The percentages are consistent across the age groups, although the percentage of men who reported participating in low intensity activity is highest in the oldest age group. A much lower percentage of the population participated regularly in high intensity activities (19% of males and 22% of females). The number of people involved in high intensity activity tended to decrease with age for both males and females. It is not appropriate to determine percentages of overall activity using these results, as there is likely to be some overlap because some people would have reported participating in both low and moderate intensity activities. As with self-reported intakes, it is important to consider there is a risk of error with using self-reported activity levels. Studies have found that age and weight can affect people's ability to accurately estimate their physical activity levels; overestimation of activity tends to be greater with older age and higher body fat levels (Irwin, Ainsworth & Conway, 2001). If self-assessment of physical activity by participants in the NB Nutrition Survey was affected by factors such as these, the actual levels of activity for this population may have been even lower than has been estimated here.

The results of the NB Nutrition Survey suggest that a greater percentage of women than men participated in both low and high intensity activity. This does not reflect the typical finding that men are more likely to be physically active than women. For example, according to the 1994/95 National Population Health Survey (NPHS), 22.7% of men in NB were physically active compared to only 14.4% of women and 19.6% of men were moderately active versus 18.9% of women (Statistics Canada, 1999b). While data from the recent Canadian Community Health Survey (CCHS) show Canadian women are catching up to men in terms of physical activity levels (Statistics Canada, 2002), in NB the percentage of physically active men continues to be higher than for women at 17.8% versus 13.4% (Statistics Canada, 2002). The recent Statistics Canada data (2002) shows, however, that when only a moderate activity level is considered, the percentage of women is higher than that for men in NB (20.1% compared to 17.7%). This information is presented to make observations about trends only; direct comparisons between the NB Nutrition Survey and NPHS or CCHS cannot be made because the age range used to define the adult population and definitions of physical activity levels differ.

Other national surveys have used different criteria to evaluate the levels of activity for Canadian adults. If the minimum requirement used to define regular activity for the NB Nutrition Survey is considered (light intensity for at least 15 minutes, three times per week) and recognize that some of the respondents may have stated they were involved in only high intensity activity, this indicates that a maximum of 46% of the population could be classified as inactive. The findings of other surveys suggest that this is an underestimate. The Canadian Community Health Survey (CCHS) defined regular physical activity as at least 60 minutes of light or 30 minutes of moderate exercise daily, and found as many as 61% of New Brunswickers aged 12 years and over were inactive in 2000 (Health Canada, 2003). The National Population Health Survey (NPHS) defined regular activity as participation in physical activity for more than 15 minutes at least 12 times per month, and considered the population 12 years and over (Statistics Canada, 1998). Similar to the CCHS, the NPHS determined that 62.5% of New Brunswickers were physically inactive.

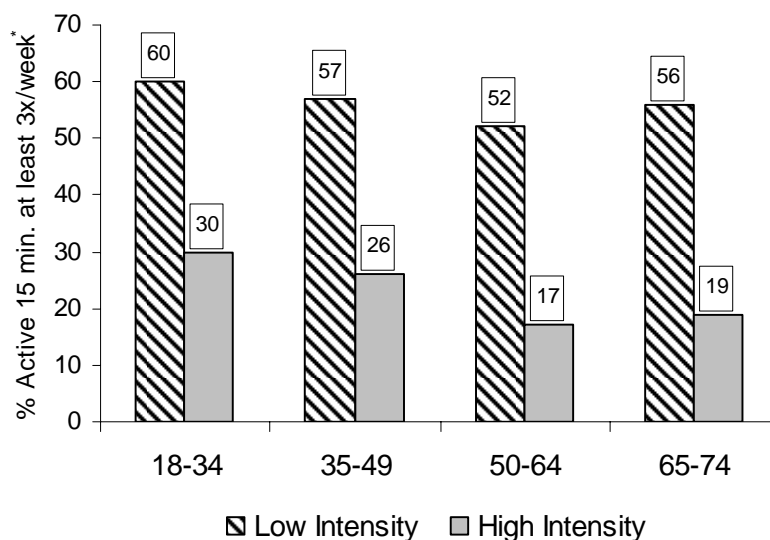
The NPHS also categorized levels of activity based on energy expenditure (Statistics Canada, 1998). The percentages of males and females who were moderately physically active according to the NPHS, 17% of males and 18% of females, were close to the findings of the NB Nutrition Survey for high intensity activities (Statistics Canada, 2001b). Even with the very low standard used here to observe activity, only small numbers of the NB populations could be considered to be involved in regular physical activity. It is likely that at least some of those who reported participating in at least 15 minutes did not accumulate an entire hour, and thus it is clear that a great percentage of New Brunswickers did not achieve the 60 minutes of daily physical activity Health Canada recommends. Although the NB Nutrition Survey was conducted in 1996/97, more recent surveys show that inactivity is a major concern in this population. According to Statistics Canada (2002), only 39% of adults in NB can be classified as being physically active compared to a national average of 43%. The percentage of New Brunswickers who are physically active is the lowest in the country (Statistics Canada, 2002).

Figure 6.4 Reported Physical Activity of NB Males (Population Percent by Age)



\* Does not reflect Health Canada recommendation to accumulate 60 minutes of physical activity daily (30-60 minutes/day for older adults).

Figure 6.5 Reported Physical Activity of NB Females  
(Population Percent by Age)



\* Does not reflect Health Canada recommendation to accumulate 60 minutes of physical activity/day (30-60 minutes/day for older adults).

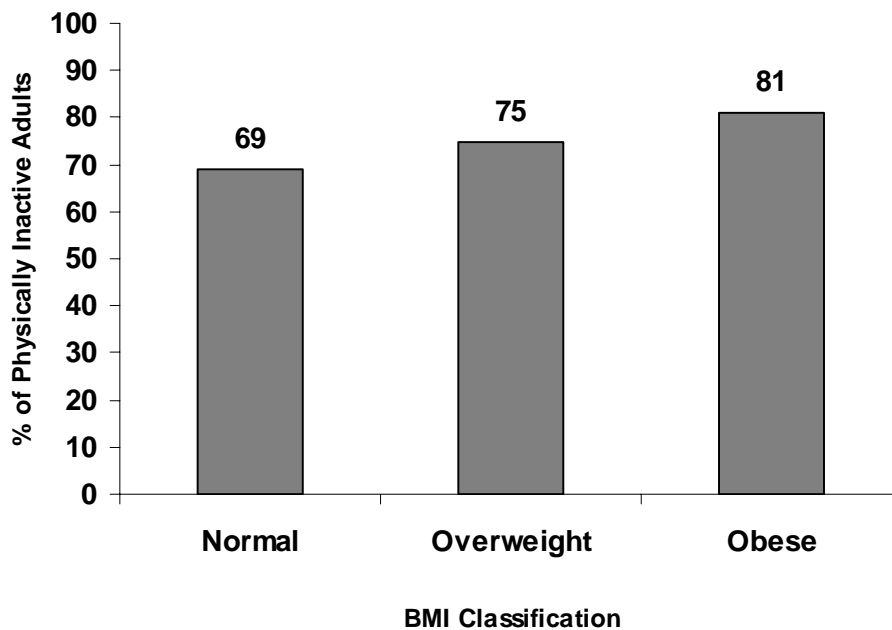
#### 6.4.1 Relationship between Physical Activity and Body Mass Index (BMI)

As discussed in Chapter 5, overall energy intakes and the percentages of energy coming from each of the macronutrients was similar between adults in NB and those in other provinces surveyed. Despite this, New Brunswickers are known to have some of the highest rates of overweight and obesity in Canada (GPI Atlantic, 2002; Statistics Canada 2000/01). Although genetics may account for some of this difference, it is most likely that energy imbalance is to blame for the rise in overweight and obesity in NB. As energy intake appeared similar according to provincial surveys, a likely explanation is that NB adults did not have an adequate energy expenditure due to lack of physical activity. As explained previously, recent Statistics Canada (2002) data confirms that adults in NB are the least physically active in the country.

Due to the limited data collected regarding physical activity and very rough estimate of energy expenditure used in this survey, it is not possible to investigate the extent to which inactivity is contributing to the rise in overweight and obesity in NB. Section 6.5 provides only a general estimate of energy intakes with the assumption that all adults in NB are sedentary. Further studies need to be conducted in order to determine whether, if intakes of all adults in the province are similar, the difference in BMIs can be explained by activity level. Figure 6.6 compares the percentage of physically active adults in NB according to BMI categories. As expected, those with a BMI in the normal range had the lowest

percentage of inactive individuals (under 70%), more of the overweight population was inactive (75%), and over 80% of those in the obese category were inactive.

Figure 6.6 Percent of Physically Inactive Adults by BMI



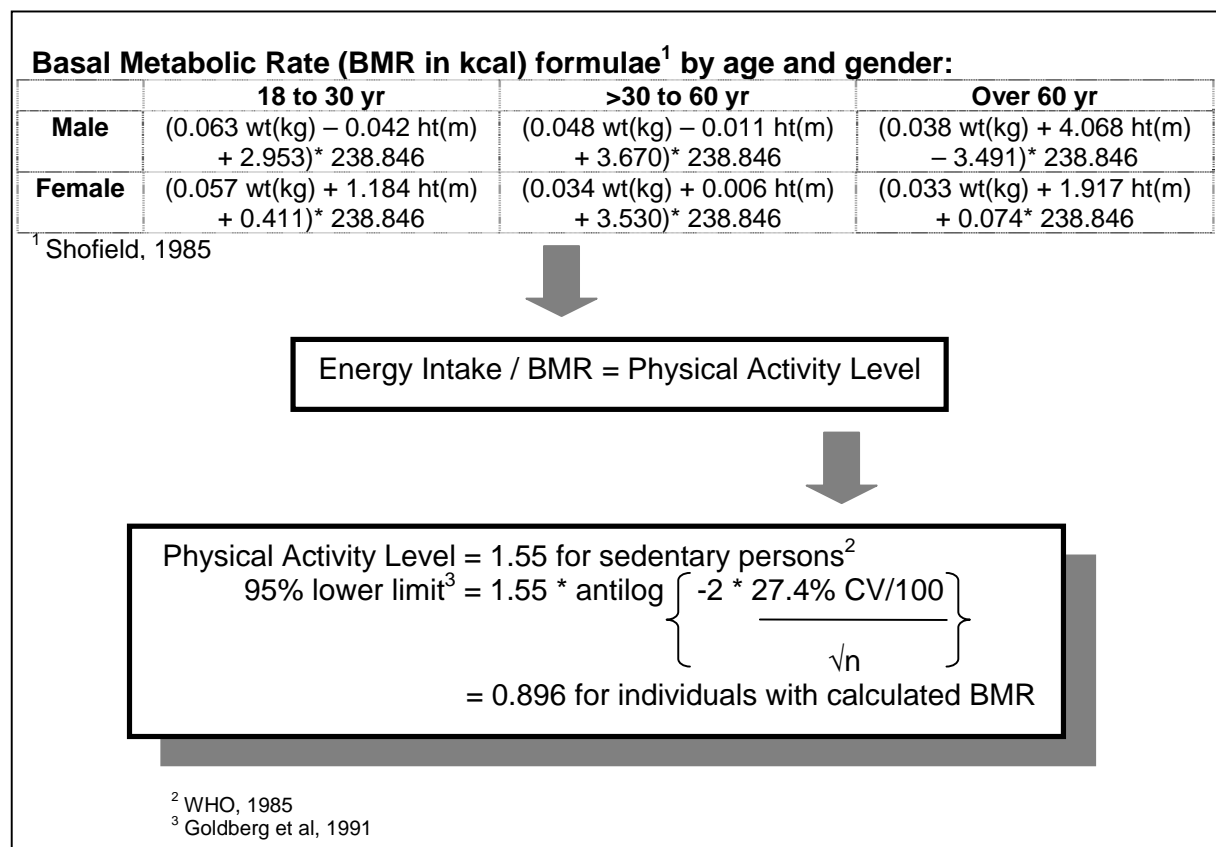
## 6.5 ENERGY INTAKE

### 6.5.1 Comparison of Reported Energy Intake to Expenditure

To evaluate the potential level of under-reporting of energy intakes, the ratio of energy intake (EI) to basal metabolic rate (BMR) was determined following the method used by the PEI Nutrition Survey (2002). The formula used to calculate this is shown in Figure 6.7.

The new Dietary Reference Intakes (DRI) provide a formula to determine total energy expenditure (TEE) which is equal to the BMR and activity level. The DRI formula for determining the estimated energy requirement (EER) uses different physical activity level (PAL) factors, which start at an interval of 1.0-1.39 for sedentary persons. This method of calculating BMR was not used in this report, however, as the formula incorporates the age and weight of individuals versus groups of adults.

Figure 6.7 Metabolic Calculations



Source: PEI Nutrition Survey, 2002

Table 6.4 shows the results of the comparison between mean EI and BMR. The ratio of EI to BMR did not follow a consistent pattern across age groups for either gender. The ratio was higher for the youngest (aged 18-34 years) and oldest (aged 65-74 years) age groups of both genders. Females of all ages had lower mean EI to BMR ratios than did males. The very low EI/BMR ratios observed raise concern about the level of under-reporting in the NB Nutrition Survey, particularly among women.

The NB Nutrition Survey did not collect detailed information regarding the frequency or duration of physical activity of respondents, and thus observations made are based on a limited, general estimation of energy expenditure. The Food and Agriculture Organization/United Nations University/World Health Organization (FAO/UNU/WHO) recommend the use of PAL for determining TEE of adult populations, however, this method provides only an imprecise estimate, based on other factors with inherent errors of measurement (Scrimshaw, Waterlow, and Schurch, 1996). The use of PAL requires more research, and it is recommended that a more accurate estimation of TEE should use doubly-labeled water and heart rate monitoring studies (Scrimshaw, Waterlow, and

Schurch, 1996). Thus, PAL as used in this report provides only a rough estimate of TEE. According to the FAO/WHO/UNU (1985) definition, the PAL for sedentary men is 1.55 and 1.56 for sedentary women. Because the EI to BMR ratio fell below 1.55 for all groups in the NB Nutrition Survey, it is possible that their energy intakes have been underestimated. Only the youngest groups of males had an EI to BMR ratio close to this PAL, at 1.49. The PAL factor cited by the FAO/WHO/UNU (1985) as necessary for survival is 1.27. With the exception of the 18-34 year age group, all females had an EI to BMR ratio below this, suggesting underestimation of intake. The difference was greatest for females in the 50-64 year old age group, with a PAL of 1.15. Underestimation of intake could be related to a number of factors, including conscious or subconscious under-reporting of intake or a lower than usual intake on the day assessed for interviewees.

Table 6.4 Reported Energy Intake and Estimated Energy Needs by Age and Gender

	Males				Females			
	18-34y (n)	35-49y (247)	50-64y (260)	65-74y (183)	18-34y (194)	35-49y (283)	50-64y (297)	65-74y (189)
Energy Intake <sup>1</sup> (kcal/d)	2836	2597	2316	2135	1903	1662	1609	1605
Basal Metabolic Rate (BMR) <sup>2</sup> (kcal/d)	1929	1857	1829	1598	1462	1432	1413	1298
Energy Intake/ BMR (ratio)	1.49	1.41	1.28	1.35	1.33	1.19	1.15	1.26

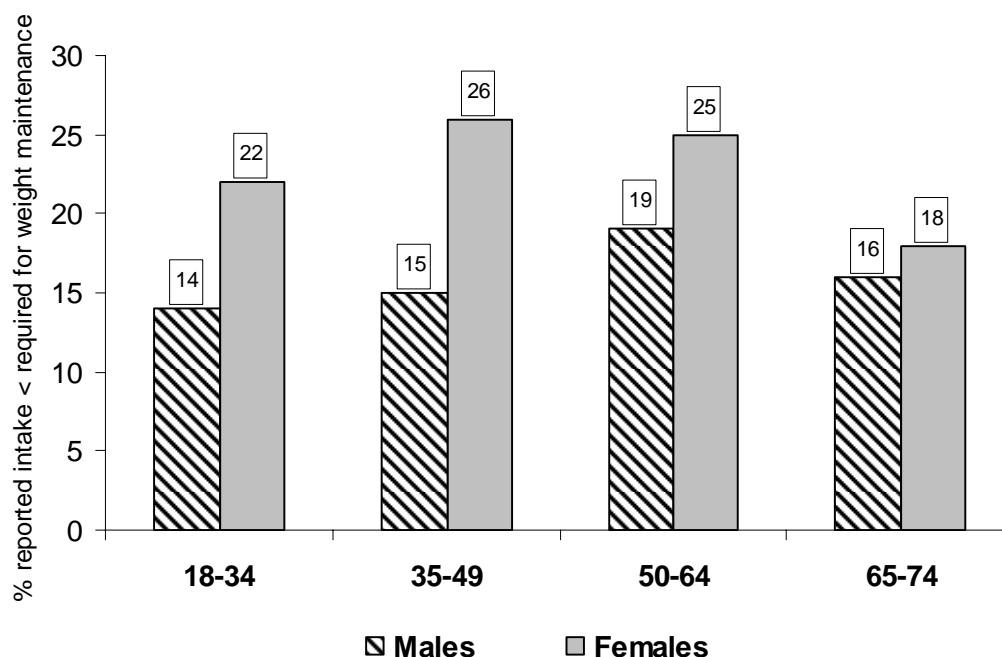
<sup>1</sup> mean intake based on single day recalls from food sources only

<sup>2</sup> Schofield, 1985

Figure 6.8 compares the percentage of reported energy intakes of the age-gender groups to the intake that would be required for weight maintenance. Assuming that the average NB adult leads a sedentary lifestyle, the overall difference between reported energy intakes and the amount of energy required for weight maintenance was approximately 19%. In all age groups, the difference between these two values was greater for women (23% of women versus 16% of men). The 65-74 year old females had a rate that was similar to that of the males, but the younger groups of females showed much higher differences between reported energy intakes versus estimated energy requirements. The differences between reported intake values and estimated energy needs did not follow any pattern according to age groups.



Figure 6.8 Reported Energy Intake<sup>1</sup> Less Than Intake Required for Weight Maintenance (Population Percent by Age and Gender)



<sup>1</sup> single day intake used to calculate 95% lower limit for individuals – Goldberg et al, 1991

### 6.5.2 Relationship Between Energy Intake and Body Mass Index (BMI)

The mean energy intake according to BMI categories is shown in Table 6.5. For men, energy intakes appear similar for the normal, overweight, and obese categories of BMI within each age group. Energy intake of the underweight males includes the lowest and highest intakes, however, the numbers in this category are so low that it is not accurate to generalize about these groups. Women's intakes were similar within age groups for the normal, overweight, and obese categories, with the exception of obese women in the 35-49 year age group who reported the lowest intake of any group. Intakes of underweight women varied as it did for men, but again due to lower sample sizes it is not possible to make generalizations about the reported intakes of women in this category. Without including the underweight group, overall intakes decreased with age in each age-gender-BMI category, with the exception of obese women, for whom there was no such pattern. It is important to keep in mind, that the observations made here used self-reported intakes. It has been found that women, and men to an even greater degree, are more likely to under-report their intake with increasing levels of overweight and obesity (Braam, Ocké, Buene-de-Mesquita & Seidell, 1998). Table 6.5 is not adjusted for under-reporting, and it is obvious that many of

the values would not be supported by metabolic evidence (for example, obese women report daily energy intakes of only 1500-1600 Kcal).

Table 6.5 also shows mean fat intakes as percentage of calories according to age, gender, and BMI. Fat intakes as a percentage of calories were similar among all groups (with the exception of the smallest sample, underweight males). For the majority of age-gender groups, the highest reported percentage of fat intakes was in the underweight categories, although this must be interpreted with caution due to the small sample sizes. If the small samples of underweight people are not considered, the percentage of energy coming from fat was higher for males than females in all groups. There was a small decrease in percentage of fat with age for both genders. The only groups having a fat intake less than 30% of energy intakes were the 65-74 year old underweight men and almost all women in the 65-74 year old age group (with the exception of those classified as underweight).

Table 6.5 Mean Energy\* and Fat Intake<sup>1</sup> by BMI<sup>2</sup>

	Males				Females			
	18-34y (n)	35-49y (163)	50-64y (247)	65-74y (260)	18-34y (183)	35-49y (194)	50-64y (283)	65-74y (297)
<b>Energy Intake (kcal)</b>								
Underweight	1782	3442	-	1677	2755	1667	1984	1641
Normal	2824	2626	2372	2280	1993	1777	1619	1783
Overweight	2924	2622	2312	2113	1864	1734	1644	1524
Obese	2736	2536	2328	2071	1601	1499	1565	1607
<b>Fat Intake (% of calories)</b>								
Underweight	38.4	43.9	-	29.5	34.1	31.1	32.5	31.1
Normal	33.6	33.4	32.4	30.5	31.3	31.7	30.9	28.3
Overweight	32.9	33.4	32.3	31.8	32.1	31.7	30.1	29.2
Obese	33.7	33.6	33.2	32.8	31.9	32.8	30.9	29.9

\* mean energy intake has not been adjusted for under-reporting

<sup>1</sup> intake based on single day recalls from food sources only

<sup>2</sup> Body Mass Index, World Health Organization, 1998

Overall, energy intake and the percentages of energy coming from each of the macronutrients was similar between adults in NB and those in the other provinces surveyed. Despite this, New Brunswickers have some of the highest rates of overweight and obesity in Canada (GPI Atlantic, 2002; Statistics Canada 2000/01). Although genetics may account for some of this difference, it is most likely that energy imbalance is largely to blame for the rise in overweight and obesity in NB. Table 6.6 compares overall energy and macronutrient

intake according to BMI classification. As expected, it shows that reported energy and individual macronutrient intakes were lowest for adults with a normal BMI and highest for those who were overweight. The reportedly lower energy intake of the obese group compared to the overweight group may be related to the increasing likelihood of under-reporting of intakes as the level of excess weight increases. If the results are observed without adjusting for under-reporting, it appears that intakes across the different BMI categories were similar overall. Thus, as intakes between provinces and across BMIs were comparable, the factor likely contributing the greatest impact on poor energy balance in NB was higher rates of physical inactivity. It will be helpful in future to conduct detailed studies of the physical activity levels of New Brunswickers to gain a better understanding of the extent of the problem.

Table 6.6 Overall Energy\* and Micronutrient Intake<sup>1</sup> by BMI<sup>2</sup>

	<b>Normal BMI</b>	<b>Overweight</b>	<b>Obese</b>
(n)	(505)	(707)	(589)
Energy Intake (Kcal)	2075	2159	2003
Fat Intake (g)	72.9	77.2	73.2
Carbohydrate Intake (g)	265	270	248
Protein Intake (g)	78.7	83.3	80.4

\* mean energy intake has not been adjusted for under-reporting

<sup>1</sup> intake based on single day recalls from food sources only

<sup>2</sup> Body Mass Index, World Health Organization, 1998

## 6.6 SOCIO-ECONOMIC FACTORS

### 6.6.1 Relationship Between Income Level and Body Mass Index (BMI)

The relationship between household income and BMI is complex. Many studies, including the National Population Health Survey (Statistics Canada, 2001a), show higher rates of obesity among those who live in food insecure households. A possible reason for this is that people living in low-income households may select higher energy foods at times when food is available (Statistics Canada, 2001a). According to the National Population Health Survey (Statistics Canada, 1999a) which was completed in 1996/97, the same time as the NB Nutrition Survey, obesity was more common among those living in lower-income households, while overweight was more common with increasing income levels. A recent report by the Canadian Population Health Initiative (2004) suggests overweight and obesity according to income follow the opposite pattern among men and women. The likelihood of being overweight or obese increases with rising income levels in the male population; while women are more likely to be overweight or obese in the lowest income category (Canadian Population Health Initiative, 2004).

## Chapter 6

Tables 6.7 and 6.8 show the percentage of men and women in NB in each BMI classification according to household income levels (see Chapter 4). The percentage of underweight adults in NB was too small to be included in these tables. Among NB men, the distribution pattern of income levels was similar within the normal weight, overweight and obese populations. The percentage of the normal weight male population in the lowest income group was almost double what it was for obese males. Consistent with the findings of the National Population Health Survey, there did appear to be a greater percentage of overweight and obese males in the upper middle/highest income group compared to the percentage of normal weight males at that income level, however the difference was only slight. Overall in NB, income level did not appear to be a strong determinant of overweight and obesity.

Among women, the distribution pattern of income was similar between the normal weight and overweight BMIs. The results in Table 6.8 appear to support the Canadian Population Health Initiative discussed above, which found that women in the lowest income categories are more likely to be overweight or obese. Approximately double the percentage of overweight and obese women fell in the lowest income group compared to the percentages of overweight and obese men with the lowest incomes. Over half of normal weight and overweight women were in the upper/middle and highest income group. About 15% less of the obese female population lived at the upper middle/higher income level than women who were normal/overweight, and obese women were the only group from both genders with less than half of their population living in upper middle/highest income households. Thus among women in NB, there did appear to be a trend between excess weight and lower income levels. The findings suggest that overweight/obese women are more likely to live in the lowest income households than men in the same BMI categories, and that obese women are least likely to live in upper middle/highest income households. It is important to note that this observed difference in income distribution by BMI is limited, and thus healthy energy intake and regular physical activity must be promoted across the entire female adult population in NB regardless of income level.

Table 6.7 BMI of NB Males by Household Income

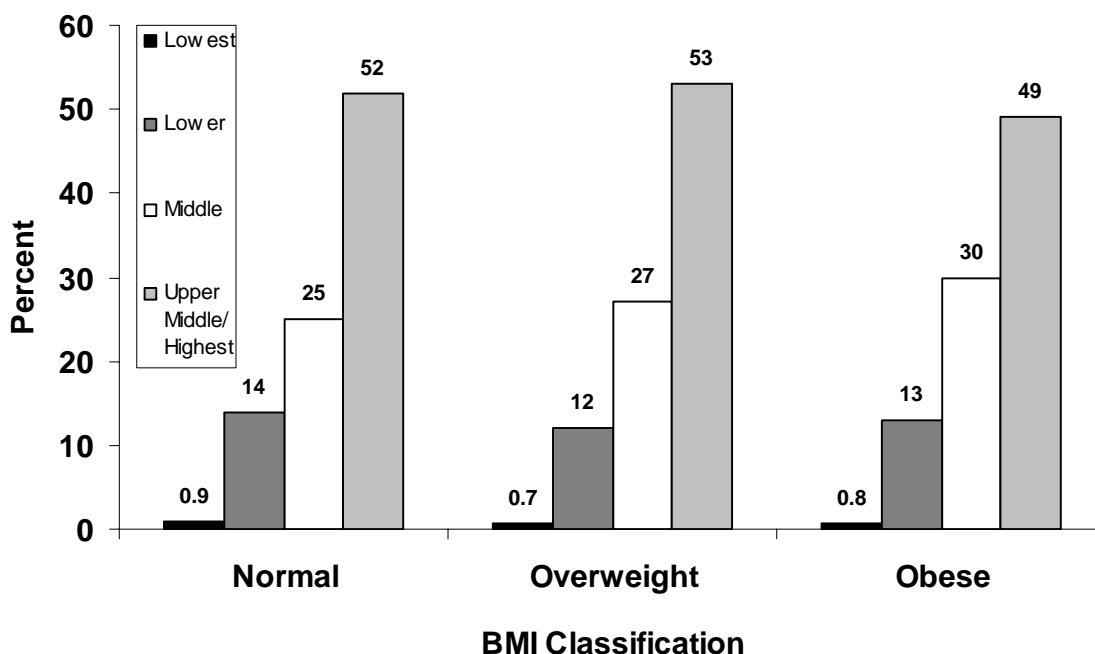
Household Income Level (n)	BMI		
	Normal BMI 18.5-24.9 (219) %	Overweight BMI 25-29.9 (383) %	Obese BMI ≥ 30 (246) %
Lowest	9	6	5
Lower	15	13	12
Middle	27	29	32
Upper Middle/ Highest	49	52	52

Table 6.8 BMI of NB Females by Household Income

Household Income Level (n)	BMI		
	Normal BMI 18.5-24.9 (384) %	Overweight BMI 25-29.9 (324) %	Obese BMI ≥ 30 (241) %
Lowest	10	10	11
Lower	12	11	18
Middle	24	25	30
Upper Middle/ Highest	55	54	41

Figure 6.9 shows the percentage of the NB adult population at each income level according to BMI. It demonstrates that although there was a slightly lower percentage of obese people living in upper middle/highest income households, overall the distribution of BMI was similar across each of the income levels. This suggests that NB adults at all income levels appear to be similarly affected by high rates of overweight and obesity. Again, this reinforces that the key to addressing the rising rate of overweight and obesity among NB adults is by promoting healthy eating and physical activity at all income levels.

Figure 6.9 Income by BMI



### 6.6.2 Relationship Between Education Level and Body Mass Index (BMI)

The National Population Health Survey (Statistics Canada, 1999a) carried out around the same time period as the 1996/97 NB Nutrition Survey, showed Canadians were more likely to have a normal BMI as level of education increased. This is consistent with patterns reported by other researchers (Expert Panel of National Institutes of Health in Statistics Canada, 1998 and Cairney & Wade, 1998 in Statistics Canada, 1999a). An explanation proposed for this finding is that as level of education rises, individuals have more exposure to messages about the importance of a healthy lifestyle (Statistics Canada, 1999a).

Tables 6.9 and 6.10 show BMI classification according to the highest level of education completed. The percentages of normal weight, overweight and obese men who completed only elementary school was approximately the same. While a greater percentage of normal weight men completed secondary school, this pattern was not repeated at the post-secondary level of education. The percentage of overweight and obese males who completed post-secondary school exceeded the percentage of those at a normal BMI attaining this same level of education. Thus, the results determined for men in NB do not follow the trend toward normal BMI with increasing education level determined by Statistics Canada. For women in NB, however, there does appear to be an association between higher education levels and healthier weights. Greater percentages of overweight and obese females completed no higher than an elementary school level compared to those at a

normal weight. The percentages of women who completed post-secondary school decreased with increasing BMI classification.

Table 6.9 BMI of NB Males by Highest Level of Education

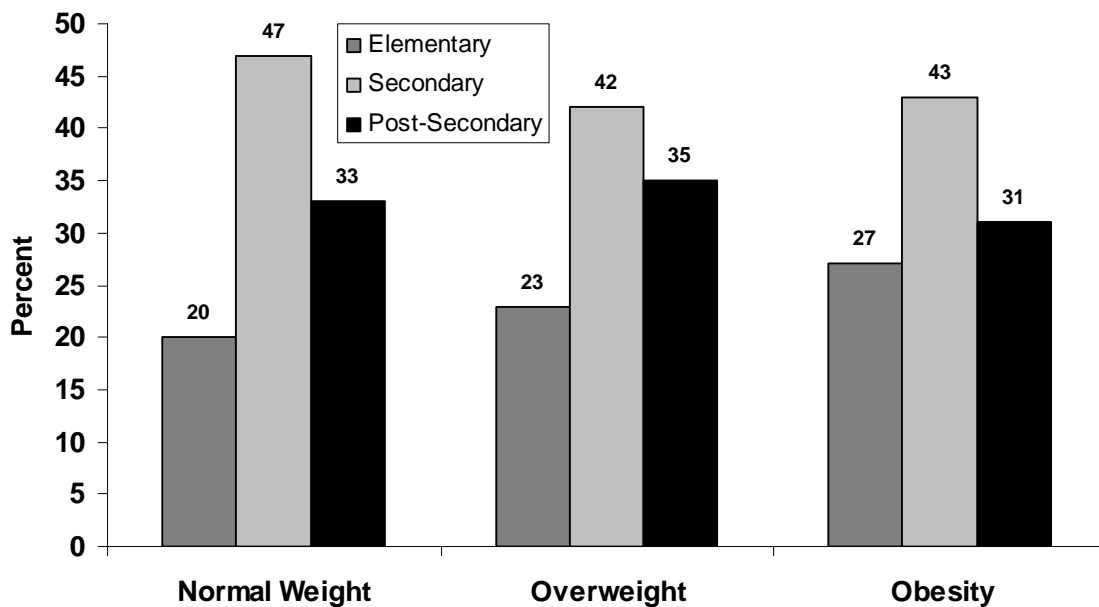
Level of Education Completed (n)	BMI		
	Normal BMI 18.5-24.9 (220) %	Overweight BMI 25-29.9 (383) %	Obese BMI ≥ 30 (246) %
Elementary	26	25	25
Secondary	47	40	42
Post-Secondary	27	34	33

Table 6.10 BMI of NB Females By Highest Level of Education

Level of Education Completed (n)	BMI		
	Normal BMI 18.5-24.9 (397) %	Overweight BMI 25-29.9 (324) %	Obese BMI ≥ 30 (241) %
Elementary	16	20	32
Secondary	48	45	40
Post-Secondary	36	35	28

Figure 6.10 shows the educational levels of adults in NB according to BMI classification. Consistent with the trend determined by Statistics Canada, the percentage of adults who had only an elementary level of education appeared to increase as BMI increased from normal weight to obese. However, while more of the normal weight population completed at least a secondary level of education compared to overweight and obese adults, there was no such pattern at the post-secondary level. Overall, the differences were small, which suggests that the link between education and weight was not strong. Thus, it is important that strategies be designed to promote healthy eating and physical activity for all NB adults regardless of the level of education they have completed.

Figure 6.10 Level of Education by BMI





# **7** FREQUENCY OF FOODS CONSUMED

This chapter presents the results from the Food Frequency Questionnaire (Appendix A), which assessed the frequency of consumption of selected foods over the past month.

## 7.1 MEASURING FOOD FREQUENCY

The food list used was limited and was not intended to provide a comprehensive assessment of representatives from the various food groups in Canada's Food Guide to Healthy Eating. We cannot calculate the number of servings consumed for each food group, compare servings consumed to the recommended number for each food group from Canada's Food Guide to Healthy Eating, or assess the contribution of individual foods to nutrient intakes. The mean number of portions of selected foods consumed by NB adults are discussed. In most cases food items are grouped according to where they fit into Canada's Food Guide to Healthy Eating.

## 7.2 CONSUMPTION OF VEGETABLES

Vegetable intake focussed on commonly consumed vegetables such as potatoes, good sources of beta-carotene, and cruciferous vegetables. Fruit intake was not assessed, so it is not possible to compare amounts consumed to the recommended 5-10 daily servings from the Vegetables and Fruit group. The mean portions of selected vegetables consumed by age and gender are shown in Table 7.1.

Fried potatoes (deep fried or pan fried) and chips (included tortillas and potato chips) belong to the "Other Foods" group and should not be considered healthy choices, however, they were included here for comparison. By portion, baked or boiled potatoes were the vegetable consumed in the greatest amount by all NB adults. Men consumed more potatoes than women. Not including more nutritious potato choices, women aged 18-49 years and men aged 18-64 years consumed more portions of chips or fried potatoes than they did most healthy vegetable choices. With the exception of the oldest group, men's intake of chips was very high compared to other vegetables. Chip and fried potato intake decreased with age for both genders.

After potatoes, New Brunswickers consumed carrots and green peas in the greatest quantities. Vegetable intake did not follow any pattern according to age groups. Although the differences were small, men consumed greater amounts of most vegetables, with the exception of broccoli, which women ate more of. One of the biggest differences observed was for raw spinach, which was eaten by men aged 35-49 years in much greater amounts than by any other age-gender group. The vegetable eaten in the lowest quantities by women was raw spinach, and among men the vegetable eaten in the least amounts was squash.

Table 7.1 Consumption of Selected Vegetables  
(Mean Number of Daily Portions by Age and Gender)

	Portion Size	Males				Females			
		18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr	18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr
<b>Potatoes</b>									
baked/boiled	1 cup	0.22	0.22	0.19	0.21	0.14	0.14	0.15	0.15
<i>*fried</i>	1 cup	0.13	0.11	0.08	0.07	0.08	0.06	0.05	0.04
<i>*chips</i>	1 oz	0.18	0.16	0.13	0.06	0.11	0.09	0.08	0.04
other (scalloped, mashed, in stews and casseroles)	1 cup	0.09	0.07	0.07	0.07	0.04	0.05	0.05	0.05
<b>Carrots</b>	½ cup	0.10	0.12	0.13	0.12	0.10	0.10	0.12	0.11
<b>Broccoli</b>	½ cup	0.08	0.11	0.09	0.07	0.10	0.09	0.09	0.09
<b>Cabbage</b>	½ cup	0.07	0.08	0.07	0.07	0.07	0.05	0.06	0.06
<b>Cauliflower</b>	½ cup	0.07	0.08	0.07	0.07	0.07	0.07	0.08	0.06
<b>Spinach</b>									
cooked	½ cup	0.07	0.08	0.08	0.06	0.05	0.04	0.05	0.08
raw	½ cup	0.11	0.18	0.08	0.08	0.11	0.10	0.09	0.08
<b>Squash</b>	½ cup	0.05	0.08	0.07	0.08	0.06	0.06	0.07	0.08
<b>Turnips</b>	½ cup	0.07	0.08	0.09	0.09	0.06	0.06	0.07	0.07
<b>Green Peas</b>	½ cup	0.18	0.17	0.17	0.15	0.14	0.14	0.15	0.15
<b>Cooked Greens</b> turnip tops, beet greens, dandelion greens, etc.	½ cup	0.07	0.09	0.08	0.10	0.05	0.09	0.07	0.06

\* These items are not healthy vegetable choices and were included for comparison purposes only

### 7.3 CONSUMPTION OF MEAT AND ALTERNATIVES

Food items evaluated from the Meat and Alternatives group included beef, pork, processed meats, poultry, eggs, fish, shellfish, and beans. The mean portions of selected meat and alternatives consumed by age group and gender are shown in Table 7.2.

It is not possible to estimate whether adults in NB were meeting the daily 2-3 servings guideline of Meat and Alternative choices from Canada's Food Guide to Healthy Eating using this information. Alternatives such as nuts, peanut butter, and tofu were not included in the questionnaire. Some choices presented here, such as processed meats and bacon, are of poor nutritional value.

Men consumed a greater number of portions of all Meat and Alternative choices included in the survey. Men in the 18-34 year age group consumed more luncheon meats than all other age-gender groups, and more than twice as much as most women. The consumption of beef, pork, processed meat, poultry, and eggs declined with age for both genders, although the decrease was more dramatic among men. This was the opposite for the portion of beans consumed, which was similar or increased slightly across age groups for both men and women. With the exception of a few foods, such as beans, women aged 64-75 years ate a similarly low or lower number of portions of meat and alternative choices than all other age-gender groups.

Women ate less fried chicken compared to chicken prepared without fat; while men reported consuming similar amounts of fried chicken to chicken not fried. Fried fish was consumed in greater amounts by both genders than fish prepared without fat.

The portions of seafood eaten, including fish and shellfish, did not follow the same pattern of decrease with age. The amounts of shellfish and lobster consumed with or without butter, margarine, or mayonnaise did not differ much, and did not follow any pattern in terms of age or gender. In general, men's intake of these foods was higher, but overall the number of portions consumed were more consistent across age-gender groups than for most other Meat and Alternative choices.

The Food Frequency Questionnaire also asked New Brunswickers about their meat intake from lamb and game animals. The reported level of consumption of these meat choices however, was extremely low.

Table 7.2 Consumption of Selected Foods from the Meat and Alternatives Group (Mean Number of Daily Portions by Age and Gender)

	Portion Size	Males				Females			
		18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr	18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr
<b>Beef</b>									
steak/roast	74 g	0.18	0.18	0.15	0.12	0.10	0.10	0.10	0.09
ground beef	74 g	0.17	0.13	0.12	0.09	0.12	0.10	0.09	0.07
hamburgers	74 g	0.18	0.13	0.10	0.10	0.08	0.08	0.08	0.07
<b>Pork</b>									
bacon	1 strip	0.33	0.32	0.26	0.28	0.20	0.22	0.20	0.18
ham/chops	74 g	0.15	0.14	0.11	0.09	0.08	0.08	0.07	0.08
<b>Processed Meats</b>									
luncheon meat	30 g	0.27	0.18	0.16	0.12	0.15	0.11	0.10	0.10
hot dogs/sausage	1 unit	0.19	0.17	0.14	0.14	0.10	0.10	0.09	0.08
bologna	30 g	0.18	0.21	0.18	0.17	0.14	0.12	0.12	0.11
<b>Poultry</b>									
not fried	74 g	0.19	0.19	0.15	0.15	0.13	0.13	0.12	0.13
fried	74 g	0.18	0.18	0.15	0.10	0.11	0.10	0.09	0.08
<b>Eggs</b>									
	1 egg	0.17	0.18	0.16	0.12	0.14	0.11	0.10	0.10
<b>Beans</b>									
boiled or baked	½ cup	0.11	0.11	0.12	0.12	0.08	0.07	0.07	0.09
<b>Seafood</b>									
fish, not fried	74 g	0.12	0.13	0.13	0.11	0.10	0.09	0.10	0.09
fish, fried	74 g	0.18	0.16	0.13	0.13	0.13	0.12	0.13	0.13
shellfish, no butter	½ cup	0.09	0.06	0.06	0.05	0.06	0.05	0.05	0.04
shellfish, with butter	½ cup	0.06	0.09	0.07	0.05	0.05	0.04	0.05	0.04
lobster, no butter	½ cup	0.05	0.07	0.07	0.03	0.03	0.04	0.05	0.04
lobster, with butter	½ cup	0.04	0.04	0.05	0.04	0.05	0.04	0.03	0.03

## 7.4 CONSUMPTION OF MILK PRODUCTS

The mean portions of selected milk products consumed by age group and gender are shown in Table 7.3. As with the previous food groups discussed, it is difficult to conclude from the Milk Products included in the survey whether adults in NB are meeting the daily 2-4 servings guideline from Canada's Food Guide to Healthy Eating. In general, however, when serving sizes and key Milk Products are considered, it does not appear likely that New Brunswickers are achieving the recommended daily intake of Milk Products. This observation is consistent with the earlier finding that the mean calcium intake of the adult population of all age groups does not meet the Adequate Intake level.

The greatest number of milk portions consumed were in the form of milk as a beverage. Men consumed greater numbers of portions of all Milk Product items, with the exception of yogurt of which women ate more portions. Men in the youngest age group ate the greatest quantities of almost all Milk Product choices listed. Use of milk on cereal, higher fat cheese, and ice cream for the 18-34 year old males was high compared to other groups. Overall, men's intake of most varieties of Milk Products decreased with age. Women aged 50-64 years tended to consume the least number of portions of most Milk Products. Not including milk consumed as a beverage, the oldest group of women used portions of Milk Products in amounts equal to or greater than that of the younger female groups.

More portions of regular fat cheese than lower fat alternatives were eaten by all age groups of both genders. Men tended to consume slightly more portions of lower fat versus >1% fat yogurt across all age groups, however the same pattern was not observed among women for this food item. Women's intake of low fat ice cream/frozen yogurt/sherbet and cheeses with less than 10% fat (e.g. cottage cheese) increased with age. The two older groups of women (aged 50-64 years and 65-74 years) ate greater quantities of 10% or less fat cheese and lower fat frozen desserts than men of the same age group.

Table 7.3 Consumption of Selected Milk Products  
(Mean Number of Daily Portions by Age and Gender)

	Portion Size	Males				Females			
		18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr	18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr
<b>Milk</b>									
as a beverage	1 cup	0.66	0.53	0.49	0.38	0.47	0.47	0.41	0.43
on cereal	½ cup	0.73	0.57	0.51	0.60	0.49	0.50	0.45	0.50
<b>Cheese</b>									
>24% BF*	74 g	0.22	0.18	0.16	0.12	0.13	0.13	0.10	0.14
10-24% BF	30 g	0.15	0.14	0.12	0.10	0.10	0.09	0.08	0.10
<10% BF	60 g (¼ cup)	0.08	0.05	0.06	0.08	0.07	0.07	0.08	0.11
<b>Ice Cream</b>									
regular	½ cup	0.17	0.12	0.14	0.10	0.09	0.08	0.07	0.08
low fat	½ cup	0.10	0.11	0.07	0.07	0.05	0.06	0.08	0.09
<b>Yogurt</b>									
<1% BF	½ cup	0.10	0.08	0.06	0.07	0.09	0.10	0.09	0.09
>1% BF	½ cup	0.09	0.07	0.06	0.06	0.10	0.08	0.08	0.10

\*BF=Butter Fat

The type of fluid milk consumed is shown in Table 7.4. Portions were calculated as one cup servings (one tablespoon portions contributed by milk used in coffee and tea are not included here). The number of portions of milk consumed as a beverage was almost double that used on cereal for each milk of the various fat contents. Milk with 1% fat was consumed in the greatest number of portions as a beverage and on cereal. The next most commonly used type of milk, both as a beverage and on cereal, was skim. Whole milk was used least. The total average number of daily servings of all types of milk is just over ¾ cup.

Additional fluid milk varieties assessed by the Food Frequency Questionnaire included buttermilk, cream, and evaporated milks (whole, 2%, light, and skim; diluted and undiluted). New Brunswickers consumed only very small amounts of these types of milk on a daily basis, so they have not been included in the results presented here.

Table 7.4 Types of Fluid Milk Consumed

	Mean number of 1 cup daily portions of milk		
	as a beverage	on cereal	total fluid milk
whole milk	0.113	0.061	0.174
2% milk (white or chocolate)	0.125	0.066	0.191
1% milk	0.136	0.070	0.206
skim milk	0.129	0.069	0.198

## 7.5 CONSUMPTION OF SELECTED GRAIN PRODUCTS

The mean number of portions of selected grain products assessed are listed in Table 7.5. The portion numbers appear low, however, it is important to note that other popular grain product choices such as rice, multi-grain bread, pasta, and bagels were not included in the survey. For this reason, it is not possible to discuss how intake of Grain Products of adults in NB compares to the daily 5-12 serving guideline. Some of the items discussed here, such as cookies and foods in the doughnuts grouping, are of poor nutritional value and belong in the Other Foods group, but are included in this section for comparison.

According to the results of this survey, men and women in NB consumed similar portions of bread across all age-gender groups. Most men consumed more white than whole wheat bread. Men in the younger two age groups ate more portions of white bread than other groups, while men 50-64 years of age were an exception as they consumed slightly more portions of whole wheat bread. The youngest group of women, aged 18-34 years, ate more white than whole wheat bread, while the other female age groups ate similar amounts of each type of bread.

Both male and female New Brunswickers ate a greater number of cracker portions than bread, however it is not appropriate to make a direct comparison because of the variation in portion sizes. If the difference was observed with this in mind, cracker intake would be at least half that of bread.

Table 7.5 Consumption of Selected Grain Foods  
(Mean Number of Daily Portions by Age and Gender)

	Portion Size	Males				Females			
		18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr	18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr
White bread	1 slice	0.30	0.31	0.24	0.20	0.22	0.22	0.19	0.18
Whole wheat bread	1 slice	0.24	0.24	0.26	0.16	0.18	0.21	0.18	0.18
Crackers	1 cracker	0.77	0.76	0.61	0.56	0.49	0.51	0.51	0.48

Table 7.6 shows the consumption of some higher fat baked foods for comparison to the healthier Grain Product choices discussed. Men and women ate a similar amount of cookie portions as they did of either type of bread. Men ate more portions of crackers than women, and slightly more portions of cookies. Men in the two younger age categories ate the most portions of crackers. Intake of portions of doughnuts, cakes, pies, muffins, and croissants was smaller and was consistent across all age-gender groups. There was no age-related pattern for either gender for intakes of cookies and doughnuts and other higher fat choices included in this group.

Table 7.6 Consumption of Selected Higher Fat Baked Items\*  
(Mean Number of Daily Portions, by Age and Gender)

	Portion Size	Males				Females			
		18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr	18 to 34 yr	35 to 49 yr	50 to 64 yr	65 to 74 yr
Cookies	1 cookie	0.32	0.28	0.26	0.26	0.25	0.19	0.19	0.19
Doughnuts/cakes/pies/ muffins/croissants	1 piece	0.08	0.08	0.08	0.08	0.07	0.07	0.06	0.06

\*Not healthy choices from the Grain Products food group

## 7.6 FREQUENCY OF EATING OUT

The Food Frequency Questionnaire (Appendix A) asked participants to list how many days in the past month they ate at restaurants, cafeterias, and had take-out foods. Table 7.7 shows the percent of New Brunswick adults who report eating out at these three types of food service establishments on a monthly, weekly, or daily basis.

Less than 20% of adults in New Brunswick reported that they ate at a cafeteria at least once/month. Restaurants and take-out food were more popular, with approximately 70% of the population eating at each of these types of food establishments at least once/month (69% dined at restaurants and 73% ate take-out food at least once/month). About one-third of New Brunswickers ate at a restaurant at least once/week, and a similar percentage of the population had take-out food at least once/week. One percent or less of the population claims to have eaten in each of these three different food settings at least once/day.



Table 7.7 Frequency of Eating Out

<b>Location</b> (n)	<b>Never or less than once/month</b> %	<b>1-3 times/ month</b> %	<b>4 times/month ~once/week</b> %	<b>More than once/week (but not daily)</b> %	<b>Once/day or more</b> %
<b>Restaurant</b> (n=1833)	31	41	11	16	1
<b>Take-Out</b> (n=1873)	27	40	13	19	1
<b>Cafeteria</b> (n=1818)	82	9	2	7	<1

# 8 FOOD GROUPS AND NUTRIENT INTAKE

A major goal of the New Brunswick (NB) Nutrition Survey was to determine the contribution of major food groups to nutrient intakes. This information was determined using data collected through the 24-hour recall. Products and recipes consisting of a variety of food groups were broken down to their ingredients so that they could be divided into the correct food groups. Miscellaneous extras and supplements, such as multivitamin/mineral supplements, supplement beverages, and meal replacement bars have not been included in this discussion.

Due to New Brunswickers' high intake of potatoes in comparison to all other vegetables, the contribution of potatoes to nutrient intakes is discussed separately within the Vegetables and Fruit group. Potatoes as listed in the Vegetables and Fruit group here do not include fried potatoes and chips, which have been placed in the "Other Foods" category. Unlike the food frequency, the 24-hour recall data did not separate whole wheat bread from other whole grain breads. As discussed in Chapter 7, most age-gender groups consumed at least slightly more white than whole wheat bread according to the results of the Food Frequency Questionnaire. In this chapter, a comparison of the percentages of macro and micronutrients provided by white bread versus all types of whole grain bread as a group (Tables 8.1-8.3) demonstrates that NB adults eat more white bread than all other types of whole grain bread combined.

## 8.1 CONTRIBUTION OF FOOD GROUPS AND INDIVIDUAL FOODS TO INTAKE OF MACRONUTRIENTS

Table 8.1 shows the contribution of the food groups from Canada's Food Guide to Healthy Eating, and individual foods within each group, to macronutrient intakes.

The greatest source of energy was the "Other Foods" group, which provided over one-third of the intake of this nutrient in New Brunswickers' diets. This category of foods includes items such as high calorie/low nutrient dense products, sugars and high sugar foods, and fats. Added fats alone provided 10.8% of calories, plus an additional 6.2% came from high fat choices such as bakery products, chocolate bars, fried potatoes, and chips. Added sugars and foods high in simple sugars, including items such as candy, popsicles and soft drinks, accounted for 9.6% of New Brunswickers' energy intake. After the "Other Foods" group, Grain Products provided the next greatest percentage of energy (25.5%), followed by the Meat and Alternatives group (19.3%). Vegetables and Fruit provided about 10.4% of energy, with potatoes contributing the greatest percentage of calories in this food group. Milk Products accounted for a similar percentage of energy intake as the Vegetables and Fruit group (10.2%). Over half of the energy intake from Milk Products came from fluid cow's milk.

Meat and Alternatives provided half the protein intake of NB adults (49%), and red meat was the main source of protein within this food group. Grain Products also contributed a significant amount of protein (20.5%), followed by Milk Products, which provided about 16.5% of protein consumption. White bread was the greatest single source of protein in the Grain Products group, and fluid cow's milk and cheese contributed the most protein from the Milk Products group.

Most of the carbohydrate intake came from the Grain Products group (40.1%), with white bread, pasta and rice providing the greatest amounts of this nutrient. The "Other Foods" group also contributed a large amount of carbohydrate (27.7%), followed by Vegetables and Fruit (18.8%). The amount of carbohydrates derived from low-nutrient dense high sugar items, such as added sugars, popsicles, candy and soft drinks, was almost identical to that coming from Vegetables and Fruit (18.9%). In terms of individual foods, the greatest percentage of carbohydrate was derived from sweetened drinks and soft drinks, followed by added sugars (including jams and syrups), then white bread and potatoes.

The "Other Foods" group provided almost half of the fat intake of New Brunswickers (47.9%). Meat and Alternatives were a source of almost one-third of fat (28.7%), and Milk Products provided about half this amount (14.1%). The greatest source of saturated, polyunsaturated, and monounsaturated fats was "Other Foods", followed by Meat and Alternatives. Milk Products provided about one-quarter of saturated fat in NB adults' diets (24.2%). Meat and Alternatives were the primary source of cholesterol, contributing to over 70% of the intake of this nutrient. Most cholesterol in this group came from eggs (25.2%) and red meats (23.2%).

Table 8.1 Contribution of Food Groups and Individual Foods to Intake of Macronutrients (Percent of Total Intake)

Food Groups and Selected Items	Nutrient							
	Energy	Protein	Carbohydrate	Total Fat	Saturated Fat	Poly-unsaturated Fat	Mono-unsaturated Fat	Cholesterol
<b>GRAIN PRODUCTS</b>	<b>25.50</b>	<b>20.53</b>	<b>40.13</b>	<b>7.21</b>	<b>5.02</b>	<b>13.01</b>	<b>6.76</b>	<b>2.13</b>
Pasta and rice	4.50	3.60	6.90	0.83	0.47	1.86	0.45	0.74
White bread	5.35	4.58	8.35	1.80	2.44	2.22	2.19	0.28
Whole grain breads	1.98	1.81	3.14	0.71	0.46	1.35	0.76	0.21
Other grain products (rolls, crackers, bagels, English muffins, pita bread, pancakes, etc.)	3.10	2.30	4.55	1.85	1.46	3.37	1.85	0.65
Whole grain/high fibre cereals	1.13	1.02	1.81	0.40	0.23	0.95	0.33	0.00
Other breakfast cereals	1.51	0.97	2.38	0.38	0.25	0.74	0.27	0.01
<b>VEGETABLES &amp; FRUIT</b>	<b>10.38</b>	<b>6.17</b>	<b>18.82</b>	<b>2.11</b>	<b>1.35</b>	<b>4.60</b>	<b>1.12</b>	<b>0.08</b>
Vegetables (except potatoes/juices)	2.49	2.64	4.36	0.69	0.34	1.80	0.38	0.00
Potatoes	3.92	2.09	7.35	0.14	0.11	0.41	0.01	0.00
Fruit except juices	3.26	0.90	6.20	0.60	0.39	0.85	0.24	0.00
Fruit and vegetable juices	1.74	0.65	3.08	0.19	0.07	0.29	0.08	0.00
Soups with vegetables	0.62	0.46	0.72	0.66	0.49	1.52	0.50	0.08
<b>MILK PRODUCTS</b>	<b>10.19</b>	<b>16.50</b>	<b>6.15</b>	<b>14.14</b>	<b>24.21</b>	<b>3.51</b>	<b>11.17</b>	<b>17.60</b>
Fluid cow's milk	5.67	9.76	4.57	5.99	10.57	1.60	4.72	8.27
Other milks (soy, goat, etc.)	0.17	0.15	0.18	0.18	0.24	0.60	0.17	0.25
Yogurts	0.28	0.38	0.34	0.12	0.24	0.20	0.09	0.22
Cheeses	3.40	6.04	0.34	6.90	11.70	1.55	5.43	7.62
Frozen desserts	0.72	0.39	0.37	0.99	1.58	0.29	0.78	1.30
<b>MEAT &amp; ALTERNATIVES</b>	<b>19.29</b>	<b>48.95</b>	<b>1.63</b>	<b>28.68</b>	<b>28.36</b>	<b>24.62</b>	<b>30.06</b>	<b>70.29</b>
Eggs	1.70	3.66	0.12	3.11	3.01	2.85	3.09	25.18
Red meats	9.43	21.90	0.19	16.12	17.69	8.15	18.16	23.19
Poultry	4.63	14.77	0.32	5.14	4.59	6.69	4.77	15.51
Fish and shellfish	1.40	5.48	0.07	1.00	0.74	1.60	0.84	4.96
Legumes, nuts/nut butter, seeds, vegetable protein foods	1.86	2.23	1.19	3.09	2.08	5.06	3.37	0.15
<b>OTHER FOODS</b>	<b>31.40</b>	<b>6.46</b>	<b>27.67</b>	<b>47.90</b>	<b>40.82</b>	<b>53.60</b>	<b>50.22</b>	<b>9.82</b>
Baked foods (croissants, cake, etc.)	1.57	0.59	1.89	1.71	1.33	1.74	1.70	0.52
Fats (spreads, sauces, etc.)	10.80	0.63	0.21	32.29	28.57	33.55	32.75	6.18
Sugars	4.35	0.44	8.83	0.03	0.37	0.02	0.03	0.00
Candies, popsicles, jello	0.62	0.12	1.01	0.29	0.50	0.10	0.15	0.03
Sweetened drinks and soft drinks	4.62	0.03	9.09	0.06	0.30	0.12	0.03	0.00
Chips, salty/high fat snack foods	1.87	0.85	1.42	3.17	1.74	5.52	3.56	0.63
Fried potatoes	1.75	0.82	2.24	1.82	2.45	1.02	1.91	0.00
Chocolate bars	1.02	0.44	1.02	1.57	2.23	0.68	1.43	0.15
Alcohol	1.78	0.29	1.18	0.34	0.46	0.02	0.03	0.02
Coffee and tea	0.61	0.41	1.06	0.14	0.35	0.19	0.03	0.00

## 8.2 CONTRIBUTION OF FOOD GROUPS AND INDIVIDUAL FOODS TO INTAKE OF FIBRE, SELECTED MINERALS, AND ELECTROLYTES

Table 8.2 shows the contribution of the food groups from Canada's Food Guide to Healthy Eating, and individual foods within each group, to the intake of fibre, selected minerals and electrolytes.

Grain Products were the largest source of fibre (41.1%), with almost equal amounts coming from white bread, pasta and rice, and whole grain breads. This finding reinforces the finding from Section 7.5 that most participants in the NB Nutrition Survey consumed more white bread than higher fibre whole wheat breads. Due to the coding of the data used to create these tables, it was not possible to separate whole wheat bread from the whole grain bread category. The Vegetables and Fruit group provided only slightly less fibre than the Grain Products group (40.1%). Vegetables (not including potatoes and juices) were the greatest source of fibre overall (18.1%), followed by fruit (not including juices) and potatoes, which each accounted for about 10% of fibre intake.

Milk Products provided over half the amount of calcium in New Brunswickers diets, with over one-third of calcium intake coming from fluid cow's milk and about 15% from cheese. Grain Products contributed 13.4% of calcium intake, followed by "Other Foods" at 10.6%.

Grain Products, Vegetables and Fruit, Meat and Alternatives, and "Other Foods" contributed almost equal amounts to Magnesium intake, at about 20% each.

The Meat and Alternatives group was the largest source of phosphorus (30.3%), followed by Milk Products (26.7%) and Grain Products (19.8%). Fluid cow's milk was the individual food contributing the most phosphorus to the diets of NB adults (16.6%), and red meat was the largest source of this nutrient in the Meat and Alternatives group (11.9%).

The greatest source of iron was Grain Products, which provided 43.7% of this nutrient to the diets of NB adults. Cereal was the greatest individual food source of this nutrient, providing almost 20% of the overall intake of iron (6.2% of iron from whole grain/high fibre cereals and 13.6% from other types of breakfast cereals). Pasta and rice were also important sources of iron (7.9%). Meats and Alternatives provided one-quarter of total iron consumption, and red meat was the individual food in this group that contributed the most iron (11.5%).

Meat and Alternatives provided the greatest percentage of zinc intake (45.8%), followed by Grain Products (18%) and Milk Products (16.1%). Almost one-third of zinc came from red meats (27.7%), and fluid cow's milk accounted for almost 10% of the consumption of this nutrient.

The main sources of sodium were "Other Foods" (22.4%), followed closely by Grain Products (19.5%). Red meat was the individual food contributing the most sodium (9.7%), with white bread being the next highest source (7.4%), and then cheese (6.1%).

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Vegetables and Fruit accounted for one-third of potassium consumption, with vegetables (not including potatoes and juices) and potatoes each accounting for about 11% of total intake. Meat and Alternatives and “Other Foods” each provided approximately 20% of New Brunswickers’ potassium intake. The food which was the greatest single source of potassium was fluid cow’s milk (12.5%).

Table 8.2 Contribution of Food Groups and Individual Foods to Intake of Fibre, Selected Minerals, and Electrolytes (Percent of Total Intake)

Food Groups and Selected Items	Nutrient							
	Fibre	Calcium	Magnesium	Phosphorus	Iron	Zinc	Sodium	Potassium
<b>GRAIN PRODUCTS</b>	<b>41.13</b>	<b>13.40</b>	<b>21.83</b>	<b>19.83</b>	<b>43.65</b>	<b>18.00</b>	<b>19.48</b>	<b>8.77</b>
Pasta and rice	6.56	1.08	4.15	2.99	7.89	3.51	0.22	0.87
White bread	6.50	4.76	3.83	3.13	3.41	2.81	7.37	1.46
Whole grain breads	6.33	2.05	1.49	2.89	4.23	2.49	3.04	1.38
Other grain products (rolls, crackers, bagels, English muffins, pita bread, pancakes, etc.)	3.88	2.57	2.47	2.07	3.37	1.69	4.16	1.02
Whole grain/high fibre cereals	4.39	0.53	3.08	2.27	6.22	1.97	1.07	1.05
Other breakfast cereals	2.38	0.43	1.45	1.20	13.56	1.20	2.03	0.64
<b>VEGETABLES &amp; FRUIT</b>	<b>40.36</b>	<b>9.59</b>	<b>19.31</b>	<b>9.34</b>	<b>6.57</b>	<b>8.55</b>	<b>9.79</b>	<b>30.00</b>
Vegetables (except potatoes/juices)	18.07	5.10	7.45	4.15	3.53	3.90	4.99	11.19
Potatoes	10.05	1.34	6.93	3.35	1.95	2.72	0.37	10.68
Fruit except juices	10.89	2.56	4.14	1.80	1.63	0.98	0.17	6.53
Fruit and vegetable juices	1.49	1.15	2.78	0.94	1.17	0.65	0.91	4.53
Soups with vegetables	0.98	0.44	0.43	0.49	2.03	0.74	3.39	1.06
<b>MILK PRODUCTS</b>	<b>0.30</b>	<b>50.86</b>	<b>14.09</b>	<b>26.74</b>	<b>1.00</b>	<b>16.14</b>	<b>10.95</b>	<b>15.04</b>
Fluid cow's milk	0.30	32.75	11.06	16.58	0.04	9.52	4.48	12.53
Other milks (soy, goat, etc.)	0.00	0.35	0.17	0.23	0.04	0.14	0.13	0.19
Yogurts	0.00	1.16	0.42	0.61	0.04	0.46	0.17	0.47
Cheeses	0.00	15.37	2.04	8.81	0.90	5.35	6.11	1.33
Frozen desserts	0.00	1.36	0.44	0.66	0.06	0.74	0.26	0.56
<b>MEAT &amp; ALTERNATIVES</b>	<b>2.82</b>	<b>8.28</b>	<b>19.16</b>	<b>30.27</b>	<b>24.74</b>	<b>45.81</b>	<b>15.87</b>	<b>20.54</b>
Eggs	0.00	1.98	0.97	3.39	2.51	2.70	1.17	1.15
Red meats	0.00	1.69	6.41	11.85	11.50	27.66	9.68	9.26
Poultry	0.09	1.48	4.73	7.83	4.91	9.08	1.76	4.56
Fish and shellfish	0.00	1.67	2.90	4.21	2.63	2.54	1.89	2.66
Legumes, nuts/nut butter, seeds, vegetable protein foods	2.27	1.39	3.88	2.37	2.23	2.83	1.27	2.25
<b>"OTHER FOODS"</b>	<b>12.66</b>	<b>10.64</b>	<b>19.53</b>	<b>11.07</b>	<b>11.98</b>	<b>8.36</b>	<b>22.41</b>	<b>20.38</b>
Baked foods (croissants, cake, etc.)	0.62	0.56	0.86	0.81	1.19	0.57	0.98	0.46
Fats (spreads, sauces, etc.)	0.00	2.27	0.51	1.08	0.37	0.51	4.97	0.71
Sugars	0.44	1.13	0.80	0.17	1.64	0.19	0.09	1.07
Candies, popsicles, jello	0.08	0.25	0.15	0.35	0.22	0.09	0.32	0.14
Sweetened drinks and soft drinks	0.00	2.25	1.23	1.84	1.21	0.97	0.60	0.72
Chips, salty/high fat snack foods	2.41	0.71	1.92	1.12	1.07	1.03	1.77	2.72
Fried potatoes	4.86	0.31	2.07	1.30	1.80	0.88	0.26	3.18
Chocolate bars	1.92	0.91	1.16	0.76	0.86	0.56	0.23	0.64
Alcohol	0.00	0.10	1.78	0.84	0.45	0.25	0.17	0.98
Coffee and tea	0.00	0.91	7.15	0.67	1.53	1.11	0.60	8.01

### 8.3 CONTRIBUTION OF FOOD GROUPS AND INDIVIDUAL FOODS TO INTAKE OF SELECTED VITAMINS

Table 8.3 shows the contribution of each food group from Canada's Food Guide to Healthy Eating, and individual foods within each group, to the intake of selected vitamins.

The greatest source of vitamin A was the Vegetables and Fruit group, which provided just under 40% of this nutrient, with vegetables (not including potatoes and juices) contributing 33.4% of this. Milk Products provided 25.8% of vitamin A, mostly through fluid cow's milk (16.7%). Added fats (including margarine, butter, sauces, etc.) accounted for over 20% of the vitamin A intake of NB adults.

Grain Products were the source of 44.7% of thiamin consumption of NB adults, with white bread contributing the greatest amount of this nutrient from this food group (8.2%). Meat and Alternatives provided 20% of thiamin intake, with over half of this coming from red meats (12%). The Vegetables and Fruit group was the source of 16.3% of thiamin intake.

Meat and Alternatives and Milk Products each provided 27% of the intake of riboflavin, followed by Grain Products which provided 23%. About 20% of riboflavin came from fluid cow's milk, while red meat contributed 11.5% to the intake of this nutrient.

Meat and Alternatives accounted for over 43.8% of niacin intake, with red meat providing 19% of this amount, and poultry 15%.

The primary source of vitamin B<sub>6</sub> was Meat & Alternatives (34.3%), closely followed by Vegetables and Fruit (31.8%). The greatest amount of vitamin B<sub>6</sub> in the Vegetables and Fruit group came from potatoes (12.8%), and in the Meat and Alternatives group, red meat (14.4%) and poultry (12.2%) were the main sources of this nutrient.

Meat and Alternatives contributed 61.9% to vitamin B<sub>12</sub> intake, with red meat being the individual food providing the largest quantity of this nutrient (35.6%). Milk Products provided about one-third of the intake of vitamin B<sub>12</sub>, with fluid cow's milk accounting for just under one-quarter of this.

Vegetables and Fruit and Grain Products each provided one-quarter of NB adults' folate intake. The amount of folate contributed by the Vegetables and Fruit group was slightly higher, but it is possible that this would no longer be the case as Grain Products now contain more folic acid with the change in the fortification regulations for flour and pasta since this survey was conducted. Vegetables (not including potatoes and juices) accounted for the greatest quantity of folate intake (15.5%), followed by white bread (7.6%). Fruit and vegetable juices, fluid cow's milk, coffee and tea, and fruit each accounted for approximately 6% of the folate intake of NB adults.



Vegetables and Fruit provided over half of the intake of vitamin C to the diets of adults in the province (57%), with vegetables (not including potatoes) accounting for over one-quarter of this amount. Fruit and vegetable juices were also a major food source of vitamin C (17.2%), as were fruit (16%) and potatoes (13%). Fluid cow's milk provided 6.7% of the vitamin C intake. Following Vegetables and Fruit, the next major food group source of this nutrient was "Other Foods", with sweetened/soft drinks, chips and other high fat/salty foods, and fried potatoes each contributing approximately 5% to the intake of the vitamin C.

Table 8.3 Contribution of Food Groups and Individual Foods to Intake of Selected Vitamins (Percent of Total Intake)

Food Groups and Selected Items	Nutrient							
	Vitamin A	Thiamin	Riboflavin	Niacin	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub>	Folate	Vitamin C
<b>GRAIN PRODUCTS</b>	<b>0.26</b>	<b>44.68</b>	<b>23.24</b>	<b>25.18</b>	<b>11.28</b>	<b>0.53</b>	<b>24.78</b>	<b>0.01</b>
Pasta and rice	0.05	6.52	6.09	4.29	1.93	0.20	2.32	0.00
White bread	0.00	8.17	4.79	5.13	1.08	0.00	7.59	0.00
Whole grain breads	0.00	2.90	1.15	2.01	1.62	0.01	3.34	0.00
Other grain products (rolls, crackers, bagels, English muffins, pita bread, pancakes, etc.)	0.11	4.48	2.74	2.60	0.82	0.22	3.50	0.00
Whole grain/high fibre cereals	0.04	4.06	0.66	1.50	1.25	0.00	1.39	0.00
Other breakfast cereals	0.00	6.45	0.57	1.50	2.62	0.00	2.18	0.00
<b>VEGETABLES &amp; FRUIT</b>	<b>38.50</b>	<b>16.25</b>	<b>9.57</b>	<b>10.37</b>	<b>31.80</b>	<b>0.52</b>	<b>26.83</b>	<b>57.00</b>
Vegetables (except potatoes/juices)	33.88	6.10	5.02	3.77	9.87	0.00	15.49	25.97
Potatoes	0.00	6.01	1.36	4.54	12.78	0.00	4.42	13.31
Fruit except juices	2.25	3.19	2.56	1.25	7.83	0.00	5.50	16.07
Fruit and vegetable juices	1.61	3.62	1.20	0.79	2.94	0.29	6.25	17.20
Soups with vegetables	1.66	0.66	0.45	0.63	0.77	0.23	0.74	0.62
<b>MILK PRODUCTS</b>	<b>25.78</b>	<b>7.18</b>	<b>26.50</b>	<b>9.56</b>	<b>8.25</b>	<b>31.02</b>	<b>7.74</b>	<b>7.03</b>
Fluid cow's milk	16.66	6.15	19.91	6.01	6.43	23.60	5.99	6.74
Other milks (soy, goat, etc.)	0.18	0.11	0.30	0.10	0.11	0.29	0.05	0.08
Yogurts	0.19	0.22	0.70	0.11	0.21	0.94	0.35	0.11
Cheeses	7.73	0.46	4.62	3.22	1.28	5.28	1.31	0.00
Frozen desserts	1.05	0.26	1.10	0.22	0.28	1.20	0.10	0.09
<b>MEAT &amp; ALTERNATIVES</b>	<b>10.31</b>	<b>19.94</b>	<b>26.89</b>	<b>43.76</b>	<b>34.34</b>	<b>61.87</b>	<b>14.81</b>	<b>1.90</b>
Eggs	6.47	1.02	6.55	1.76	2.16	6.91	4.42	0.00
Red meats	0.06	12.00	11.54	19.04	14.44	35.64	3.02	0.27
Poultry	1.70	2.69	5.02	14.67	12.17	7.29	1.53	0.30
Fish and shellfish	0.99	1.20	1.75	5.12	3.48	10.47	1.19	0.54
Legumes, nuts/nut butter, seeds, vegetable protein foods	0.17	1.66	0.85	2.26	1.63	0.15	3.86	0.37
<b>OTHER FOODS</b>	<b>23.84</b>	<b>7.80</b>	<b>9.94</b>	<b>9.37</b>	<b>9.78</b>	<b>5.49</b>	<b>13.71</b>	<b>11.66</b>
Baked foods (croissants, cake, etc.)	0.36	1.01	0.80	0.68	0.42	0.14	4.60	0.05
Fats (spreads, sauces, etc.)	20.55	0.40	1.28	0.35	0.37	1.64	0.28	0.27
Sugars	0.02	0.29	0.45	0.09	0.32	0.00	0.18	0.32
Candies, popsicles, jello	0.08	0.05	0.12	0.04	0.05	0.13	0.05	0.02
Sweetened drinks and soft drinks	0.05	0.72	0.75	0.01	0.22	0.00	0.09	5.48
Chips, salty/high fat snack foods	0.49	0.86	0.59	0.09	1.85	0.26	1.86	4.25
Fried potatoes	0.00	1.78	0.40	0.14	2.75	0.00	1.78	4.54
Chocolate bars	0.06	0.30	0.89	0.03	0.22	0.57	0.44	0.00
Alcohol	0.01	0.47	1.19	0.11	0.21	0.38	1.81	0.01
Coffee and tea	0.00	0.03	2.22	0.10	0.06	0.00	5.52	0.00

# **9** NUTRITION AND HEALTH ATTITUDES

This chapter presents information on attitudes related to nutrition and health. The information is derived from both the Nutrition and Health Questionnaire, and the Food Frequency Questionnaire described in Chapter 2 (see Appendix A).

## **9.1 HEALTH-RELATED ATTITUDES**

As part of the Food Frequency Questionnaire, respondents were asked to indicate whether they were choosing or avoiding foods based on concerns about health maintenance/improvement, to avoid chronic diseases such as heart disease or cancer, or because of nutrient content (e.g. fibre or fat content). The Health Questionnaire evaluated beliefs regarding risk factors for heart disease, including losing weight, lowering blood pressure and eating fewer high fat foods. Other questions addressed whether interviewees had ever been informed by a health professional that they should lose weight, that their blood pressure was high, or that they suffered from diabetes.

Sources of health information were also addressed. Interviewees were asked about the levels of information they got from various sources, such as physicians, dietitians, the media, food labels, and government and voluntary organizations. Questions about Canada's Food Guide to Healthy Eating were addressed at the end of the Food Frequency Questionnaire.

Response rates for the health and nutrition attitude-related questions were high (99.8-100%). The single exception to this was the question regarding awareness of Canada's Food Guide to Healthy Eating, which had a low response rate (one question involved only 50% of the original survey group). This was because the questions regarding the food guide were not asked at the first interview with respondents for whom a second session was planned. The reason for this was to avoid the possibility that discussion of the food guide at the first interview might bias the second 24-hour recall.

## **9.2 ATTITUDES ON HEALTH AND DISEASE PREVENTION**

Respondents' attitudes regarding reducing risk factors for heart disease was assessed using a series of questions in the Food Frequency Questionnaire and the Nutrition and Health Questionnaire. New Brunswickers' perceptions regarding the main causes of heart disease are shown in Table 9.1.

While overall "unhealthy lifestyle" was not selected by many as a cause of heart disease (9%), many specific lifestyle choices were emphasized as likely causes. More men than women felt that smoking is a major contributing factor to heart disease (59% versus 49%). The oldest groups of both genders (65-74 years) were least likely to indicate smoking as a

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risk factor for heart disease. Lack of exercise was considered a risk factor by 39% of men and 43% of women. The percentage of adults believing that lack of exercise contributes to heart disease decreased with age for both genders. Approximately 38% of men and 48% of women felt that dietary fat was a major cause of heart disease. Overall, over one-third of New Brunswickers felt that stress/worry/tension could lead to heart disease (35%).

Other factors listed on the questionnaire were considered not be as strongly linked to heart disease. Unlike fat, dietary cholesterol was not indicated by many people as a common cause of heart attacks (14%). Poor eating habits overall were chosen as a major risk factor by 22% of men and 30% of women. Despite the high rates of overweight and obesity in NB, this was considered to be a major cause of heart disease by only 21% of men and 28% of women. While 20% of the population blamed high blood cholesterol as a leading cause of heart disease, the least likely factor to be cited by New Brunswickers as a cause of heart disease was arteriosclerosis (4%). About 22% of the population felt that an individual's family history is a major contributing factor to heart disease.

Similar or greater numbers of women compared to men believed most of the items listed are major contributing factors to heart disease. Exceptions to this included smoking and alcohol/drinking too much, which were selected as main risk factors by more men than women. New Brunswickers of both genders in the 65-74 year age group were less likely than the younger population to believe that many of the factors listed are major causes of heart disease.

Table 9.1 Beliefs Regarding Main Causes of Heart Disease  
(Population Percent by Age and Gender)

	Males				Females			
	18-34y (n) (163)	35-49y (247)	50-64y (260)	65-74y (183)	18-34y (194)	35-49y (283)	50-64y (297)	65-74y (189)
Smoking	59	61	53	43	56	50	49	4
High Blood Pressure/ Hypertension	11	13	17	12	17	15	12	10
High Blood Cholesterol	24	18	22	14	27	21	19	15
Lack of Exercise	42	47	34	31	51	49	37	33
Arteriosclerosis/ Hardening of the Arteries	3	4	7	3	<1	5	3	5
Poor Diet/ Poor Eating Habits	25	28	21	18	28	33	33	26
Overweight/ Obesity	14	23	24	22	25	32	29	28
Dietary Fat: Fatty Food/ High Fat Diet	43	37	28	42	49	51	42	49
Dietary Cholesterol/ Cholesterol in Foods	14	15	14	10	20	20	13	11
Family History/ Heredity	14	21	24	15	23	30	27	22
Stress/ Worry/ Tension	31	37	37	33	33	41	39	30
Alcohol/ Drinking Too Much	14	14	18	22	15	9	14	14
Unhealthy Lifestyle	8	6	10	8	9	7	13	9

As part of the Food Frequency Questionnaire, respondents were also asked to indicate whether they were choosing or avoiding foods in order to improve their health or prevent chronic disease (Table 9.2). Overall, the factors most likely to affect food choices were: 1) maintaining or improving health (65%); 2) weight gain (46%); and 3) heart disease (40%). Overall, both men and women selected these same three factors in the same order. However, the percentage of men who selected weight loss over heart disease was less than 5%, while the importance of these two factors was separated by a difference of almost 15%

among women. Women were more likely to choose or avoid certain foods based on all of the health concerns listed. This finding is in agreement with the Tracking Nutrition Trends survey carried out by the National Institute of Nutrition (1997), which found that more Canadian women than men consider nutrition to be extremely or very important, and that women are more likely to report that they have already implemented healthy eating habits or plan to in the near future. Determining food choices according to health concerns tended to increase with age for women, but a similar pattern was not evident among the men. In all cases with the exceptions of osteoporosis and weight gain, men in the 18-34 year age group were least likely to be influenced by health concerns when selecting foods. A number of health concerns have a far more significant impact on women's food choices than on men's; for example, health maintenance/improvement (74% of women versus 55% of men), osteoporosis (32% of women versus 6% of men), cancer (27% of women versus 13% of men), and weight gain (59% of women versus 33% of men).

Table 9.2 Choosing or Avoiding Foods Due to Health Concerns  
(Population Percent by Age and Gender)

	Males				Females			
	18-34y (n) (163)	35-49y (247)	50-64y (260)	65-74y (183)	18-34y (194)	35-49y (283)	50-64y (297)	65-74y (189)
Maintaining or Improving Your Health	42	56	64	58	64	76	77	78
Heart Disease	22	32	48	43	26	43	53	52
Cancer	9	14	17	13	18	31	33	27
Osteoporosis	5	7	7	5	22	31	39	36
High Blood Pressure	15	21	35	29	18	31	39	44
Diabetes	9	11	22	18	13	22	30	27
Weight Gain	33	31	37	30	59	61	58	57

The NB Nutrition Survey's Health Questionnaire included several questions about whether doctors or other health professionals had ever advised them to lose weight or informed them that they had diabetes or high blood pressure (see Table 9.3).

The number of adults reporting they were told they had high blood pressure increased with age for both genders. The overall percentage of New Brunswickers who were told they had high blood pressure was 27%. This is comparable to the 26% of New Brunswickers who had high blood pressure in 1997 according to the Atlantic Health Sciences Health Status Report. The finding that more women than men reported high blood pressure is consistent with the results of the Canadian Community Health Survey (Heart and Stroke Foundation, 2003). Among men aged 50-74 years, an average of 15% thought hypertension can cause heart attacks compared to 37% who were told they had high blood pressure; and for women in the same age group, only 11% linked hypertension and heart attacks yet 43% were told they had high blood pressure. This demonstrates that there is large percentage of adults who have been told they have high blood pressure, but are not aware of the link between hypertension and heart attacks. It must be noted that self-reported high blood pressure does not necessarily mean that the person suffers from chronic hypertension. The

percentage of men and women in the younger age groups (aged 18-34 years and 35-49 years) who stated that they avoided certain foods based on concerns about high blood pressure was higher than the percentage who were told they had high blood pressure. The percentages of older women (aged 50-64 years and 65-74 years) and men in the 50-64 year age group who determined food choices based on concerns about high blood pressure was equal to the number who stated they were informed their blood pressure was high. In the oldest group of men (aged 65-74 years), however, only 29% reported high blood pressure as a reason for avoiding or choosing certain foods, while 38% claim to have been advised they had high blood pressure.

The statistics on self-reported diagnosis of diabetes in this survey suggest that the concern about how food choices affect this illness is greater than the number who actually have it. The NB Nutrition Survey had a higher percentage of reported incidence of diabetes than the Canadian Community Health Survey completed in 2000, which found that only 5.8% of New Brunswickers claimed to have diabetes (Heart and Stroke Foundation, 2003). Over twice the percentage of adults in NB chose or avoided foods due to concern about diabetes than those that had been informed that they have diabetes (19% versus 9%). Adults in all age-gender groups selected some foods based on concern about diabetes, with the exception of men aged 65-74 years for whom the percent of those who based food selection on diabetes was one percent lower than those who reported being diagnosed with diabetes.

The most dramatic difference between whether food choices were based on a health concern and medical advice was in the area of weight loss. Weight gain affected food choices for a greater percentage of the NB population than for those who reported that a health professional has advised they lose weight. While approximately 33% of all men based some food selection on a concern about weight gain, only 7% reported being advised by a health professional to lose weight. Almost 59% of women used weight gain as a reason for avoiding or choosing certain foods while just 7% had been advised to lose weight. Despite the higher percentage of people trying to avoid weight gain, the numbers are still less than the percent classified as overweight and obese as discussed in Chapter 6 (61% of females and 74% of males). Although more NB men were overweight/obese than women, less of the male population was concerned about selecting or avoiding certain foods to limit weight gain. The percentage of adults advised to lose weight increased with age until the 50-64 year age group for both genders and then dropped again in the oldest group of men and women aged 65-74 years. This gap is likely related to the high rates of overweight and obesity in the province, leading consumers to have a greater concern about weight gain in comparison to concerns about other health issues that a health professional may have indicated to them. Women especially are known to have a greater concern about the topic of weight gain in our society, and thus it is not surprising to see that the percentage of those who were concerned about their weight was greater than the percentage who would actually be classified as overweight/obese.

A further concern raised by this finding was the low number of adults who reported being advised to lose weight by a health professional in comparison to the high rate of overweight and obesity in the province. The bottom row of data in table 9.3 show the total percentage

of obese adults in each age-gender group (from Table 6.1). For most age-gender groups, the percentage of obese adults was approximately three times the percentage who claimed to have been advised by a health professional to lose weight. In the case of the younger two groups of men, the rate of obesity was 5 to 10 times the percentage who said they were told to lose weight. The Expert Panel of Reviewers suggests this be investigated more closely (see Chapter 11), as it indicates that doctors and other health professionals need to take a more proactive approach in addressing the issue of weight loss with their patients.

Table 9.3 Reported Diagnosis of Selected Health Problems  
(Population Percent by Age and Gender)

Doctor/other professional has informed you that:	Males				Females			
	18-34y	35-49y	50-64y	65-74y	18-34y	35-49y	50-64y	65-74y
	(n)	(n)	(n)	(n)	(n)	(n)	(n)	(n)
You have high blood pressure	(163) 9	(247) 17	(259) 35	(183) 38	(194) 14	(282) 21	(297) 40	(189) 45
You have diabetes	(163) <1	(247) <1	(259) 15	(183) 19	(194) 6	(282) 9	(297) 10	(189) 14
You should lose weight	(163) 2	(247) 5	(260) 12	(183) 9	(194) 5	(283) 8	(297) 11	(189) 8
Rate of obesity (%)	25	28	35	25	18	28	31	23

### 9.3 PERCEIVED WAYS OF IMPROVING EATING HABITS

The Nutrition and Health Questionnaire listed a number of dietary changes and asked participants to indicate which ones they felt could help improve a person's eating habits (Appendix A). Table 9.4 shows the results for the various dietary measures that were offered for respondents to select from.

Women overall and in almost all age groups, were more likely to indicate that any of the proposed dietary habits were ways to eat healthier. This is consistent with a survey conducted by the American Dietetic Association (2002), which determined that women were more likely to be aware of the health benefits of foods. Although the overall percentages were different, men and women had similar opinions regarding the ranking of how important each of the proposed dietary measures was to healthy eating. The healthy eating habits selected did not follow any age patterns for either gender.

The eating habit selected by most New Brunswickers for improving nutrition was choosing a diet low in saturated fat, although this was selected by less than half of the adult population overall (48%). Choosing a diet with plenty of fruits and vegetables was next, with 29% of men and 41% of women stating this was an important healthy dietary measure. The youngest group of men and women (aged 18-34 years) were more likely to select eating



plenty of vegetables and fruit as a healthy strategy than older New Brunswickers. Using low-fat cooking methods was also one of the more popular choices, and was recommended as a healthy measure by one-quarter of the population overall. Only 23% of New Brunswickers believed that using salt/sodium in moderation is a way to improve eating habits, compared to the 29% who stated they make food choices based on concerns about high blood pressure (Table 9.2) and the 27% who reported having been told they had high blood pressure (Table 9.3). Approximately 20% of adults in NB felt that people should choose a diet low in cholesterol, which was equal to the percent who stated that high blood cholesterol is a leading cause of heart disease (Table 9.2). Women ages 18-34 years and 34-49 years were more likely than any other age-gender group to believe that choosing a diet with lots of fibre is important to health (20%), despite the fact that the mean fibre intakes of these two groups was lowest and only 1% of women in these age groups had a mean fibre intake which meets the Adequate Intake level (see Chapter 5).

The eating habit least important to men was consuming at least 2 servings of dairy products per day; while women were least likely to indicate that eating a diet with plenty of breads, cereals, rice and pasta was as important as other habits. Less than 10% of women and less than 5% of men felt that getting at least 2 servings of dairy products per day was a way to improve eating habits. The dairy products guideline was the least popular healthy dietary measure selected by women aged 50-64 years, and they felt this eating strategy was of less health value than women in the other age groups. Label reading was a similarly unpopular choice among those surveyed, with less than 8% of New Brunswickers overall agreeing that this is a way to improve eating habits. It should be noted however, that since this report there has been a considerable increase in education directed toward reading nutrition labels.

Table 9.4 Perceived Ways of Improving Eating Habits  
(Population Percent by Age and Gender)

	Males				Females				
	(n)	18-34y (163)	35-49y (247)	50-64y (260)	65-74y (183)	18-34y (194)	35-49y (283)	50-64y (297)	65-74y (189)
Use salt or sodium in moderation		17	21	23	22	24	25	25	27
Choose a diet low in saturated fat		50	48	37	37	64	54	45	50
Choose a diet with plenty of fruits and vegetables		36	27	28	26	49	44	37	35
Use sugars only in moderation		10	15	12	22	18	19	20	25
Choose a diet with lots of fibre		8	12	11	8	20	20	14	16
Eat a variety of foods		14	19	15	10	18	20	18	11
Choose a diet low in cholesterol		20	16	22	18	20	21	21	19
Choose a diet with plenty of breads, cereals, rice and pasta		5	5	7	2	10	10	10	5
Eat at least 2 servings of dairy products daily		6	4	4	4	11	11	6	10
Use low-fat cooking methods		24	23	15	19	21	33	29	33
Read food labels		7	5	6	4	16	13	7	3

Table 9.5 shows the results for a series of questions from the Food Frequency Questionnaire, which asked respondents whether they were choosing or avoiding foods based on nutrient content. Similar to the previous questions discussed, it was determined that for all age-gender groups, women were more likely to choose or avoid foods based on all of the nutrient concerns listed. In most cases, men and women in the 18-34 year age group were less likely to choose or avoid foods based on nutrient content than older adults of the same gender. Thus, men in the youngest age group (18-34 years) tended to focus

least on nutrient concerns when selecting foods to eat. Men in the 50-64 year age group were more likely than men in other age groups to consider each of the nutrient components when making food choices. The use of nutrient composition as a basis for selecting/avoiding foods increased with age for women for most of the choices listed.

Overall, about 40% of men and 59% of women claimed that they choose foods based on nutrient content. In total, at least half of all women in the province considered some type of nutrient characteristic to help make food selections. Similarly, the American Food Marketing Institute (1997) and the Canadian National Institute of Nutrition (1997) determined that women were more concerned about specific nutrition issues than men and were also more likely to attempt to follow healthy eating recommendations. For both women and men, fat content was the most popular reason for avoiding certain foods (52% of men and 72% of women indicated this). This agrees with the finding by the National Institute of Nutrition's Tracking Nutrition Trends survey (1997) which indicated that both men and women in Canada were most concerned about fat when given a list of possible items to choose from. The next most important consideration for women was unsaturated fat content (60%), followed by fibre content (54%) and avoidance of saturated fat (53%). After fat content, men tended to focus on avoiding cholesterol (41%), and choosing for fibre content (39%) and unsaturated fat content (39%). Of the possible choices listed, sugar content was least likely to be selected by either gender as a reason for selecting or avoiding particular foods.

Table 9.5 Choosing or Avoiding Foods Based on Nutrient Content  
(Population Percent by Age and Gender)

	Males				Females			
	18-34y (163)	35-49y (247)	50-64y (259)	65-74y (182)	18-34y (194)	35-49y (282)	50-64y (297)	65-74y (189)
(n)								
Choose for nutrient content	41	40	43	37	51	66	60	58
Choose for unsaturated fat content	26	39	51	41	45	65	65	66
Choose for fibre content	30	36	46	42	39	54	62	62
Avoid fat content	35	49	64	59	68	72	73	74
Avoid salt content	17	34	47	49	36	46	55	62
Avoid cholesterol content	24	35	59	47	36	53	61	60
Avoid sugar content	19	28	34	37	33	47	53	50
Avoid saturated fat content	25	32	48	37	40	52	59	60

## 9.4 SOURCES OF INFORMATION ABOUT HEALTHY EATING

The NB Nutrition Survey Nutrition and Health Questionnaire (Appendix A) included a question which asked participants about where they get information about healthy eating. Sources listed included physicians and dietitians, various forms of media, grocery store displays and food packages, and volunteer and government organizations. Participants were asked to rate each source according to whether it provided none, a little, or a lot of information. Table 9.5 shows New Brunswickers' response to this question.

The sources used to provide the most nutrition information to New Brunswickers varied according to gender. Consistent with other sections of the study, women reported that they rely on almost all the sources listed for nutrition knowledge to a greater extent than men do. The greatest percentage of women stated that the medium providing them with a lot of nutrition information is books (32%), closely followed by food labels or packages (31%). Among men, the greatest percentage reported that the source which provided them with a lot of nutrition information was dietitians or nutritionists (16%), followed by food labels or packages (15%). These results differ from the findings of the Canadian Tracking Nutrition Trends survey which indicated that women relied most on product labels for nutrition information, while men tended to get their information from television and radio shows (National Institute of Nutrition, 1997).

The source that most men and women said they received no nutrition information from was government services (81% of men and 76% of women). A large percentage of men also stated that grocery store handouts and or displays did not provide them with any healthy eating guidance (75%). Since the 1996-97 survey, many major grocery store chains employ dietitians and have put great emphasis on providing nutrition information.

Table 9.6 Sources of Information about Healthy Eating (Population Percent by Age and Gender)

(n)	Males				Females			
	18-34y (163)	35-49y (247)	50-64y (260)	65-74y (183)	18-34y (194)	35-49y (283)	50-64y (297)	65-74y (189)
<b>Physician</b>								
a lot of information	4	8	15	12	14	9	10	12
a little information	23	22	29	26	26	27	32	27
no information	62	59	51	59	54	56	55	57
don't know/no answer	12	10	5	2	5	8	3	3
<b>Dietitian or Nutritionist</b>								
a lot of information	5	16	20	21	18	18	27	26
a little information	8	7	14	16	12	15	14	15
no information	70	61	56	57	55	53	49	52
don't know/no answer	17	16	10	7	16	13	10	7
<b>Books</b>								
a lot of information	7	10	14	11	31	31	36	28
a little information	28	33	33	23	38	44	32	34
no information	57	52	50	60	28	23	30	34
don't know/no answer	8	5	3	6	3	3	3	4
<b>Newspaper or Magazine Articles</b>								
a lot of information	5	8	15	11	24	31	33	26
a little information	41	46	40	37	54	47	42	50
no information	49	43	43	47	22	22	25	23
don't know/no answer	6	3	2	5	0	0	1	1
<b>Television Programs</b>								
a lot of information	7	8	9	13	22	20	18	23
a little information	57	51	46	38	51	47	45	42
no information	35	39	44	47	27	33	36	35
don't know/no answer	2	2	1	2	0	0	1	0
<b>Grocery Store Handouts or Displays</b>								
a lot of information	1	3	3	2	10	8	11	10
a little information	20	21	14	14	36	37	28	25
no information	72	70	79	77	51	53	58	63
don't know/no answer	7	7	5	7	3	2	3	3
<b>Food Labels or Packages</b>								
a lot of information	20	13	13	12	31	32	35	27
a little information	23	36	29	23	43	42	38	35
no information	54	50	56	58	24	26	27	38
don't know/no answer	4	1	2	6	2	<1	<1	0
<b>Volunteer Organizations<sup>1</sup></b>								
a lot of information	3	2	5	5	3	8	9	8
a little information	13	15	18	14	23	24	20	18
no information	75	76	72	76	66	61	63	66
don't know/no answer	8	6	4	4	9	6	8	7
<b>Government Services<sup>2</sup></b>								
a lot of information	2	3	3	2	5	3	4	1
a little information	12	13	8	6	19	15	6	7
no information	78	78	83	86	67	73	80	83
don't know/no answer	8	6	6	6	9	9	9	9

<sup>1</sup> e.g. Heart & Stroke Foundation, Canadian Cancer Society, etc.<sup>2</sup> e.g. Public Health Services

### 9.4.1 Awareness and Use of Canada's Food Guide to Healthy Eating

At the end of the Food Frequency Questionnaire interviewers inquired about participants' knowledge and use of Canada's Food Guide to Healthy Eating. To avoid creating bias in the second 24-hour recall, those for whom a second interview was planned were not asked these questions at the initial session. The results of the questions regarding the food guide are shown in Table 9.7. It is important to remember that these results are not as reliable as they include responses from a much smaller segment of the population than other sections of the NB Nutrition Survey.

Of the New Brunswickers who answered this part of the questionnaire, almost three-quarters said they had heard about or seen Canada's Food Guide to Healthy Eating. (72%). Men were less likely to know about the food guide than women (61% versus 84%). Knowledge of this healthy eating guide was more common among the youngest groups of both genders (aged 18-34 years and 35-49 years). The age-gender category with the lowest percentage of people aware of the food guide was men aged 65-74 years (39%). Approximately 94% of women in the 35-49 year age group reported that they had heard about or seen Canada's Food Guide to Healthy Eating.

Those who were aware of the food guide were asked to select ways in which they used it. More women than men reported using the food guide in all of the categories suggested, regardless of age. There was no age-related pattern to how the food guide was used. The most popular use for the food guide for both genders was for planning/choosing meals at home; approximately one-quarter of women aged 35-49 years and 50-64 years reported using it for this purpose. The guide was used less often for grocery shopping, with the highest percent of people using it for this reason being the same two groups of women (aged 35-49 years and 50-64 years). Very few people claimed to use the food guide to help them select foods in restaurants (4% of women and 1% of men).

Table 9.7 Awareness and Use of Canada's Food Guide to Healthy Eating (Population Percent by Age and Gender)

	Males				Females			
	18-34y (n)	35-49y (n)	50-64y (n)	65-74y (n)	18-34y (n)	35-49y (n)	50-64y (n)	65-74y (n)
<b>Have you ever seen or heard about Canada's Food Guide to Healthy Eating?</b>	(116)	(158)	(187)	(134)	(130)	(192)	(204)	(124)
Percent who said "yes"	70	74	59	39	91	94	83	69
<b>Do you use it?</b>	(80)	(117)	(109)	(53)	(118)	(179)	(168)	(86)
Percent who said "yes"	17	22	23	32	33	50	52	49
<b>How do you use it?</b>	(163)	(247)	(259)	(183)	(194)	(282)	(296)	(189)
Percent who said:								
For Shopping	2	5	4	3	8	16	15	12
For planning/choosing meals at home	6	7	8	9	18	26	26	17
For choosing foods in restaurants	0	1	2	1	4	5	4	4

## **10** FOOD SECURITY

The last section of the Nutrition and Health Questionnaire focussed on food security (see Appendix A). Questions addressed issues such as usage of food banks or soup kitchens, reasons for lack of food, and how often the individual/family was affected by food shortage. People living in poverty are at greater risk of developing illness for numerous reasons, one of which is lack of adequate income for purchasing nutritious foods (Heart and Stroke Foundation of Canada, 2003). One of the goals of the NB Nutrition Survey was to assess the prevalence of food insecurity. This chapter includes a very limited discussion of the food security issue, as data was available for only two of the related questions and the response rate for these questions was low (52%). A possible reason for the low response rate was that interviewers and respondents did not feel comfortable with asking/answering these questions. One interviewer also raised the concern that many lower income New Brunswickers change addresses often and thus were more difficult to locate for an interview. This introduces the possibility that the percentages of those with low incomes and food shortages in NB might be underestimated by this study.

### **10.1 FOOD BANK USAGE**

The increased use of food banks across the country indicates the growing number of Canadians who do not have access to adequate amounts of food. According to the Canadian Association of Food Banks (1997) the number of people using food banks more than doubled between 1989 and 1997. One of the NB Nutrition Survey food security questions asked if the individual's family got food from a food bank or soup kitchen in the past month. Of the 946 people who responded to this question, 2% said they had visited a food bank or soup kitchen in the past month and 98% stated they had not. This is comparable to the Canadian Association of Food Banks' finding that 2.28% of the NB population received emergency food assistance, according to their 1997 Hunger Count survey.

### **10.2 FOOD INSUFFICIENCY**

The Nutrition and Health Questionnaire asked respondents to state the level of food sufficiency in their household according to whether there was always enough food, sometimes not enough food, or often not enough food to eat. Out of a total of 946 responses, 97% reported they always had enough food, 2% said sometimes there was not enough food to eat, and 1% stated that often there was not enough food. This reinforces the likelihood that the percentage of New Brunswickers experiencing food shortages was greater than the number who sought emergency food assistance (i.e. 3% with not enough food to eat versus 2% using food banks/soup kitchens).

The Demographic Profile asked interviewees to indicate the gross income for the entire



household according to ranges that started below \$5,000 and ended at \$60,000 and over (see Appendix A). Statistics Canada's Low Income Cut-Off (LICO) can be used to describe different levels of household income adequacy. Households with incomes below the LICO typically face financial difficulties, with over 55% of their income going toward the costs of basic life necessities, including food, shelter, and water (Canadian Council on Social Development, 1992; Federal, Provincial and Territorial Advisory Committee on Population Health, 1999). This leads to a lower standard of living and deprivation, as there is little or no money left for other needs such as health needs, home supplies, transportation, education, recreation, etc. (Canadian Council on Social Development, 1992). An income below the LICO is not a definitive indicator of poverty and does not lead to food shortages in all cases, but it does suggest there is a higher risk of not meeting dietary needs for those in lower income households.

Chapter 4 discusses income adequacy levels according to household size and income (see Table 4.3). Men and women in the 18-34 year age group had the greatest percentage of adults in the lowest income group, putting this segment of the population at high risk for inadequate nutrient intake. One possible contributor to this may be that a portion of the younger adult population is likely to be in post-secondary school for much of the year. It is important to acknowledge that although the NB Nutrition Survey only considered the nutritional needs of adults, some of those with the lowest/lower income adequacy levels were likely to have been parents, therefore also having children at risk of being hungry and suffering nutritional deficiencies. Men and women aged 65-74 years had the highest percentage of adults in the lowest/lower income category (36% of men and 38% of women). Consistent with the findings of the Report on the Health of Canadians (1996), women over age 65 were more likely to have the lowest incomes compared to men in the same age group. This suggests that older New Brunswickers, especially women, are at high risk for nutritional inadequacies due to lack of money for purchasing healthy food and/or sufficient amounts of food.

### 10.3 INCOME ADEQUACY AND NUTRIENT INTAKES

Not having enough money to purchase nutritious food is a concern for many families living on lower incomes. A study in 1997 by the National Institute of Nutrition (NIN) found that 20% of Canadians whose household income was under \$25,000 said they did not have enough money to eat nutritiously. Statistics Canada (2001a) reports that in 1998-99, 30% of Canadians living in low income and 12% of those in middle income households believed their nutritional intake had been compromised as a result of food insecurity.

Table 10.1 shows the mean nutrient intakes of New Brunswickers according to income adequacy levels as described in Chapter 4 (see Section 4.6). Macronutrient intakes were similar between New Brunswickers of different income adequacy levels. Mean fat intakes for all groups exceeded 30% and those in the middle income households had the highest fat intake as a percentage of calories. Mean intakes of all micronutrients was lowest for the lowest income category, which indicates that they are at greatest risk for nutrient deficiencies compared to adults with higher incomes. This is especially true for folate,

vitamin C, calcium, fibre and magnesium, for which all groups had low mean intakes regardless of income level and for which a high prevalence of inadequacy was observed in the overall NB adult population (see Section 5.3.2 and 5.3.3). Mean vitamin C intake was lowest for the lower income group. The lower income group had less mean calcium and magnesium intakes than those with higher incomes, but intakes of other nutrients were similar overall. Intakes of most micronutrients were similar between adults from the middle income and highest income households.

Table 10.1 Mean Nutrient Intake<sup>1</sup> by Income Adequacy Level

	Lowest			Lower			Middle			Upper Middle/Highest		
	Estimate	[95% CI]		Estimate	[95% CI]		Estimate	[95% CI]		Estimate	[95% CI]	
Mean												
Protein	16.2	15.5	16.9	16.4	15.6	17.1	16.2	15.6	16.7	16.4	16.0	16.8
Carbohydrate	50.7	48.4	53.0	50.1	48.9	51.3	50.0	48.6	50.4	50.4	49.7	51.1
Total Fat	31.4	29.2	33.6	32.6	31.5	33.7	33.2	32.4	34.1	31.9	31.2	32.5
Saturated Fat	10.7	9.8	11.6	11.0	10.4	11.5	11.4	11.0	11.8	11.2	10.9	11.5
Polyunsaturated Fat	4.8	4.4	5.2	5.3	4.8	5.9	5.5	5.3	5.8	5.4	5.2	5.5
Monounsaturated Fat	12.6	11.7	13.6	13.1	12.7	13.5	13.0	12.6	13.4	12.5	12.2	12.9
Cholesterol	234.6	207.9	261.3	264.8	244.4	285.2	270.1	257.2	283.1	258.5	250.0	267.1
Fibre	12.2	11.1	13.4	15.4	13.2	15.8	14.7	13.8	15.5	15.0	14.4	15.6
Sodium	2864	2601	3127	3000	2633	3367	3173	3022	3325	3041	2930	3152
Potassium	2604	2289	2919	2885	2607	3163	2972	2829	3115	2925	2829	3021
Calcium	644	575	714	652	602	703	731	699	763	745	721	769
Phosphorus	1160	1022	1299	1251	1101	1401	1326	1266	1386	1323	1277	1369
Magnesium	248	219	277	274	242	307	285	273	298	286	276	295
Iron	12.4	10.9	13.9	13.8	12.9	14.6	13.7	13.3	14.1	13.6	13.3	13.9
Zinc	9.4	8.0	10.7	9.9	9.2	10.6	10.1	9.8	10.4	9.9	9.7	10.0
Vitamin A	694.8	592.9	796.6	819.4	760.2	878.6	774.6	736.4	812.9	806.0	776.3	835.7
Thiamin	1.2	1.1	1.3	1.4	1.3	1.5	1.4	1.4	1.5	1.4	1.4	1.5
Riboflavin	1.6	1.4	1.7	1.7	1.5	1.9	1.7	1.7	1.8	1.7	1.7	1.8
Niacin	32.8	29.2	36.5	35.3	32.6	38.0	36.3	35.3	37.5	35.6	34.8	36.3
Vitamin B <sub>6</sub>	1.5	1.4	1.6	1.6	1.5	1.8	1.6	1.6	1.7	1.6	1.6	1.7
Vitamin B <sub>12</sub>	3.5	2.9	4.0	3.8	2.8	4.8	3.7	3.4	4.0	3.6	3.4	3.9
Pantothenic Acid	4.2	4.0	4.5	4.7	4.6	4.9	4.7	4.5	5.0	4.7	4.6	4.9
Folacin	189.9	170.0	209.9	215.5	202.8	228.0	215.4	204.7	226.1	220.8	211.7	229.9
Vitamin C	90.2	65.3	115.1	86.6	76.9	96.1	98.5	88.7	108.2	102.4	95.2	109.5

<sup>1</sup> Intakes based on single day recalls from food sources only

# 11 DISCUSSION

This report discusses key observations regarding the results of the NB Nutrition Survey conducted in 1996-97. The objectives outlined in Chapter 1 have been addressed, including: estimated macro and micronutrient intakes; groups of NB adults at risk of inadequacies; weight status related to health risk; frequency of intake of selected food items from each of the Canada's Food Guide to Healthy Eating food groups; and food security. Additional data collected by the survey but not directly related to these objectives was not evaluated (e.g. use of fats on foods and in cooking, supplement use, etc.). This information is available through Health Canada for review at a later date.

New Brunswickers' macronutrient intakes appeared to fall within the Dietary Reference Intake (DRI) guidelines. These new guidelines differ from the Nutrient Recommendations which were used in the assessment of other provincial nutrition surveys. The adult population in NB appeared to be meeting the recommended percentages of intake for fat, carbohydrates, and protein. The Nutrient Recommendations (Health and Welfare Canada, 1990) advised that fat intake be limited to no more than 30% of energy intake, and a recent statement by the World Health Organization (2003) continues to support this limit. The new DRI's developed by Canada and the United States, however, have increased the suggested maximum fat intake to 35%. With the exception of women in the 64-75 year age group, New Brunswickers exceeded the 30% recommendation for fat intake, but intakes fell within the more current DRI guidelines. On a positive note, the fat intake of adults in NB decreased since the last major nutrition survey completed in 1972. There did appear to be some awareness of the importance of reducing fat intake, as overall the most popular choice for fluid milk was 1% versus higher fat varieties. About half of the population felt that reducing fat intake was an important dietary measure and claimed they tried to limit fat when selecting foods. This means, however, there were still many who had not received the message about the importance of reducing fat intake. Some New Brunswickers, especially younger men, continued to consume greater amounts of higher fat foods such as processed meats, regular fat cheese, and regular ice cream, than lower fat choices. It is also important to emphasize the consumption of foods prepared using healthier cooking methods instead of frying. Men in particular need to be more conscious of the preparation method when cooking or making food choices, as they ate as much or more fried chicken, fried fish, and fried potatoes/chips than they did of these same foods cooked using all other methods.

New Brunswick adults reported energy intakes which were lower than those of the 1972 Nutrition Canada Survey, with the exception of the 65-74 year age group of both genders. The low self-reported energy intakes observed in the NB Nutrition Survey were at least partly related to under-reporting, which tends to increase as the level of overweight and obesity rises. The limited information regarding physical activity showed that a large percentage of the population was inactive. Regardless of the extent of under-reporting, the rising rates of overweight and obesity in NB indicate that the energy intakes of most adults exceeded what was necessary for their sedentary lifestyles. Only about one-quarter of men

and less than 40% of women were found to be at an acceptable weight for their height according to the Body Mass Index (BMI) or the combined use of BMI and waist circumference (WC). The picture is even worse using the World Health Organization (WHO) WC cut-offs, which indicate that over half of men and women in NB had an increased or substantially increased risk of developing health problems. The NB Nutrition Survey was conducted in 1996/97 and recent statistics show that the rates of overweight and obesity have remained high. This indicates that the majority of the NB adult population is carrying extra weight and has an unhealthy weight-distribution pattern, which puts them at high to extremely high risk of developing health problems.

Many New Brunswickers did not appear to be meeting their needs for several key nutrients. Adequate folate intake has been linked to reduced risk of cardiovascular disease (National Institute of Nutrition, 1998) and may reduce the risk of spina bifida in infants if consumed in sufficient amounts perinatally (Health Canada, 1997). The older Nutrient Recommendations for folate ranged from 185-230 micrograms for adults (Health and Welfare Canada, 1990). The new DRI's increased adults' required intake to 320 micrograms. Few people were meeting their needs for folate from food sources according to the results of the NB Nutrition Survey. In November 1998, an amendment to the Food and Drug Regulations increased the amount of folic acid added to flour to 0.15 mg/100 g of flour and pasta products (Health Canada, 1997; Health Canada, 1999b). Prior to this the addition of folic acid was optional and amounts added ranged from 0.04 to 0.15 mg (Health Canada, 1997). Thus the 1991 Canadian Nutrient File version used in this study would have evaluated intakes based on a lower level of folic acid fortification. This extra amount is expected to increase the average woman's daily intake by about 100 µg per day (Health Canada, 1999b), which would still give a mean intake of folic acid below estimated requirements. This was especially true in the two youngest groups of females (i.e. ages 18-49 years), who were most likely to conceive. Since the 1996-97 survey, another factor that may have increased intake of this nutrient by women of childbearing age is a heightened awareness of the recommendation for folic acid supplementation through the advice of a health professional, the media or a national health campaign.

The NB Nutrition Survey shows the majority of New Brunswickers were not getting sufficient amounts of some nutrients key to bone health and the prevention of osteoporosis. None of the age-gender groups in the province had an adequate intake of calcium and 70% of adults were not getting enough magnesium. Although this survey was not able to determine how many servings of Milk Products from Canada's Food Guide to Healthy Eating were consumed, the results of the Food Frequency Questionnaire suggest it is unlikely that NB adults were achieving the recommended 2-4 servings/day. According to the evaluation of nutrition attitudes, less than 10% of the NB population believed that meeting the guideline for the Milk Products group was an important step for improving eating habits. This emphasizes the importance of promoting an increased consumption of low-fat dairy products to improve calcium intake. It is interesting to note that the consumption of Milk Products decreased for women in the 50-65 year age group, but increased again for the oldest group. This finding agreed with the Nutrition and Health Questionnaire, which determined that women in the 50-65 year age group were less likely than women of other

ages to believe that getting at least 2 servings of milk products daily was an important part of healthy eating. It is important to note that this report has not assessed the use of supplements, and it is possible that some adults in NB who were concerned about inadequate calcium in their diet may have been using supplements to increase their intake. In addition to reducing the risk of osteoporosis, adequate magnesium intake may also play a role in reducing the risk of heart disease and high blood pressure. To increase magnesium intake in the population, recommendations should focus on increasing vegetable and seafood intake and emphasizing whole grains over refined grain products. This survey showed that New Brunswickers ate at least as much white bread as whole wheat.

Intakes of vitamin A and vitamin C were poor for much of the population. Vitamin A is important for maintaining a healthy immune system as well as the health of eyes, skin, intestinal and urinary tracts, among other benefits. The antioxidant vitamin C plays an important role in overall health and in adequate amounts may lower the risk of developing chronic illnesses, including cardiovascular disease and some forms of cancer. These findings highlight the importance of getting adequate amounts of low-fat fortified milk products to provide additional vitamin A as well as for bone health. It was not possible to evaluate data on the intake of vitamin A carotenoid precursors, due to the large percentage of the population who had a zero intake level of carotene (see Chapter 2, section 2.6.3). In addition to contributing to vitamin A status, carotenoids such as beta-carotene act as antioxidants that may reduce the risk of developing many chronic diseases. Emphasizing an increase in the amount and varieties of vegetables and fruit consumed throughout the province (with a focus on more colorful vegetables and fruits rather than the already very popular potato), could help improve intakes of vitamin A, carotenoids, and vitamin C along with folic acid, magnesium, and fibre, which have also been noted as concerns.

Vitamin B<sub>6</sub> intake was low for the NB population over 50 years of age, which may be addressed by recommending these adults increase their intakes of lean meats, shellfish, and whole grain products. Intakes of shellfish were similar whether with or without butter, and were low overall. This means that in promoting an increased intake of shellfish, it is important to reinforce healthier cooking methods to avoid adding extra fat at the same time. Vitamin B<sub>12</sub> intake also appeared to decrease with age, which is a further reason to promote increased consumption of meats and milk products in the older population. Women in general had intakes below the recommended requirements for thiamin and zinc, which indicates that this group of the population might benefit from increasing the amounts of lean meats and whole grains they eat. Increased intake of enriched whole grains and lean meats would also help improve the iron intakes of the women aged 19-34 years, who were less likely than other New Brunswickers to be meeting their requirement for this mineral. Women's intake of beans was low, so it is possible that promoting increased consumption of legumes might be another strategy for improving iron intake.

The "Other Foods" category from Canada's Food Guide to Healthy Eating provided the greatest percentage of energy, fat and sodium to the intakes of NB adults. "Other Foods" include high energy/low nutrient density products, sugars, and fats. These "Other Foods"

accounted for half of the intake of total, saturated, polyunsaturated, and monounsaturated fat. After Vegetables and Fruit, the “Other Foods” category provided the next greatest quantity of vitamin C and also contributed greatly to the intake of vitamin A. Grain Products were the largest source of carbohydrate, fibre, magnesium, thiamin, and iron, and also contributed considerable amounts to the intake of riboflavin and folate. The Vegetables and Fruit group was the source of over half of the vitamin C intake of New Brunswickers. Vegetables and fruit provided the greatest quantities of vitamin A, folate, and potassium, and also provided large amounts of fibre and vitamin B<sub>6</sub>. With the increase in the fortification regulations for flour and pasta since this survey was conducted, it is possible that the amount of folate coming from Grain Products exceeds that from the Vegetables and Fruit group. Half of the calcium consumption came from the Milk Products group. Milk Products also contributed large amounts of vitamin A, riboflavin, and vitamin B<sub>12</sub>. Meat and Alternatives accounted for about half of the protein intake and provided the most vitamin B<sub>6</sub>, B<sub>12</sub>, phosphorus, and zinc. After “Other Foods”, the Meat and Alternatives group provided the most total, saturated, polyunsaturated, and monounsaturated fat and was the main source of cholesterol. The individual food items contributing most to the intake of a wide variety of nutrients were red meat, fluid cow’s milk, and vegetables. Within the Grain Products group, white bread, pasta and rice contributed the most to nutrient intakes. The results regarding the contribution of major food groups to nutrient intakes highlight the importance of reinforcing that “Other Foods” should be included in moderation only. NB adults could benefit from making an effort to limit the amount of “Other Foods” they are consuming and replacing these with nutrient-dense choices from the four healthy food groups. In the Grain Products group it is important to emphasize whole wheat and other whole grain breads and cereals versus refined products such as white bread. The survey results show that red meat was the major source of nutrients and fat from the Meat and Alternative group. It may be beneficial to include a wider variety of foods from this group, such as fish and vegetarian alternatives. As discussed, the NB Nutrition Survey suggests that adults did not appear to be getting the recommended number of servings from the Milk Products group, so promoting increased consumption of low-fat dairy foods would provide greater amounts of the nutrients this food group is already contributing, but which were lacking overall in New Brunswickers’ intake. Similarly, consuming more of the low-fat nutrient dense items which make up the Vegetables and Fruit group would provide a greater supply of health-promoting nutrients to the population.

Although the percentage of energy that New Brunswickers were eating in the form of carbohydrates fell within the DRI guidelines of 45 to 65%, it is a concern that much of the carbohydrate consumed came from refined products. Over 85% of the carbohydrate derived from Grain Products was from white bread, pasta, rice and cereals which were not whole grain or high fibre. The results show that almost one-fifth of overall carbohydrate intake was from high sugar “Other Foods”, such as added sugars and syrups, candy, popsicles, soft drinks and other sweetened drinks. The individual foods providing the highest percentage of carbohydrate intake were soft drinks and other sweetened drinks, followed by added sugars. The results of the NB Nutrition Survey suggest that New Brunswickers made a healthy shift toward less fat and more carbohydrate intake. Unfortunately, however, much of this carbohydrate came from refined grain products, sugars and products high in sugar with

lower nutrient density. Choosing more nutritious carbohydrate sources, including whole grain products and vegetables and fruit, could improve the intake of several nutrients New Brunswickers were not getting enough of, such as fibre, thiamin, vitamin B<sub>6</sub>, folic acid, vitamin C, and vitamin A.

An assessment of New Brunswickers' health and nutrition-related attitudes demonstrated discrepancies between the amounts of people suffering from certain health problems versus those who were attempting to address these through healthy eating. More people reported having had high blood pressure than claimed to consider this health concern when making food choices. It is also disconcerting to find that fewer people were aware of the link between hypertension and heart attacks than said they had high blood pressure. The Nutrition and Health Questionnaire results show that some New Brunswickers were making an attempt to choose healthy foods to maintain or achieve a healthy weight; however, the percentage of those who were concerned about their weight was less than the percentage classified as overweight and obese. Although more NB men were overweight/obese than women, less of the male population was concerned about selecting or avoiding certain foods to limit weight gain. Thus, despite the heightened concern about obesity in our country, fewer New Brunswickers were basing food choices on avoiding weight gain than were actually obese/overweight. An exception to this was diabetes, as more people claimed that they selected foods based on this health concern than had been told they had it. About forty percent of the population agreed that lack of exercise was a major contributing factor to heart attacks; however the majority of the NB population was inactive. One of the most important steps toward addressing the levels of overweight and obesity in NB is to increase energy expenditure through regular activity. The many benefits of regular physical activity, including weight loss and maintenance, could help reduce the incidence of and manage health risks associated with overweight/obesity, hypertension, diabetes, and heart disease.

According to the NB Nutrition Survey, the primary source of nutrition information for women was books, while the largest percentage of men stated they got a lot of information from dietitians. Food labels and packages were the next most popular information source for both men and women. In 2002, the Heart and Stroke Foundation implemented its "Health Check" symbol on food labels to promote healthy choices. The "Health Check" program was promoted in print, on television and radio, and in grocery stores across Canada. In 2003, Health Canada introduced new nutrition labeling regulations and distributed educational materials to help professionals and consumers understand how to use these labels. It is possible that due to the revised food labels and promotional programs, that even more New Brunswickers may be using food labels as a source of nutrition information than at the time of the NB Nutrition Survey in 1996-97. Many major grocery stores in NB now offer nutrition education to their consumers by employing dietitians to provide tours and education sessions. Thus, although three-quarters of the New Brunswickers surveyed in 1996-97 stated they did not get information from grocery store handouts or displays, a greater percentage of adults might report using this as a source of nutrition information today.

In some cases it appears that New Brunswickers were aware of healthy eating advice, but were not implementing it. Although three-quarters of the population were aware of Canada's



Food Guide to Healthy Eating, just over one-third said they actually used it to help them make food choices. Large numbers of New Brunswickers agreed that one of the most important steps to eating healthier is to increase vegetable and fruit intake, yet the food frequency and nutrient analyses from this study suggest that intake of these foods was inadequate for much of the population. Adult women in NB stated that they believed increasing fibre intake is very important, yet white bread was a more popular choice than whole wheat for most of them. Despite an effort to reduce fat intake, New Brunswickers were eating out at restaurants and purchasing fast food on a regular basis. While this does not necessarily mean that they were choosing high fat items, it is certainly more challenging to make healthy choices in these situations. These examples suggest that while many New Brunswickers were aware of the importance of key nutritional recommendations, they were not yet putting them into practice.

One potential barrier to following the nutrition guidelines is lack of adequate income with which to buy healthy food choices. The Nutrition Survey found that about 2% of families reported visiting a food bank in the past month or did not always have enough food to eat. This does not include many other New Brunswickers who may not have used emergency food aid, but who had a household income which put them at greater risk for numerous health concerns, including nutritional deficiencies. Nutrient intakes were assessed according to household income adequacy levels. Low income adequacy was divided further into lowest income and lower income groups. Calcium, magnesium, folate, and fibre intakes appeared inadequate across all income groups. The lowest income group had the lowest overall micronutrient intake, putting them at the greatest risk of suffering from these particular nutrient deficiencies. The greatest proportion of those with the lowest incomes were men and women 18-34 years of age. These women would have been at higher risk for having low birth weight infants as a result of inadequate nutrition. Their low calcium intakes might also put them at greater risk for developing osteoporosis later in life. Poor nutrition in the 18-34 year age group is also a concern as some of these adults may have been parents, therefore also putting their children at high risk for nutrient deficiencies. Adults aged 65-74 years of both genders, but in particular women, comprised the greatest percentage of those in the lowest/lower income group. This group also had lower nutrient intakes than those in the middle and higher income ranges, and thus were at increased risk for nutrient deficiencies than those with more income. With some of the poorest calcium intakes, low income older New Brunswickers, especially women, were at greater risk of developing osteoporosis than higher income groups. Having some of the lowest intakes of calcium, magnesium, folate, and fibre also means this segment of the population would have received less of the protective benefits these nutrients might have provided against developing cardiovascular disease and associated risk factors such as high blood pressure.

## 11.1 FUTURE DIRECTIONS

In future surveys it would be helpful to have had a greater variety of food items from each food group listed on the Food Frequency Questionnaire, so the results could be used to approximate the average number of daily servings from each food group. A more accurate

assessment of whether New Brunswickers' intakes fall within the guidelines for each food group could be used to observe possible inadequacies according to Canada's Food Guide to Healthy Eating. This could be used to determine more accurately which food groups need to be emphasized in order to improve the intake of nutrients which have been found to be lacking due to the eating habits of NB adults.

The 1972 Nutrition Canada Survey did not observe intake of high sugar/low nutrient density and refined grain foods in the same way carried out in this report, so it was not possible to do a direct comparison of how the intake of these types of foods may have changed in New Brunswick between the two surveys. It may be useful in future surveys to do a comparison of how much carbohydrate is coming from whole grains, vegetables and fruits rather than refined wheat products and primarily sugar from "Other Foods", with the goal of seeing a shift to a greater percentage coming from healthier carbohydrate sources.

To achieve a better response for the food security part of the survey, it may be helpful to reduce the discomfort level of interviewers and interviewees by making answers more anonymous. One possibility would be that interviewers could give the questionnaires to the interviewees at the end of the session and provide a stamped addressed envelope with which to send the answers in once they had been completed in private.

In a future survey it may be beneficial to have enough information from the Food Frequency Questionnaire to estimate intake from entire food groups, to determine more precisely which food groups New Brunswickers are lacking in according to parameters such as age, gender, and income levels.

To better understand the magnitude of the energy imbalance contributing to rising rates of overweight/obesity, it would be helpful to do a detailed evaluation of physical activity levels/energy expenditure and compare this to energy intakes that take under-reporting into consideration. When calculating energy expenditure with the method applied in this report, it is important to be aware of the limitations of the estimated Physical Activity Level (PAL) that was used, and more research into the PAL would be required.

Information on the use of nutrition supplements was collected as part of the NB Nutrition Survey, however this was not discussed in the report as it was not one of the goals of the survey. It could be useful to analyse this data to determine whether the use of supplements helps to improve the levels of inadequacy observed for specific nutrients in particular age-gender groups. For example, since this survey was conducted in 1996-97, it would be interesting to determine whether more women of childbearing age in NB are taking folic acid as has been promoted by national campaigns.

## 12 CONCLUSIONS

- The New Brunswick (NB) Nutrition Survey is the first province-wide survey conducted in NB since the Nutrition Canada Survey in 1972. Energy and nutrient intakes appeared to have declined since the 1972 survey. According to the NB Nutrition Survey, nutrient intakes of New Brunswickers were similar to adults in the other Canadian provinces that conducted surveys over the past decade. A sample of 1,816 individuals has provided useful information about the dietary habits of New Brunswick adults. Caution must be used when interpreting some results, due to the limited sample sizes in some geographic areas for particular age-gender groups.
- The percentage of energy New Brunswickers were eating in the form of fat decreased since the 1972 Nutrition Canada Survey. Although New Brunswickers were still consuming a fat intake above 30% of their energy intake (overall 32% of caloric intake is coming from fat), this is in line with the more current Dietary Reference Intake (DRI) guidelines which increase the acceptable percentage of calories from fat.
- The decrease in energy from fat since 1972 was replaced with increases in the percentage of calories coming from protein and carbohydrates. Protein and carbohydrate intakes of NB adults also fell within DRI guidelines. A considerable amount of this carbohydrate intake, however, came from sugars and high sugar/low nutrient dense foods and refined grain products. Consuming a greater amount of carbohydrate in the form of more nutritious whole grains, vegetables and fruit, may help New Brunswickers improve their intake of nutrients such as fibre, thiamin, vitamin B<sub>6</sub>, folic acid, vitamin C, and vitamin A.
- Most New Brunswickers were not getting sufficient amounts of folate, with 90% of men and 97% of women failing to meet the Estimated Average Requirement (EAR). Inadequate folate intakes may increase the risk for cardiovascular disease in adults and spina bifida prenatally. After the NB Nutrition Survey was conducted, Health Canada amended the fortification level of folacin in flour; however, it is uncertain how much impact this additional amount would have on the percentage of the population meeting the EAR. Further studies will need to be carried out to evaluate the impact of mandatory folic acid fortification of flour and recommendations for folic acid supplementation among childbearing women in Canada.
- Two-thirds to three-quarters of the population did not meet their needs for magnesium. Almost 30% did not achieve their required intake of vitamin A. Data on the intake of beta-carotene could not be evaluated due to the large percentage of adults who had zero intakes. Approximately half of NB adults were not meeting the EAR for vitamin C. less than 10% of the population achieved the Adequate Intake (AI) level for fibre. These nutrients play various roles in overall health, maintaining a healthy immune system, and

reducing the risk of chronic diseases, including cardiovascular disease and certain forms of cancer. Inadequate intakes of these nutrients as a group, suggests that New Brunswickers do not eat adequate amounts and varieties of vegetables and fruit. As the Food Frequency Questionnaire (FFQ) considered only selected vegetables and did not evaluate fruit intake, further study is required to gain a better understanding of vegetable and fruit intake in NB. The data collected from the 24-hour recalls may help in analyzing intake from this food group. In addition to poor vegetable and fruit intake, low magnesium and fibre intake could also be related to the likelihood that New Brunswickers chose refined products over whole grain products, as indicated by the fact that almost twice as many people consumed white bread over whole wheat.

- Poor calcium intake was a concern for both genders and across all age groups in NB, as none met the mean AI for this mineral. Information collected from the FFQ suggests that few New Brunswickers were meeting Canada's Food Guide to Healthy Eating's recommendation of 2-4 servings of Milk Products daily, which is the main source of well-absorbed calcium for Canadians. When questioned about important healthy eating habits, adequate consumption of milk products was considered a low priority for most New Brunswickers. Inadequate calcium intake increases the risk of osteoporosis and calcium also holds the potential for protection against risk factors for heart disease such as hypertension. Poor calcium intake and low Milk Products consumption highlights the importance of promoting increased consumption of low-fat dairy products in NB.
- A segment of the adult population over 65 years of age, especially women, could benefit from increased intakes of vitamins B<sub>6</sub> and B<sub>12</sub>. At least a third of women were not meeting the EAR for zinc, many were not meeting their requirement for thiamin, and women under 50 were less likely to be meeting the EAR for iron. Thus, older New Brunswickers and women in all age groups may benefit from increasing their consumption of whole grains, meats, shellfish, and meat alternatives such as legumes and nuts. Higher consumption of low-fat Milk Products, as already recommended for increasing calcium intake, may additionally provide the benefit of increasing vitamin B<sub>12</sub> intake. Additionally, the new DRIs recommend that adults over 50 years of age consume foods fortified with crystalline vitamin B<sub>12</sub> or take vitamin B<sub>12</sub> supplements to meet the requirement for this nutrient.
- Overweight and obesity are major health concerns in NB. The NB Nutrition Survey found that 41% of adults in the province were overweight and 19% were obese. More recent statistics indicate the rates of overweight and obesity in NB have remained high since this survey was conducted in 1996/97. Being overweight or obese increases the risk for a number of chronic illnesses, including cardiovascular disease, diabetes, and some cancers. Over half of the NB adult population was at increased or substantial risk of developing health problems according to the World Health Organization's (WHO) waist circumference (WC) cut-off measurements. A higher percentage of men than women were overweight and obese, but women in all age groups were more likely to have WCs placing them at the WHO's substantially increased risk level of developing

health problems. It is not possible to make an accurate statement regarding physical activity levels with the limited amount of information collected on this from the survey; however, it appears that a large segment of the NB adult population did not participate in regular physical activity. Lack of or an insufficient amount of physical activity is likely to be a significant contributor to the rapidly increasing rate of overweight and obesity in this province. More recent and detailed data confirms that a great number of New Brunswickers remain inactive. The survey showed that a segment of the NB population ate out regularly, and as it is more difficult to make healthy food choices at restaurants and fast food outlets, this may also have contributed to weight gain.

- The “Other Foods” category from Canada’s Food Guide to Healthy Eating includes high energy/low nutrient density items such as added sugars and fats, cakes and pies, candy, chocolate bars and fried potatoes. “Other Foods” provided the greatest percentage of energy, fat and sodium to New Brunswickers’ intakes. To improve their intake of health promoting nutrients, New Brunswickers need to limit the intake of these “Other Foods”, while increasing their consumption of Vegetables and Fruit, choosing more whole grain foods from the Grain Products group, including a wider variety of healthy choices from the Meat and Alternatives group, and meeting the recommended daily number of servings of Milk Products. It is also important to emphasize healthier cooking methods instead of frying (e.g. for foods such as potatoes, chicken, fish/seafood, etc.).
- Many New Brunswickers, especially women, were aware of the importance of following a healthy lifestyle, and they listed not smoking, reducing fat intake, exercising regularly, and increasing vegetable and fruit consumption among their top recommendations. Choosing foods based on achieving or maintaining a healthy weight was considered important by at least one-third of men and almost twice as many women. The message about reducing fat intake appears to have reached many adults, and in addition to being listed as an important dietary habit by both men and women, movement towards this goal was reflected in observations such as a lower overall percentage of calories coming from fat and a higher consumption of 1% versus whole milk. Unfortunately there appeared to be a much greater gap between knowledge and action for other key lifestyle and nutrition recommendations, as the NB Nutrition Survey showed that intake of vegetables and fruit was low, large numbers of the population did not exercise regularly, and the majority of New Brunswickers were overweight or obese.
- People with low incomes tend to have poorer health, and a contributing factor to this is lack of adequate income to buy sufficient amounts of food and healthy food choices. The NB Nutrition Survey found that energy, protein and fat intakes were similar across all income levels, but that adults living in households with the lowest incomes had the lowest micronutrient intakes. The greatest percentages of adults in the very lowest income group were the youngest men and women (aged 18-34 years), while the overall low income group was predominated by the oldest adults, in particular women (aged 65-74 years). A number of nutrients, including calcium, magnesium, folate, and fibre were found to be lacking across all ranges of income, and thus those with the lowest

income were at the greatest risk of suffering the health-related consequences of being deficient in these nutrients.

- The information gathered from the NB Nutrition Survey can be used to determine important health promotion messages. Key areas which should be addressed include increasing consumption of vegetables and fruit, low-fat milk products, and promoting the choice of whole grain products over refined ones. Women and the older population could also benefit from increased consumption of Meats and Alternatives. At the same time that increased consumption of these foods is promoted, it is also important to continue to emphasize limiting fats and extras to avoid adding extra energy intake to prevent weight gain. Although there were still some New Brunswickers who did not understand or were not aware of good nutrition habits, the majority of the population was aware of at least some healthy eating messages. Unfortunately this awareness was not being put to use, as shown by the finding that two-thirds of the population was aware of Canada's Food Guide to Healthy Eating, but only one-third had used it. The survey has also demonstrated that many adults were aware of the importance of reducing fat intake, maintaining/achieving a healthy weight and exercise, despite the high rate of overweight and obesity in the province. According the NB Nutrition Survey, the population appeared to gain weight with age. New Brunswickers of all ages need to learn and implement strategies to reach and maintain a healthy weight. Helping adults to understand and incorporate healthy changes is also likely to provide preventive benefits if these habits are passed on to their children.
- The NB Nutrition Survey demonstrates that strategies must be designed not only to increase awareness of healthy eating guidelines, but also to educate consumers on how to translate nutrition knowledge into action. It is important that any recommendations made are practical. For example, New Brunswickers could benefit from learning skills such as how to use healthier cooking methods, how to make healthier choices if eating out often, and how to incorporate regular physical activity into each day. To have an impact, it is critical that the nutrition interventions created to support these recommendations be part of a coordinated multi-sectorial strategy to promote the implementation of positive lifestyle changes for disease prevention.

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# APPENDICES

# APPENDIX A

## Survey Instruments

Form B	24-Hour Recall Form
Form C	Food Frequency Questionnaire
Form D	Nutrition and Health Questionnaire
Form E	Demographic Profile







Identifier #:     

## FORM C

NEW BRUNSWICK NUTRITION SURVEY  
FOOD FREQUENCY QUESTIONNAIRE**Part 1.** This section deals with the frequency of consumption of specific foods during the **past month**.

FOOD	FREQUENCY			PORTION SIZE		COMMENTS
	FURTHER FOOD DESCRIPTION(S)	#	DAY/D WEEK/W MONTH/M	REFERENCE PORTION SIZE OR MODEL	HOW MUCH/ HOW MANY?	
HOW OFTEN DID YOU CONSUME:				MO-M		
01 Broccoli				MO-M		
02 Carrots or mixed vegetables & carrots				MO-M		
03 Cabbage, coleslaw, and sauerkraut				MO-M		
04 Cauliflower				MO-M		
05 Spinach - cooked				MO-M		
06 Spinach - raw				MO-M		
07 Squash (dark yellow)				MO-M		
08 Turnip				MO-M or ½ CR-L, T4		
09 Green peas				MO-S		
10 Greens				MO-M		
11 Fish (excluding shellfish) - fried				PC-S		
12 - cooked other ways				PC-S		
13 Lobster - dipped in butter/ margarine/mayonnaise - fried				¾ - 1 lb or ½ cup (w/o shell)		
14 Lobster - cooked other ways				¾ - 1 lb or ½ cup (w/o shell)		
15 All other shellfish - dipped in butter/ margarine/ mayonnaise - fried				10 units or MO-M (w/o shell)		

Appendix A

Identifier #:

16 All other shellfish - cooked other ways				10 units or MO-M (w/o shell)		
FOOD	FREQUENCY			PORTION SIZE		COMMENTS
	FURTHER FOOD DESCRIPTION(S)	#	DAY/D WEEK/W MONTH/M	REFERENCE PORTION SIZE OR MODEL	HOW MUCH/ HOW MANY?	
17 Poultry - fried				PC-S		
18 - cooked other ways				PC-S		
19 Beef and Veal - steaks, roasts, stews and other cuts				PC-S		
20 - hamburgers				PC-S		
21 - other ground beef				PC-S		
22 Liver (all types)				PC-S		
23 Lamb and Mutton - roasts, chops and other cuts				PC-S		
24 Pork and Ham - roasts, chops and other cuts				PC-S		
25 -bacon				1 STRIP		
26 Wild game - large animals				PC-S		
27 - small animals				PC-S		
28 Beans - boiled or baked				MO-M		
29 Wieners or Sausages (with or without a bun)				1 Unit		
30 Bologna				1 CR-L, T – 1		
31 Luncheon meats				1 SLICE		
32 Pizza				1 SLICE		
33 Cheese (more than 24% b.f.)				1 SLICE or 1/3 PC-S		
34 Light Cheese (10-24% b.f.)				1 SLICE or 2 TBL		
35 Cottage cheese or any cheese (less than 10% b.f.)				MO-S		
36 Eggs or egg dishes				1 EGG		
37 Potatoes - French fries or pan fried				MO-L		
38 - baked or boiled				BA-L 1 medium		

Identifier #: 

39 - scalloped, mashed, potato salad, or potatoes in stews and casseroles				MO-L		
FOOD	FREQUENCY			PORTION SIZE		COMMENTS
	FURTHER FOOD DESCRIPTION(S)	#	DAY/D WEEK/W MONTH/M	REFERENCE PORTION SIZE OR MODEL	HOW MUCH/ HOW MANY?	
40 Potato chips or tortilla chips				1 BO-L		
41 Rich gravy or pan drippings				¼ CUP		
42 Cream or cheese sauce				¼ CUP		
43 Yogurt (more than 1% b.f.)				½ CUP 175 G		
44 Light Yogurt (1% or less b.f.)				½ CUP 175 G		
45 Ice cream, regular or rich				½ CUP		
46 Low fat ice cream, frozen yogurt, ice milk or sherbet				½ CUP		
47 Bread, white				1 SLICE		
48 Bread, whole wheat				1 SLICE		
49 Crackers				1 CRACKER		
50 Cookies				1 COOKIE		
51 Donuts, cakes, pies, muffins or croissants				1 UNIT		
52 Beer				1 BOTTLE		
53 Wine				4 FOZ		
54 Spirits				1 FOZ		
<b>IN TEA AND COFFEE, WHAT KIND OF MILK DID YOU USE? [DO NOT READ LIST]</b>						
55 whole milk				1 TBL		
56 2% milk				1 TBL		
57 1% milk				1 TBL		
58 skim milk				1 TBL		
59 dry skim milk powder				1 TSP		
60 cream or creamers				1 TBL		
61 evaporated milk, regular (whole) - <b>undiluted</b>				1 TBL		

Appendix A

Identifier #:

62 evaporated milk, light - <b>undiluted</b>				1 TBL		
63 evaporated milk, 2% - <b>undiluted</b>				1 TBL		
FOOD	FREQUENCY			PORTION SIZE		COMMENTS
	FURTHER FOOD DESCRIPTION(S)	#	DAY/D WEEK/W MONTH/M	REFERENCE PORTION SIZE OR MODEL	HOW MUCH/ HOW MANY?	
64 evaporated milk, skim - <b>undiluted</b>				1 TBL		
65 evaporated milk, regular (whole) - <b>diluted</b>				1 TBL		
66 evaporated milk, light - <b>diluted</b>				1 TBL		
67 evaporated milk, 2% - <b>diluted</b>				1 TBL		
68 other types of milk (please specify) _____						
69 did not use milk or cream (please check) _____						
70 used coffee whitener (please check) _____						
71 did not drink tea or coffee (please check) _____						
<b>ON CEREALS WHAT KIND OF MILK DID YOU USE? [DO NOT READ LIST]</b>				½ CUP		
72 whole milk						
73 2% milk				½ CUP		
74 1% milk				½ CUP		
75 skim milk				½ CUP		
76 cream				½ CUP		
77 evaporated milk, regular (whole) - <b>undiluted</b>				½ CUP		
78 evaporated milk, light - <b>undiluted</b>				½ CUP		
79 evaporated milk, 2% - <b>undiluted</b>				½ CUP		
80 evaporated milk, skim - <b>undiluted</b>				½ CUP		
81 evaporated milk, regular (whole) - <b>diluted</b>				½ CUP		
82 evaporated milk, light - <b>diluted</b>				½ CUP		
83 evaporated milk, 2% - <b>diluted</b>				½ CUP		
84 other types of milk (please specify) _____						

Identifier #:

85 ate cereals dry (please check) _____						
86 did not eat cereals (please check) _____						
FOOD	FREQUENCY			PORTION SIZE		COMMENTS
	FURTHER FOOD DESCRIPTION(S)	#	DAY/D WEEK/W MONTH/M	REFERENCE PORTION SIZE OR MODEL	HOW MUCH/ HOW MANY?	
AS A <b>BEVERAGE</b> WHAT KIND OF MILK DID YOU DRINK? [ <b>DO NOT READ LIST</b> ]						
87 whole milk				1 CUP		
88 2% milk (white or chocolate)				1 CUP		
89 1% milk				1 CUP		
90 buttermilk				1 CUP		
91 skim milk				1 CUP		
92 evaporated milk, regular (whole) - <b>undiluted</b>				1 CUP		
93 evaporated milk, light - <b>undiluted</b>				1 CUP		
94 evaporated milk, 2% - <b>undiluted</b>				1 CUP		
95 evaporated milk, skim - <b>undiluted</b>				1 CUP		
96 evaporated milk, regular (whole) - <b>diluted</b>				1 CUP		
97 evaporated milk, light - <b>diluted</b>				1 CUP		
98 evaporated milk, 2% - <b>diluted</b>				1 CUP		
99 other types of milk (please specify) _____						
100 did not drink milk (please check) _____						
HOW FREQUENTLY IN THE LAST MONTH DID YOU HAVE MEALS FROM?						
	FURTHER DESCRIPTION(S)	#	DAY/D WEEK/W MONTH/M	COMMENTS		
101 restaurants (table service)						
102 take out, fast food restaurants or delis						
103 cafeterias (tray service)						

Identifier #:     

**Part II.** This section deals only with **homemade foods** and **uses of fat** over the past month. *Please check (✓) the main source(s) of fat used. (If more than one source is checked, then all checks will be calculated as equal proportions).*

	MAIN SOURCE	
		<b>IF YOU ATE HOME DEEP-FAT FRIED FOODS AT LEAST TWICE THIS PAST MONTH, WHAT WAS THE MAIN KIND OF FAT OR OIL USED? [DO NOT READ LIST]</b>
104		a) Vegetable oil
105		b) Lard, bacon, or animal fat
106		c) Shortening
107		d) Do not know
108		e) Did not eat home deep-fried foods this past month
		<b>IF YOU ATE HOME PAN-FRIED FOODS AT LEAST TWICE THIS PAST MONTH, WHAT WAS THE MAIN KIND OF FAT OR OIL USED? [DO NOT READ LIST]</b>
109		a) Butter
110		b) Soft margarine
111		c) Hard margarine
112		d) 50 / 50 spread
113		e) 20 / 80 spread
114		f) Lard, bacon or animal fat
115		g) Shortening
116		h) Oil
117		i) Pam or no oil
118		j) Do not know
119		k) Did not eat home pan-fried foods this past month
		<b>IF YOU ATE HOME-BAKED FOODS AT LEAST TWICE THIS PAST MONTH, WHAT WAS THE MAIN KIND OF FAT OR OIL USED? [DO NOT READ LIST]</b>
120		a) Butter
121		b) Soft margarine
122		c) Hard margarine
123		d) 50 / 50 Spread
124		e) 20 / 80 Spread
125		f) Shortening
126		g) Oil
127		h) Lard, bacon, or animal fat
128		i) Do not know
129		j) Did not eat homemade baked goods that contained fat this past month

Identifier #:     

	MAIN SOURCE	
		<b>WHAT WAS THE MAIN KIND OF "FAT SPREAD" YOU USED ON BREAD, BUNS, MUFFINS, ETC. THIS PAST MONTH? [DO NOT READ LIST]</b>
130		a) Butter
131		b) Soft margarine
132		c) Hard margarine
133		d) Low calorie margarine
134		e) 50 / 50 spread
135		f) 20 / 80 spread
136		g) Lard, bacon or pork fat
137		h) None or none of these
138		i) Did not eat bread, buns, muffins, etc. this past month
		<b>WHAT WAS THE MAIN KIND OF "FAT SPREAD" YOU USED ON POTATOES OR VEGETABLES THIS PAST MONTH? [DO NOT READ LIST]</b>
139		a) Butter
140		b) Soft margarine
141		c) Hard margarine
142		d) Low calorie margarine
143		e) 50 / 50 spread
144		f) 20 / 80 spread
145		g) Sour cream
146		h) Lard, bacon fat, or animal fat
147		i) None or none of these
148		j) Did not eat potatoes and vegetables this past month

Appendix A

Identifier #:

**PART III** This section deals with your food habits during the past month. Please check (✓) one or more when relevant.

	MOST OFTEN	[If the person did <u>not</u> eat meat or poultry or fish in Part I, then check (✓) "Did not eat meat/poultry/fish cooked by these methods this past month" below where appropriate (instead of asking questions #149 to 198)].
		<b>OF THE MEAT YOU ATE LAST MONTH, WHAT WAS THE MOST COMMON METHOD OF COOKING IT? [DO NOT READ LIST]</b>
149		a) Broiled
150		b) Pan-fried with fat
151		c) Pan-fried without fat or with pan spray
152		d) Deep-fat fried
153		e) Oven-roasted (Baked)
154		f) Boiled/stewed/pot-roasted
155		g) Microwaved
156		h) Barbecued
157		i) Steamed/Poached
158		j) Did not eat meat cooked by these methods this past month
		<b>OF THE POULTRY YOU ATE LAST MONTH, WHAT WAS THE MOST COMMON METHOD OF COOKING IT? [DO NOT READ LIST]</b>
159		a) Broiled
160		b) Pan-fried with fat
161		c) Pan-fried without fat or with pan spray
162		d) Deep-fat fried
163		e) Oven-roasted (Baked)
164		f) Boiled/stewed
165		g) Microwaved
166		h) Barbecued
167		i) Steamed/ Poached
168		j) Did not eat poultry cooked by these methods this past month



Identifier #:     

		OF THE <b>FISH</b> YOU ATE LAST MONTH, WHAT WAS THE MOST <b>COMMON METHOD</b> OF COOKING IT? THIS DOES NOT INCLUDE CANNED FISH. [DO NOT READ LIST]
169		a) Broiled
170		b) Pan-fried with fat
171		c) Pan-fried without fat or with pan spray
172		d) Deep-fat fried
173		e) Oven-roasted (Baked)
174		f) Boiled/stewed
175		g) Microwaved
176		h) Barbecued
177		i) Steamed/Poached
178		j) Did not eat fish cooked by these methods this past month
		[If the person did <u>not</u> eat meat or poultry in Part I, then check (✓) "Did not eat meat/poultry this past month" below where appropriate.]
		OF THE <b>MEAT</b> YOU ATE LAST MONTH, DID YOU EAT THE <b>VISIBLE FAT OF THE MEAT</b> ?
179		a) Always
180		b) Sometimes
181		c) Never
182		d) Did not eat poultry this past month
		OF THE <b>POULTRY</b> YOU ATE LAST MONTH, DID YOU EAT THE <b>SKIN ON THE POULTRY</b> ?
183		a) Always
184		b) Sometimes
185		c) Never
186		d) Did not eat poultry this past month
		OF THE <b>MEAT OR POULTRY</b> YOU ATE LAST MONTH, DID YOU EAT <b>GRAVY</b> WITH YOUR <b>MEAT OR POULTRY</b> ?
187		a) Always
188		b) Sometimes
189		c) Never
190		d) Did not eat meat or poultry this past month

Appendix A

Identifier #:

		<b>OF THE FISH</b> (excluding all shellfish) YOU ATE LAST MONTH, DID YOU PUT <b>A SAUCE</b> ON YOUR <b>FISH</b> ?
191		a) Always
192		b) Sometimes
193		c) Never
194		d) Did not eat fish this past month
		<b>OF THE SHELLFISH</b> (excluding lobster) YOU ATE LAST MONTH, DID YOU PUT <b>A SAUCE</b> ON YOUR <b>SHELLFISH</b> ?
195		a) Always
196		b) Sometimes
197		c) Never
198		d) Did not eat shellfish this past month
		<b>IN THE PAST MONTH, WHAT WAS THE MAIN KIND OF DRESSING YOU ADDED TO YOUR SALADS? [DO NOT READ LIST]</b>
199		a) mayonnaise
200		b) mayonnaise-type and regular salad dressing
201		c) low calorie and calorie reduced salad dressing
202		d) other (i.e. yogurt, vinegar only, tomato juice, etc.)
203		e) did not add dressing
204		f) did not eat salad this past month

Identifier #: 

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**PART IV.** This section deals with WHY you choose the foods that you eat. (Briefly probe to confirm some action is being taken). Please check (✓) one or more when relevant.

ARE YOU <b>CHOOSING OR AVOIDING</b> FOODS OR TYPES OF FOODS BECAUSE YOU ARE CONCERNED ABOUT:	
205	Maintaining or improving your health?
206	Heart disease?
207	Cancer?
208	Osteoporosis (brittle bones)?
209	High Blood Pressure?
210	Diabetes?
211	Weight gain?
ARE YOU <b>CHOOSING</b> TO EAT FOODS OR TYPES OF FOODS BECAUSE OF:	
212	The nutrients they contain?
213	The unsaturated fat content?
214	The fibre content?
ARE YOU <b>AVOIDING</b> FOODS OR TYPES OF FOODS BECAUSE OF:	
215	The fat content?
216	The salt content?
217	The cholesterol content?
218	The sugar content?
219	The saturated fat content?
ASK <b>ONLY</b> IF SUBJECT HAS NOT MENTIONED MEAT:	
220	Are you a vegetarian?
ARE YOU FOLLOWING ANY SPECIAL DIET?	
221	<input type="checkbox"/> Yes (Specify) _____ <input type="checkbox"/> No (Go to Question # 225)
WAS THIS SPECIAL DIET PRESCRIBED BY A DOCTOR, DIETITIAN OR OTHER HEALTH PROFESSIONALS?	
222	Doctor: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused
223	Dietitian: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused
224	Other health professionals: <input type="checkbox"/> Yes (Specify) _____ <input type="checkbox"/> No <input type="checkbox"/> Refused

Identifier #: 

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**[IF THE PERSON HAS A SECOND INTERVIEW ASSIGNED, THEN GO TO FORM D, QUESTION #1]**

225 HAVE YOU EVER SEEN OR HEARD ABOUT THE “CANADA’S FOOD GUIDE TO HEALTHY EATING”?  
(Show food Guide)

- Yes  
 No (Go to Form D, Question #1)

226 Do you use it?

- Yes  
 No (Go to Form D, Question #1)

227 How do you use it? (Check one or more when relevant)

- for shopping e.g. to help prepare my shopping list  
 for planning/choosing meals (at home)  
 for choosing foods in restaurants  
 other (specify) \_\_\_\_\_

Identifier #:     

**FORM-D**  
**NB Nutrition Survey**  
**Nutrition and Health Questionnaire**

- I. What do you think are the main causes of heart disease? **[DO NOT READ, PROBE IF FEWER THAN 2 RESPONSES ARE GIVEN: "CAN YOU THINK OF ANYTHING ELSE?" OR "CAN YOU BE MORE SPECIFIC?"] [RECORD ALL RESPONSES].**

- Smoking..... 01  
 High blood pressure/hypertension..... 02  
 High blood cholesterol..... 03  
 Lack of exercise..... 04  
 Arteriosclerosis/hardening of the arteries..... 05  
 Poor diet/poor eating habits..... 06  
 Overweight/obesity..... 07  
 Dietary fat: fatty food/high fat diet..... 08  
 Dietary cholesterol/cholesterol in foods..... 09  
 Family history/heredity..... 10  
 Stress/worry/tension..... 11  
 Alcohol/drinking too much..... 12  
 Unhealthy lifestyle..... 13  
 Other \_\_\_\_\_ 14
- Refused..... 88  
 No/don't know..... 99

2. Have you ever been told by a doctor or other health professional that you have high blood pressure?

- Yes..... 01 (if Male go to Q.3; if Female go to 2a)  
 No..... 02 (Go to Q.4)  
 Refused..... 88 (Go to Q.4)  
 Don't know..... 99 (Go to Q.4)

- 2a. Were you pregnant at the time you were told your blood pressure was high ?

- Yes..... 01  
 No..... 02  
 Refused..... 88  
 Don't know..... 99

3. As far as you know is your blood pressure high, low or normal now?

- High..... 01  
 Low..... 02  
 Normal..... 03  
 Refused..... 88  
 Don't know..... 99

Identifier #: 

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3a Are you now doing anything to lower or control your blood pressure?

- Yes..... 01
- No..... 02 (Go to Q.4)
- Refused..... 88 (Go to Q.4)
- Don't know..... 99 (Go to Q.4)

3b. Which of the following things are you doing to lower or control your blood pressure?  
**[READ LIST AND CHECK ALL THAT APPLY]**

- Taking Medication..... 01
- Following a Diet..... 02
- Exercising..... 03
- Trying to lose weight..... 04
- Something else \_\_\_\_\_ 05

**[DO NOT READ]**

- Refused..... 88
- Don't know..... 99

4. Have you ever been told by a doctor that you have diabetes or high blood sugar ?

- Yes..... 01 (If Male go to Q.5, if Female go to 4a)
- No..... 02 (Go to Q.6)
- Refused..... 88 (Go to Q.6)
- Don't know..... 99 (Go to Q.6)

4a. Were you pregnant at the time you were told you had diabetes or high blood sugar?

- Yes..... 01
- No..... 02
- Refused..... 88
- Don't know..... 99

5. As far as you know, do you have diabetes or high blood sugar?

- Yes..... 01
- No..... 02
- Refused..... 88
- Don't know..... 99

5a Are you now doing anything to control diabetes or high blood sugar?

- Yes..... 01
- No..... 02 (Go to Q.6)
- Refused..... 88 (Go to Q.6)
- Don't know..... 99 (Go to Q.6)

Identifier #:     

- 5b. Which of the following are you doing to control diabetes or high blood sugar?  
**[READ LIST AND CHECK ALL THAT APPLY]**

Taking insulin by injection..... 01  
 Taking pills..... 02  
 Following a diet..... 03  
 Exercising..... 04  
 Trying to lose weight..... 05  
 Something else \_\_\_\_\_ 06

**[DO NOT READ]**

Refused..... 88  
 Don't know..... 99

**[READ]** Now I would like to ask you some questions about your exercise habits.

6. Which one of these statements best describes your usual type of work or daily routine?  
**[READ FIRST FOUR OPTIONS]**

You sit during the day and do not walk around  
 much..... 01  
 You stand or walk around quite a bit but do not  
 have to lift very often..... 02  
 You lift or carry light loads, or you have to  
 climb stairs or hills often..... 03  
 You do heavy work or carry very heavy loads..... 04

**[DO NOT READ]**

Refused..... 88  
 Don't know..... 99

7. Are you limited in the kind or amount of physical activity or exercise you can do because of a physical or health problem?

Yes..... 01  
 No..... 02  
 Temporarily (i.e. due to injury, etc)..... 03  
 Refused..... 88  
 Don't know..... 99

8. How many times per week do you participate in low intensity physical activities, such as walking, golf, gardening, bowling, etc. for at least 15 minutes at a time ?  
**[READ FIRST FOUR OPTIONS]**

Every day..... 01  
 3 or more times per week, but not every day..... 02  
 Less than 3 times per week..... 03  
 Less than once per week..... 04

**[DO NOT READ]**

Refused..... 88  
 Don't know..... 99

9. How many times per week do you participate in high intensity physical activities, such as brisk walking, tennis, jogging, swimming, cycling, basketball, aerobics, etc. for at least 15 minutes at a time ? **[READ FIRST FOUR OPTIONS]**

- Every day..... 01
- 3 or more times per week, but not every day ..... 02
- Less than 3 times per week..... 03
- Less than once per week..... 04

**[DO NOT READ]**

- Refused..... 88
- Don't know..... 99

**[READ]** Now I would like to ask you some questions about your weight.

10. Have you ever tried to lose weight?

- Yes..... 01
- No..... 02
- Refused..... 88
- Don't know..... 99

11. Are you presently trying to: **[READ FIRST 3 OPTIONS]**

- Lose weight..... 01
- Gain weight..... 02 **(Go to Q.14)**
- Neither..... 03 **(Go to Q.14)**

**[DO NOT READ]**

- Refused..... 88 **(Go to Q.14)**
- Don't know..... 99 **(Go to Q.14)**

12. Did a doctor or other health professional advise you to lose weight?  
**[READ LIST AND CHECK ALL THAT APPLY]**

- Advised by doctor..... 01
- Advised by other health professional..... 02
- Own idea..... 03
- Someone else (specify) \_\_\_\_\_ 04
- \_\_\_\_\_
- Refused..... 88
- Don't know..... 99

13. Which of the following are you doing to lose weight?  
**[READ LIST AND CHECK ALL THAT APPLY]**

- Change/modify eating habits..... 01
- Exercising..... 02
- Skipping meals..... 03
- Taking diet pills..... 04
- Attending weight control program..... 05
- Something else (specify) \_\_\_\_\_ 06





Identifier #: 

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**FOOD SECURITY**

Now I would like to ask you some questions about your food situation?

16. In the past month, did you or anyone in your family get food from a food bank or soup kitchen?

- Yes ..... 01
- No ..... 02 (Go to Q.18)
- Refused ..... 88 (Go to Q.18)
- Don't know ..... 99 (Go to Q.18)

17. Thinking about the last month, on how many days did you or your family get food from a food bank or soup kitchen?

- Record number of days here ..... \_\_\_\_\_
- Refused ..... 88
- Don't know ..... 99

18. Which of the following statements best describes the amount of food eaten by you and your family:

***With the family income,***

- There is always enough food to eat ..... 01 (Go to Form E)
- Sometimes there is not enough food to eat ..... 02
- Often there is not enough food to eat ..... 03
- Refused ..... 88 (Go to Form E)
- Don't know ..... 99 (Go to Form E)

19. Thinking about the last month, how many days did you or your family not have enough food to eat ?

- Record number of days here: ..... \_\_\_\_\_
- Refused .. 88
- Don't know ..... 99

20. Did any of the following reasons contribute to this lack of food?

- a. Problems with transportation .....
- b. Not having working appliances (such as refrigerator or stove) for storing or preparing foods .....
- c. Not having enough money to buy food or beverages .....
- d. Not having an adequate choice of foods available to you .....

Yes	No	DK/NA

**[READ]** Were there any other reasons which contributed to this lack of food?

- 1. If Yes (specify) \_\_\_\_\_
- 2. If Yes (specify) \_\_\_\_\_



Identifier #:

## FORM E

### NB NUTRITION SURVEY DEMOGRAPHIC PROFILE

**In order to compare your answers with people from similar backgrounds we would like to ask you a few questions about yourself.**

1. What is your date of birth?

Day

Month

Year

2. What language do you speak at home most of the time?

English

French

Other (specify) \_\_\_\_\_

3. How many people, including yourself, live in this household?

Record #:  (If only one person, go to Q.5)

4. Of that total number, how many persons are under 18 years old and are your dependants?

Record #:

Identifier #:     

5. What is the highest grade or level of education you have ever attended or ever completed?

- |    |                          |   |
|----|--------------------------|---|
| 01 | <input type="checkbox"/> | No schooling  |
| 02 | <input type="checkbox"/> | Some Elementary   |
| 03 | <input type="checkbox"/> | Completed Elementary  |
| 04 | <input type="checkbox"/> | Some Secondary  |
| 05 | <input type="checkbox"/> | Completed Secondary   |
| 06 | <input type="checkbox"/> | Some Community College, Technical College, or Nurses's training     |
| 07 | <input type="checkbox"/> | Completed Community College, Technical College, or Nurse's training |
| 08 | <input type="checkbox"/> | Some University (e.g. B.A. M.A. PhD) or teachers college            |
| 09 | <input type="checkbox"/> | Completed University (e.g. B.A. M.A. PhD) or teachers college       |
| 10 | <input type="checkbox"/> | Other education or training (Specify _____ )                        |

6. What is your current marital status? Are you...

- |    |                          |  |
|----|--------------------------|--|
| 01 | <input type="checkbox"/> | Single (Never Married)?                            |
| 02 | <input type="checkbox"/> | Married (and not separated), or living common law? |
| 03 | <input type="checkbox"/> | Separated?   |
| 04 | <input type="checkbox"/> | Divorced?  |
| 05 | <input type="checkbox"/> | Widowed?   |

7. For statistical purposes only, we need to know your best estimate of the total income, before taxes, of all household members last year (1995). Could you please tell me from the card, which letter applies to your total household income?

- |    |                     |
|----|---------------------|
| A. | Less than \$ 5,000  |
| B. | \$5,001 - \$10,000  |
| C. | \$10,001 - \$20,000 |
| D. | \$20,001 - \$30,000 |
| E. | \$30,001 - \$40,000 |
| F. | \$40,001 - \$50,000 |
| G. | \$50,001 - \$60,000 |
| H. | \$60,001 and more   |
| I. | Don't know          |

Appendix A

Identifier #:

8. Weight used for calibration

Weight on scale of calibration weight

•  Kg

•  Kg

Weight  •  Kg or  lb.

Measured

Self-reported  ...Reason \_\_\_\_\_

Refusal

9. Height  •  cm or  feet  inches

Measured

Self-reported  ...Reason \_\_\_\_\_

Refusal

10. Waist  •  cm  •  cm  •  cm

Refusal

11. Hips  •  cm  •  cm  •  cm

Refusal

Acknowledgements: Newfoundland & Labrador Nutrition Survey, 1996  
 Prince Edward Island Nutrition Survey, 1995  
 Alberta Nutrition Survey, 1994  
 Canada's Health Promotion Survey, 1990  
 Nova Scotia Nutrition Survey, 1990

# APPENDIX B

## Training Schedule

Training Schedule (agenda follows) used with NB Nutrition Survey Training Manual.

### **Contents of NB Nutrition Survey Training Manual:**

Chapter 1	Survey Overview
Chapter 2	Survey Personnel
Chapter 3	Interviewer Responsibilities
Chapter 4	The Survey Process
Chapter 5	Interviewing Guidelines – General Guidelines
Chapter 6	The 24-Hour Recall
Chapter 7	The Food Frequency Questionnaire
Chapter 8	Nutrition and Health Questionnaire
Chapter 9	Demographic Information
Chapter 10	Anthropometric Measurements
Chapter 11	Quality Control Procedures
Chapter 12	Data Process and Handling

## NEW BRUNSWICK NUTRITION SURVEY

### Interviewer's Training Program

September 23 to October 04, 1996, Hotel Beauséjour  
Moncton, New Brunswick

#### WEEK I

DATE 1996	TOPIC/AGENDA	PRESENTER
<p><i>Monday,</i> <i>Sept. 23</i> <b>Meeting Room</b> Ballroom "B"</p> <p><b>Breakout Rooms</b> Small Rooms</p>	<p>Welcome, Introduction and Overview of Survey [Chpt 1]</p> <p>Roles and Responsibilities of the Project Team, Interviewers &amp; Facilitators [Chpt 2 &amp; 3] Introduction of Participants <b>BREAK</b> Review of Training Schedule Interactive Exercise - Group Survival <b>LUNCH</b> Introduction to Survey Forms/Portion Models [Chpt 4] <b>BREAK</b> General Rules of Recording Quantities Using Portion-size Models [Chpt 6] Practice -&gt; Recording Quantities Using Portion Models</p>	<p>Principal investigator and Co- Investigators Dr. Danielle Brulé &amp; Dr. Jennifer Taylor Dr. Chris Balram</p> <p>All participants</p> <p>Dr. D. Brulé Dr. D. Brulé</p> <p>Dr. D. Brulé/Dr. J. Taylor</p> <p>Dr. D. Brulé/Dr. J. Taylor</p> <p>Dr. D. Brulé/Dr. J. Taylor</p>
<p><i>Tuesday,</i> <i>Sept. 24</i> <b>Meeting Room</b> Ballroom "B"</p> <p><b>Breakout Rooms</b> Small Rooms</p>	<p>General Rules of Recording Quantities Using Portion-size Models <b>BREAK</b> Food Description Guidelines [Chpt 6] <b>LUNCH</b> Survey Interviewing Skills [Chpt 5] Practice -&gt; Initial Phone Contact &amp; How to Handle Refusal Over the Phone</p>	<p>Dr. D. Brulé</p> <p>Dr. D. Brulé/Dr. J. Taylor</p> <p>Dr. D. Brulé/Dr. J. Taylor Dr. D. Brulé/Dr. J. Taylor</p>
<p><i>Wednesday,</i> <i>Sept. 25</i> <b>Meeting Room</b> Capitol Theatre</p> <p><b>Breakout Rooms</b> Small Rooms</p>	<p>Food Description Guidelines <b>BREAK</b> Food Description Guidelines Practice -&gt;Recording Foods &amp; Quantities (Using training manual) <b>LUNCH</b> Coded Columns on 24-Hour Recall Form Steps in conducting 24-Hour recall, Probing Without Bias <b>BREAK</b> Anthropometry Workshop [Chpt 10] Practice -&gt; Anthropometric Measurements</p>	<p>Dr. D. Brulé/Dr. J. Taylor</p> <p>Dr. D. Brulé/Dr. J. Taylor</p> <p>Dr. J. Taylor Dr. D. Brulé</p> <p>Natalie Carrier Dr. D. Brulé/Dr. J. Taylor</p>



## WEEK I continued

DATE 1996	TOPIC/AGENDA	PRESENTER
<p><i>Thursday,</i> Sept. 26 <b>Meeting Room</b> Capitol Theatre</p> <p><b>Breakout Rooms</b> Small Rooms</p>	<p>Recording Recipes and Nutrient Supplements Practice - &gt; 24 Hour Recall Form (in pairs) <b>BREAK</b> Food Frequency Questionnaire-Part I [Chpt 7] <b>LUNCH</b> Food Frequency Questionnaire – Parts II, III &amp; IV <b>BREAK</b> Practice -&gt; Food Frequency Questionnaire Complete/Review Forms, submit Forms to Danielle</p>	<p>Dr. D. Brulé/Dr. J. Taylor Dr. D. Brulé</p> <p>Dr. D. Brulé/Dr. J. Taylor</p> <p>Dr. D. Brulé/Dr. J. Taylor</p> <p>Dr. D. Brulé/Dr. J. Taylor</p>
<p>Friday, Sept. 27 <b>Meeting Room</b> Capitol Theatre</p> <p><b>Breakout Rooms</b> Small Rooms</p>	<p>Set-up Survey Teams (Interviewers + Facilitators) Flow Chart of Field Data Collection Presentation of an Example of the Sample List <b>BREAK</b> Explaining Administrative &amp; Control Forms Logistics Regarding Interviewers' Payment <b>LUNCH</b> Administrative &amp; Control Forms (continued) Oaths and Photos for Name Tags Video tape -&gt; Interviews, Phone Contacts  Review of Training to Date and Weekend Assignments</p>	<p>Marielle Degrâce Marielle Degrâce John Boyne</p> <p>M. Degrâce/Dr. J. Taylor John Boyne/Marielle Degrâce</p> <p>Dr. D. Brulé/Dr. J. Taylor M. Degrâce M. Degrâce, Audiovisual department of U. de Moncton Dr. D. Brulé</p>

## WEEK II

DATE 1996	TOPIC/AGENDA	PRESENTER
<p><i>Monday,</i> Sept. 30 <b>Meeting Room</b> Ballroom "C"</p> <p><b>Breakout Rooms</b> Small Rooms</p>	<p>Discussion of Weekend Assignments (Interv. &amp; Facil.) (submit 24 Hour Recall Forms to Danielle) Demographic Profile Questionnaire - Form E [Chpt 9] <b>BREAK</b> Nutrition &amp; Health Questionnaire - Form D [Chpt 8] Practice -&gt; Forms D and E <b>LUNCH</b> Practice -&gt; All Forms: Group A (Submit Forms to Facilitators) <b>BREAK</b> Demonstration of CANDI Operation [Chpt 12] Quality Control Procedures &amp; Feedback from Ottawa [Chpt 11] Meeting with Facilitators Only</p>	<p>Interviewers &amp; Dr. D. Brulé</p> <p>Dr. D. Brulé/M. Degrâce</p> <p>M. Degrâce/Dr. D. Brulé Dr. D. Brulé</p> <p>Dr. D. Brulé</p> <p>Dr. D. Brulé Dr. D. Brulé</p> <p>Dr. D. Brulé/M. Degrâce</p>

## Appendix B

## WEEK II continued

DATE 1996	TOPIC/AGENDA	PRESENTER
<p><i>Tuesday,</i> Oct. 01 <b>Meeting Room</b> Ballroom "C"</p> <p><b>Breakout Rooms</b> Small Rooms</p>	<p>Discussion/Feedback about Practices Practice -&gt; All forms: Groups (Submit Forms to Facilitators)</p> <p style="text-align: center;"><b>BREAK during practice</b></p> <p>Personal Safety</p> <p style="text-align: center;"><b>LUNCH</b></p> <p>Feedback from Danielle about Previous Interviews Set-up Assignment for Grocery Product Discovery</p> <p>Grocery Tour</p>	<p>Trainees, Facilitators And Dr. D. Brulé</p> <p>Community Policing Co-ordinator</p> <p>Dr. D. Brulé Dr. D. Brulé, Facilitators &amp; Interviewers Facilitators &amp; Interviewers</p>
<p><i>Wednesday,</i> Oct. 02 <b>Meeting Room</b> Ballroom "C"</p> <p><b>Breakout Rooms</b> Small Rooms</p> <p><b>Please Note:</b> <b>Take manuals and equipment with you.</b></p>	<p>Highlights of Grocery Tour from Each Team Viewing of NB Videotape</p> <p style="text-align: center;"><b>BREAK</b></p> <p>Set Menu Exercise #1</p> <p style="text-align: center;"><b>LUNCH</b></p> <p>Assignments for In-Home Interviews Set up Rooms for Volunteer Interviews Volunteer Interviews Check Forms and Submit Package to Facilitators Meeting with Facilitators</p> <p>OPTIONAL: In-Home Interviews this evening</p>	<p>Interviews &amp; Facilitators Dr. D. Brulé</p> <p>Dr. D. Brulé</p> <p>M. Degrâce/Dr. D. Brulé M. Degrâce/Dr. D. Brulé Trainees</p> <p>Dr. D. Brulé/M. Degrâce</p>
<p><i>Thursday,</i> Oct. 03 <b>Meeting Room</b> Ballroom "C"</p> <p><b>Please Note:</b> <b>Take manuals and equipment with you.</b></p>	<p>Discussion/Feedback of Volunteers' Interviews Team Meeting</p> <p style="text-align: center;"><b>BREAK</b></p> <p>Written Evaluation</p> <p style="text-align: center;"><b>LUNCH</b></p> <p>In-Home Interviews</p> <p>Meeting with Facilitators and Quality Control Supervisor</p>	<p>Dr. D. Brulé &amp; Facilitators Interv. &amp; Facilit. Teams</p> <p>Dr. D. Brulé</p> <p>Interviewers</p> <p>Dr. D. Brulé &amp; Co-Investigators</p>
<p>Friday, Oct. 04 <b>Meeting Room</b> Ballroom "C"</p>	<p>Discussion/Feedback of In-Home Interviews Answers for Written Evaluation</p> <p style="text-align: center;"><b>BREAK</b></p> <p>Distribution of All Forms and of Sample Lists Final Review/Discussion – Technical Issues</p> <p style="text-align: center;"><b>LUNCH</b></p> <p>Final Review of Administrative Issues Trainees' Evaluation of the Training and Recommendations for Spring Retraining Final Wrap-up</p>	<p>Dr. D. Brulé &amp; Facilitators Dr. D. Brulé</p> <p>M. Degrâce M. Degrâce</p> <p>M. Degrâce/Dr. D. Brulé Trainees New Brunswick Investigator Team</p>

## **APPENDIX C**

### **Administrative Data Control Forms**

Form	Interviewee Profile Form & Record of Calls
Form A-1	Data Entry
Form	Master Tally Sheet
Form	Data Control Form

### NB Nutrition Survey – INTERVIEWEE PROFILE FORM

Interviewer ID:

LABEL:	ID Number Sex, Date of Birth, Age First Name, Last Name Address 1 Address 2, Postal Code Phone
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---

New Name: \_\_\_\_\_

New Address: \_\_\_\_\_

\_\_\_\_\_

New Postal Code: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Location/Other Comments

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

---

Please give the name of a close relative or friend whom we can contact in case we need to reach you.

Contact Name: \_\_\_\_\_

Contact Address: \_\_\_\_\_

\_\_\_\_\_

Contact Postal Code: \_\_\_\_\_

Contact Phone Number: \_\_\_\_\_

### RECORD OF CALLS & APPOINTMENTS

ASSIGNED INTERVIEW DAY: \_\_\_\_\_

CALL	DATE	TIME	NOTES
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Acknowledgements: Newfoundland and Labrador Nutrition Survey, 1996  
 PEI Nutrition Survey, 1995  
 Alberta Nutrition Survey, 1994  
 Nova Scotia Nutrition Survey, 1990  
 Saskatchewan Nutrition Survey, 1993

**NB NUTRITION SURVEY – DATA ENTRY**

**FORM A-1**

Date of birth and sex

Correct on label

Yes

No



Interviewer ID

LABEL:                      Reference Number  
    Sex, Date of Birth  
 Assigned Interview Day, Assigned Repeat Int. Day

**STATUS**

1  Interview Obtained  
 No Interview Obtained



**Reason for no interview:**

Non Responding → reason for non response:

- 2  Refusal
- 3  Location verified, temporary no contact
- 4  Language
- 5  Other \_\_\_\_\_

Not Resolved → reason not resolved:

- 6  Letter returned, no further info.
- 7  No answer after at least 5 phone attempts
- 8  Cannot locate by phone or home visit

Not Eligible → reason not eligible:

- 09  Dead
- 10  Pregnant/Nursing
- 11  Moved out-of-province
- 12  Moved within the province but out of your sampling region
- 13  Hospitalization/extraordinary illness
- 14  Living in Institution or Reserve
- 15  Other \_\_\_\_\_

Date Interview Completed 

Month	Day	Year
<input type="text"/>	<input type="text"/>	<input type="text"/>

Actual Interview Day #  (1=Mon., 2=Tues., ...)

Actual Repeat Interview Day #  (1=Mon., 2=Tues., ...)

**SIGN OFF CONTROL CHECK (ID CODES):**

**INTERVIEWER**

**FACILITATOR**

Interviewer's Opinion of Information:

Outcome of interview:

- Reliable
- Unable to recall one or more meals
- Unreliable, other reasons, specify

- Complete response
- Partial response
- Non response

**TOTAL # OF PAGES IN PACKAGE**

**SUPERVISOR**





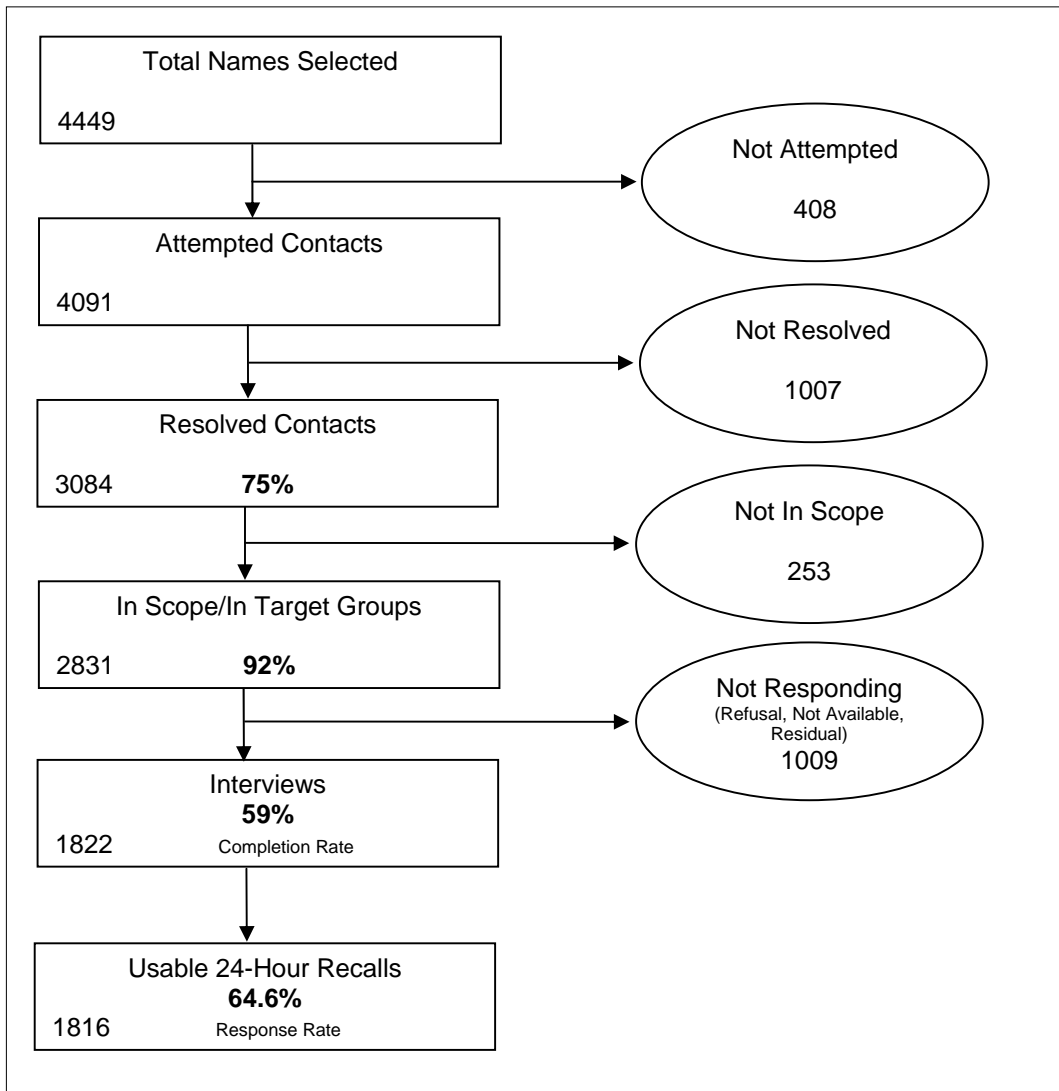


# APPENDIX D

## Non-Response Tables and Forms

Figure D.1	Flow of Response Categories
Table D.1	NB Accountability Table by Age-Gender Group
Table D.2	NB Response Rates: Lower Bound on Analysis by Age-Gender Group
Table D.3	NB Response Rates: Upper Bound on Analysis by Age-Gender Group
Table D.4	Characteristics of Responders and Refusers
Form A-2	Non-Response Questionnaire

**Figure D.1 Flow of Response Categories**



**Table D.1 NB Accountability Table by Age-Gender Group**

		Sampling Age-Sex Groups											Total	
		M 18-29	M 30-39	M 40-49	M 50-59	M 60-69	M 70-74	F 18-29	F 30-39	F 40-49	F 50-59	F 60-69		F 70-74
Number drawn	Sum	401	419	417	419	411	183	405	409	422	418	417	178	4499
Attempted	Sum	358	370	378	388	372	176	370	366	385	381	377	170	4091
Resolved	Sum	233	251	284	300	296	157	230	267	292	310	316	148	3084
In scope	Sum	188	239	267	285	275	134	179	246	285	297	301	135	2831
Interviewed	Sum	110	137	166	178	176	89	116	172	190	200	210	78	1822
Recalls	Sum	108	137	165	178	176	89	115	172	190	200	208	78	1816
Reliable response	Sum	108	137	165	178	176	89	115	172	190	200	208	78	1816

Source: BBCA 451311-009

Appendix D

**Table D.2 NB Response Rates: Lower Bound on Analysis by Age-Gender Group (Percent of Individuals by Age and Gender)**

Sampling Age Sex Groups	Season					
	Fall 96		Spring 97		All	
	Response	n	Response	n	Response	n
	Rate		Rate		Rate	
M 18-29	0.36	144	0.33	169	0.35	313
M 30-39	0.45	166	0.33	192	0.38	358
M 40-49	0.49	171	0.43	190	0.46	361
M 50-59	0.53	174	0.43	199	0.48	373
M 60-69	0.52	168	0.49	183	0.50	351
M 70-74	0.64	72	0.53	81	0.58	153
F 18-29	0.36	149	0.36	170	0.36	319
F 30-39	0.49	156	0.51	189	0.50	345
F 40-49	0.49	173	0.52	205	0.50	378
F 50-59	0.59	167	0.51	201	0.54	368
F 60-69	0.55	168	0.60	194	0.57	362
F 70-74	0.46	65	0.52	92	0.50	157
Total	0.49	1773	0.46	2065	0.47	3838

Source: BBCA 451311-009 NB

**Table D.3 NB Response Rates: Upper Bound on Analysis by Age-Gender Group  
(Percent of Individuals by Age and Gender)**

Sampling Age Sex Groups	Season					
	Fall 96		Spring 97		All	
	Response	n	Response	n	Response	n
	Rate		Rate		Rate	
M 18-29	0.57	91	0.58	97	0.57	188
M 30-39	0.60	123	0.54	116	0.57	239
M 40-49	0.63	134	0.61	133	0.62	267
M 50-59	0.64	143	0.61	142	0.62	285
M 60-69	0.64	137	0.64	138	0.64	275
M 70-74	0.70	66	0.63	68	0.66	134
F 18-29	0.62	86	0.67	93	0.64	179
F 30-39	0.69	110	0.71	136	0.70	246
F 40-49	0.63	133	0.70	152	0.67	285
F 50-59	0.70	141	0.65	156	0.67	297
F 60-69	0.67	138	0.71	163	0.69	301
F 70-74	0.49	61	0.65	74	0.58	135
Total	0.64	1363	0.65	1468	0.64	2831

Source: BBCA 451311-009 NB

**Table D.4 Characteristics of Responders and Refusers<sup>1</sup>**

	Responders		Refusers <sup>1</sup>	
	N	%	N	%
<b>Daily Smokers</b>				
Males	225	26	86	23
Females	228	23	72	19
<b>Bread Consumption</b>				
White	1071	60	399	55
Whole wheat	582	35	270	37
<b>Milk Consumption</b>				
2% milk	889	51	382	55
Whole milk	234	14	106	16
1% milk	264	15	83	12
<b>Use of Vitamin-Mineral Supplements</b>				
Males	225	26	86	25
Females	385	41	135	37

<sup>1</sup> Non-respondents to the NB Nutrition Survey, and completed non-response questions

Source: BBKA 451311-009NB

**NON-RESPONSE QUESTIONS**

**FORM A-2**

--	--	--	--	--	--	--	--	--	--

Reference Number Int ID

Non-response questions completed Yes  No

*If you face a refusal: At the first phone contact, if an eligible person refuses to participate, tell the person that you have a few short questions to ask. Remind them that these questions refer to them personally, not the household. Ask for all four questions below.*

*If the person accepts: Ask questions 1 to 4 after completing the Demographic Profile (Form E) but before doing the height and weight measurements.*

1. During the past month, did you eat bread?

Yes  No

If yes, what type of bread did you usually eat? (Check only one) **DO NOT READ**

- |   |  |
|---|--|
| <input type="checkbox"/> Whole wheat (100%, 80%, 60%) | <input type="checkbox"/> White bread       |
| <input type="checkbox"/> Multigrain/Cracked Wheat     | <input type="checkbox"/> Rye, pumpernickel |
| <input type="checkbox"/> Do Not Know                  | <input type="checkbox"/> Other _____       |

2. During the past month, did you use milk?

Yes  No

If yes, what type of milk did you usually use? (Check only one) **DO NOT READ**

- |   |  |
|---|--|
| <input type="checkbox"/> Whole milk         | <input type="checkbox"/> Evaporated milk |
| <input type="checkbox"/> 2% milk            | <input type="checkbox"/> Other           |
| <input type="checkbox"/> 1% milk            | <input type="checkbox"/> Do not know     |
| <input type="checkbox"/> Skim milk          |  |
| <input type="checkbox"/> Powdered Skim milk |  |

3. During the past month, did you use any vitamin-mineral supplement?

Yes  No

4. Have you ever smoked cigarettes?

Yes  No → END.  Refused to answer → END.

↓ At the present time do you smoke cigarettes?

Yes  No → END  Refused to answer → END.

↓ Do you usually smoke cigarettes every day?

Yes  No → END.  Refused to answer → END.

↓ How many cigarettes do you smoke a day?

Number  Refused to answer

# APPENDIX E

## Nutrient Intake Confidence Intervals

Table E.1	<b>Nutrient Intake</b> , by Gender: Means and 95% Confidence Intervals
Table E.2	<b>Nutrient Intake</b> , Males: Medians and 95% Confidence Intervals
Table E.3	<b>Nutrient Intake</b> , Females: Medians and 95% Confidence Intervals
Table E.4	<b>Nutrient Density</b> , Males: Means and 95% Confidence Intervals
Table E.5	<b>Nutrient Density</b> , Females: Means and 95% Confidence Intervals
Table E.6	<b>Micronutrient Inadequacy</b> , Males: Percent of Individuals and 95% Confidence Intervals
Table E.7	<b>Micronutrient Inadequacy</b> , Females: Percent of Individuals and 95% Confidence Intervals
Table E.8	<b>Mean Nutrient Intake</b> by Geographic Region
Table E.9	<b>Mean Nutrient Intake</b> by Education



**Table E.1 Nutrient Intake<sup>1</sup> by Gender: Means and 95% Confidence Intervals**

Nutrient	n	Males 853			Females 963		
		Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI
Energy	2582	2495	2669	1729	1681	1778	
Protein	103	98	107	69.9	67.5	72.3	
Carbohydrate	314	306	322	221	216	227	
Total fat	97.5	94.2	100.8	63.1	61.4	64.7	
SFA	33.7	32.4	35.1	22.1	21.5	22.7	
PFA	15.9	15.3	16.5	10.5	9.7	11.4	
MUFA	39.1	37.7	40.6	24.6	24.1	25.0	
Cholesterol	364	353	375	228	199	256	
Fibre	16.6	16.0	17.1	12.9	12.5	13.4	
Sodium	3577	3346	3808	2537	2492	2582	
Potassium	3346	3236	3457	2464	2401	2527	
Calcium	866	820	891	694	651	736	
Phosphorus	1510	1464	1555	1092	1045	1139	
Magnesium	320	307	333	242	233	251	
Iron	16.6	16.1	17.2	11.9	11.2	12.5	
Zinc	13.5	12.6	14.5	8.8	8.2	9.3	
Vitamin A	1227	1075	1380	1086	770	1402	
Thiamin	1.76	1.69	1.83	1.25	1.20	1.30	
Riboflavin	2.05	1.98	2.13	1.52	1.41	1.64	
Niacin	44.5	42.1	46.9	30.6	29.7	31.6	
Vitamin B <sub>6</sub>	1.99	1.90	2.09	1.41	1.36	1.45	
Vitamin B <sub>12</sub>	7.12	6.69	7.55	4.76	2.19	7.34	
Pantothenic acid	5.50	5.32	5.87	3.95	3.71	4.20	
Folacin	241	229	252	191	175	207	
Vitamin C	103.0	97.0	109.0	93.6	82.6	105.0	
Caffeine	211	192	231	168	156	180	
Alcohol	7.85	5.48	10.20	2.39	0.74	4.00	

<sup>1</sup> intakes based on single day recalls from food sources only

**Table E.2 Nutrient Intake<sup>1</sup>, Males: Medians and 95% Confidence Intervals**

Nutrient	18-34 163			35-49 247			50-64 260			65-74 183		
	Median	Lower CI	Upper CI	Median	Lower CI	Upper CI	Median	Lower CI	Upper CI	Median	Lower CI	Upper CI
Energy	2616	2516	2741	2461	2374	2535	2233	2155	2307	2020	1914	2120
Protein	98	94	100	97	94	99	91	88	93	81	76	83
Carbohydrate	338	316	353	294	288	305	283	271	289	257	243	274
Total fat	93	90	102	91	85	95	80	77	84	70	66	74
SFA	33	32	36	32	29	33	26	24	28	23	22	24
PFA	14.0	14.0	16.0	14.0	13.0	14.0	13.0	12.0	14.0	11.0	10.0	12.0
MUFA	37	36	41	36	33	38	31	29	33	27	25	29
Cholesterol	289	264	310	320	303	339	284	271	309	245	225	271
Fibre	14.0	13.0	15.0	14.0	13.0	16.0	16.0	15.0	18.0	14.0	14.0	16.0
Sodium	3631	3547	3739	3327	3229	3455	3060	2901	3193	2711	2603	2873
Potassium	3135	2941	3320	3176	3065	3291	3113	2997	3237	2964	2842	3145
Calcium	826	771	915	768	728	812	660	630	707	658	620	689
Phosphorus	1495	1441	1565	1449	1390	1503	1313	1269	1366	1284	1224	1346
Magnesium	298	289	316	300	287	311	306	285	313	272	260	287
Iron	15.0	15.0	16.0	15.0	15.0	16.0	15.0	14.0	16.0	14.0	14.0	15.0
Zinc	12.0	11.0	12.0	12.0	12.0	12.0	11.0	11.0	12.0	9.8	9.3	10.0
Vitamin A	667	616	745	781	730	817	775	737	809	916	807	1018
Thiamin	1.7	1.6	1.8	1.6	1.5	1.7	1.5	1.4	1.6	1.5	1.4	1.6
Riboflavin	1.9	1.8	2.1	1.9	1.8	2.0	1.8	1.7	1.9	1.6	1.6	1.7
Niacin	42	41	44	41	40	43	39	38	40	35	33	37
Vitamin B <sub>6</sub>	1.9	1.8	1.9	1.8	1.8	1.9	1.8	1.7	1.8	1.8	1.7	1.9
Vitamin B <sub>12</sub>	3.9	3.7	4.2	4.0	3.7	4.2	3.3	3.0	3.6	3.3	3.2	3.7
Pantothenic acid	5.0	4.7	5.5	5.1	4.9	5.3	4.8	4.7	5.0	4.8	4.5	5.0
Folacin	217	205	230	219	207	230	227	215	240	210	203	220
Vitamin C	75	58	86	75	67	86	72	69	79	69	60	79

<sup>1</sup>intakes from food sources only, adjusted for intra-subject variability

Source: BBCA E451311-009BV2

**Table E.3 Nutrient Intake<sup>1</sup>, Females: Medians and 95% Confidence Interval**

Nutrient	n	18-34 194			35-49 283			50-64 297			65-74 189		
		Median	Lower CI	Upper CI	Median	Lower CI	Upper CI	Median	Lower CI	Upper CI	Median	Lower CI	Upper CI
Energy		1744	1696	1819	1572	1533	1624	1565	1518	1615	1500	1446	1563
Protein		66	62	70	66	63	68	65	63	67	63	60	65
Carbohydrate		222	212	231	201	193	206	203	195	212	209	199	217
Total Fat		60	58	61	56	54	58	53	52	55	48	45	51
Saturated Fat		21	21	22	19	18	20	18	17	19	15	14	17
Polyunsaturated Fat		9.2	8.8	9.5	8.8	8.5	9.2	8.3	8.0	8.8	8.1	7.6	8.6
Monounsaturated Fat		23	22	24	21	21	22	20	19	21	17	17	19
Cholesterol		186	175	198	182	173	194	184	177	194	169	159	178
Fibre		10.0	9.0	11.0	11.0	10.0	12.0	12.0	12.0	13.0	15.0	13.0	16.0
Sodium		2519	2462	2588	2318	2204	2408	2240	2168	2332	2173	2072	2289
Potassium		2210	2102	2353	2286	2200	2366	2466	2405	2548	2542	2360	2587
Calcium		648	600	700	568	535	609	578	545	628	528	499	587
Phosphorus		1047	998	1098	991	959	1036	1001	958	1051	994	934	1070
Magnesium		220	208	231	219	208	229	233	224	242	241	229	254
Iron		11.0	11.0	11.0	11.0	10.0	11.0	11.0	11.0	11.0	12.0	11.0	12.0
Zinc		7.7	7.4	8.1	7.8	7.4	8.2	7.7	7.5	7.9	7.4	7.1	8.0
Vitamin A		552	516	588	579	554	615	696	659	742	814	720	905
Thiamin		1.1	1.1	1.2	1.1	1.1	1.1	1.2	1.1	1.2	1.2	1.2	1.4
Riboflavin		1.4	1.4	1.5	1.4	1.3	1.4	1.4	1.3	1.4	1.3	1.3	1.4
Niacin		29	27	30	28	28	29	28	27	29	28	26	29
Vitamin B <sub>6</sub>		1.3	1.2	1.3	1.3	1.2	1.3	1.4	1.3	1.5	1.5	1.3	1.5
Vitamin B <sub>12</sub>		2.3	2.2	2.7	2.4	2.2	2.6	2.5	2.3	2.6	2.3	2.2	2.5
Pantothenic Acid		3.6	3.5	3.7	3.5	3.4	3.6	3.8	3.7	3.9	3.8	3.6	4.0
Folacin		157	152	162	170	163	178	184	176	194	190	180	200
Vitamin C		62	56	77	58	47	69	72	65	78	78	70	92

<sup>1</sup> intakes from food sources only, adjusted for intra-subject variability

Source: BBCA E451311-009BV2

**Table E.4 Nutrient Density<sup>1</sup>, Males: Means and 95% Confidence Intervals**

Nutrient	n	18-34 163			35-49 247			50-64 260			65-74 183		
		Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI
Protein		38.6	37.2	39.3	42.4	39.1	45.7	41.6	39.6	43.6	41.3	41.0	42.1
Carbohydrate		124.3	122.5	126.1	119.5	116.1	122.9	125.5	123.0	128.1	128.3	123.7	134.0
Total fat		38.7	37.4	40.0	39.2	37.4	40.9	36.8	35.8	39.3	35.7	33.4	38.0
SFA		13.0	12.5	13.5	13.1	12.4	13.8	12.1	11.3	13.0	12.2	11.6	12.7
PFA		6.10	5.86	6.34	5.92	5.51	6.34	6.30	5.85	6.75	5.94	5.68	6.20
MUFA		14.9	14.8	15.1	15.2	15.1	15.3	14.5	14.1	14.9	13.8	12.8	14.8
Cholesterol		127.6	111.2	144.0	155.9	147.0	164.7	150.7	144.8	156.7	143.9	131.4	156.4
Fibre		5.81	5.71	5.91	6.81	5.75	7.86	8.00	6.95	9.04	8.31	7.46	9.17
Sodium		1449	1350	1547	1415	1257	1573	1405	1330	1481	1418	1342	1495
Potassium		1234	1184	1284	1357	1293	1420	1450	1382	1519	1552	1467	1638
Calcium		332.7	306.9	358.5	343.0	327.6	358.4	327.7	321.9	333.6	350.9	335.5	366.2
Phosphorus		574.2	550.8	597.7	609.8	587.5	632.1	615.9	578.1	653.7	643.3	632.2	654.4
Magnesium		118	105	131	131	125	137	141	130	151	140	131	150
Iron		6.09	5.92	6.26	6.66	6.19	7.14	7.31	6.33	8.30	7.80	7.00	8.61
Zinc		5.02	4.63	5.41	5.54	5.26	5.81	6.01	4.76	7.27	5.40	5.10	5.69
Vitamin A		484.2	257.9	710.5	485.6	412.3	558.9	545.0	514.9	575.1	730.9	673.0	788.9
Thiamin		0.67	0.63	0.71	0.71	0.59	0.82	0.76	0.70	0.81	0.77	0.74	0.80
Riboflavin		0.78	0.69	0.87	0.83	0.82	0.85	0.83	0.79	0.86	0.85	0.82	0.87
Niacin		16.5	16.0	17.1	18.5	16.8	20.2	18.3	17.1	19.4	18.1	17.1	19.0
Vitamin B <sub>6</sub>		0.75	0.67	0.82	0.80	0.75	0.86	0.84	0.80	0.88	0.91	0.85	0.97
Vitamin B <sub>12</sub>		2.52	1.80	3.24	2.93	2.28	3.57	2.95	2.34	3.55	4.32	1.99	6.67
Pantothenic acid		2.06	1.79	2.31	2.23	2.18	2.28	2.30	2.23	2.37	2.47	2.32	2.63
Folacin		87.6	69.8	105.4	96.9	88.4	105.5	109.2	102.5	115.9	111.6	101.9	121.2
Vitamin C		40.5	34.6	46.5	42.7	33.3	52.1	43.2	40.1	46.2	42.0	33.1	50.9
Caffeine		54	51	56	122	105	138	113	108	117	93	79	106
Alcohol		2.53	1.70	3.35	3.11	1.64	4.59	2.14	1.52	2.76	1.49	0.71	2.28

<sup>1</sup>mean intake per 1,000 kcal; intakes based on single day recalls from food sources only

**Table E.5 Nutrient Density<sup>1</sup>, Females: Means and 95% Confidence Intervals**

Nutrient	n	18-34 194			35-49 283			50-64 297			65-74 189		
		Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI
Protein		39.0	37.6	40.5	42.1	40.7	43.5	43.2	41.4	45.1	42.2	40.1	44.3
Carbohydrate		130.9	127.8	134.0	126.8	122.9	130.7	131.3	128.8	133.7	136.7	132.4	141.1
Total Fat		35.6	33.9	37.3	36.0	34.6	37.5	33.6	32.7	34.4	31.6	29.5	33.6
Saturated Fat		12.8	11.4	14.2	12.4	12.2	12.6	12.1	11.6	12.6	11.1	10.4	11.7
Polyunsaturated Fat		5.8	5.3	6.4	6.1	5.9	6.3	5.7	5.5	5.9	6.0	5.0	7.0
Monounsaturated Fat		13.8	13.0	14.6	14.3	13.9	14.6	13.2	12.9	13.5	12.5	11.8	13.1
Cholesterol		129.4	98.8	160.1	132.6	117.4	147.8	141.6	135.6	147.5	131.1	106.0	156.1
Fibre		6.5	6.0	7.0	7.7	7.3	8.0	8.9	8.6	9.2	10.2	9.9	10.6
Sodium		1529	1492	1565	1500	1474	1526	1534	1452	1616	1481	1269	1692
Potassium		1348	1285	1411	1516	1425	1606	1641	1593	1688	1669	1628	1710
Calcium		410	374	445	401	361	441	416	369	463	375	351	398
Phosphorus		619	583	655	634	602	666	681	638	725	668	650	685
Magnesium		133	127	139	148	142	154	159	152	166	161	160	162
Iron		6.58	6.09	7.07	7.08	6.53	7.63	7.64	7.42	7.87	7.67	7.45	7.89
Zinc		4.85	4.40	5.31	5.37	4.80	5.93	5.43	5.03	5.83	5.31	5.15	5.48
Vitamin A		619.1	212.2	1026.0	563.4	468.1	658.7	798.8	675.7	912.9	880.9	775.2	4.85
Thiamin		0.68	0.67	0.70	0.75	0.67	0.82	0.81	0.76	0.86	0.87	0.80	0.93
Riboflavin		0.91	0.79	1.03	0.87	0.81	0.94	0.92	0.88	0.95	0.90	0.90	0.91
Niacin		17.2	16.7	17.7	18.7	18.4	19.1	19.0	18.5	19.5	19.0	17.2	20.9
Vitamin B <sub>6</sub>		0.76	0.70	0.82	0.84	0.78	0.90	0.95	0.91	0.99	0.99	0.89	1.09
Vitamin B <sub>12</sub>		3.62	-0.54	7.78	2.43	1.85	3.01	2.66	2.01	3.26	2.22	1.57	2.86
Pantothenic acid		2.28	2.05	2.50	2.28	2.07	2.49	2.54	2.42	2.67	2.60	2.47	2.73
Folacin		105.7	85.5	126.0	114.8	98.3	131.3	130.7	126.8	134.7	131.5	117.0	146.1
Vitamin C		57.0	54.7	59.6	54.0	35.3	78.8	59.8	54.7	64.9	62.2	47.8	76.7
Caffeine		79	70	88	162	151	172	124	109	139	100	70	130
Alcohol		0.99	-0.17	2.15	1.36	0.73	2.00	0.96	0.82	1.10	0.77	0.64	0.91

<sup>1</sup>mean intake per 1,000 kcal; intakes based on single day recalls from food sources only

**Table E.6 Micronutrient Adequacy, Males: Percent of Individuals<sup>1</sup> and 95% Confidence Intervals**

	EAR	19-34 yr			35-49 yr			50-64 yr			65-70 yr		
		%	(n)	95% CI	%	(n)	95% CI	%	(n)	95% CI	%	(n)	95% CI
Folate (µg)	320	22	(12)	7-18	9	(22)	5-12	14	(35)	9-18	4	(5)	0.6-8
Niacin (mg)	12	100			100			100			100		
Phosphorus (mg)	580	100			100			100			99	(115)	97-101
Riboflavin (mg)	0.9	92	(148)	88-96	95	(234)	93-98	98	(253)	96-99	95	(115)	91-99
Thiamin (mg)	1	94	(142)	90-98	93	(229)	90-96	91	(235)	87-94	89	(163)	85-94
Vitamin A (µg)	625	55	(88)	47-63	74	(184)	68-79	74	(194)	68-79	80	(146)	74-86
Vitamin B <sub>12</sub> (µg)	2	97	(156)	95-100	94	(232)	91-97	87	(226)	83-91	86	(99)	79-92
Vitamin C (mg)	75	50	(81)	43-58	50	(125)	44-57	48	(121)	41-54	43	(51)	34-52
Zinc (mg)	9.4	100			100			100			100		
	EAR	19-30 yr			31-50 yr			51-70 yr			70-74 yr		
		%	(n)	95% CI	%	(n)	95% CI	%	(n)	95% CI	%	(n)	95% CI
Magnesium (mg)	330 if 19-30 yr 350 if 31-74 yr	38	(43)	29-47	28% (N=184) 95% CI: 24-32								
Vitamin B <sub>6</sub> (mg)	1.1 if 19-50 yr 1.4 if 50+ yr	98% (n=420) 95% CI: 97-99			78% (n=323) 95% CI: 74-82								
Iron (mg)	6	100% (n=410)			100% (n=442) 95% CI: 99-100								

<sup>1</sup> adjusted for intra-subject variability; based on food sources only

Source: BBCA E451311-009BV2

**Table E.7 Micronutrient Adequacy, Females: Percent of Individuals<sup>1</sup> and 95% Confidence Intervals**

	EAR	19-34 yr		35-49 yr		50-64 yr		65-70 yr					
		%	(n)	95% CI	%	(n)	95% CI	%	(n)	95% CI			
Folate (µg)	320	2	(3)	0-4	2	(7)	0.6-4	5	(16)	3-7	2	(2)	0-4
Niacin (mg)	11	100			99	(281)	98-100	99	(295)	98-100	100		
Phosphorus (mg)	580	93	(177)	89-97	93	(265)	91-96	95	(284)	93-98	90	(116)	85-95
Riboflavin (mg)	0.9	91	(172)	87-95	89	(253)	86-93	92	(274)	89-95	86	(111)	80-92
Thiamin (mg)	0.9	81	(148)	75-87	74	(210)	69-79	77	(227)	72-82	80	(148)	74-85
Vitamin A (µg)	625	61	(116)	54-68	65	(187)	60-71	79	(234)	74-83	85	(160)	80-90
Vitamin B <sub>12</sub> (µg)	2	64	(123)	57-71	67	(191)	61-72	74	(219)	69-79	65	(83)	56-73
Vitamin C (mg)	75	53	(100)	45-60	50	(140)	44-55	60	(179)	54-66	69	(89)	62-77
Zinc (mg)	6.8	71	(136)	65-78	65	(185)	59-70	66	(196)	61-72	66	(125)	59-73
	EAR	19-30 yr		31-50 yr		51-70 yr		71-74 yr					
		%	(n)	95% CI	%	(n)	95% CI	%	(n)	95% CI			
Magnesium (mg)	330 if 19-30 yr 350 if 31-74 yr	27	(32)	19-35	27% (n=223)		95% CI: 23-30						
Vitamin B <sub>6</sub> (mg)	1.1 if 19-50 yr 1.4 if 50+ yr	66% (n=335)		95% CI: 62-70		58% (n=264)		95% CI: 54-63					
Iron (mg)	8.1 if 19-50 yr 5 if 50+ yr	89% (n=421)		95% CI: 86-92		99% (n=480)		95% CI: 98-100					

<sup>1</sup> adjusted for intra-subject variability; based on food sources only

Source: BBCA E451311-009BV2

**Table E.8 Mean Nutrient Intake<sup>1</sup> by Geographic Region - Part 1**

New Brunswick Nutrition Survey	Moncton			Saint John			Fredericton			Edmundston		
	Estimate	[95% CI]		Estimate	[95% CI]		Estimate	[95% CI]		Estimate	[95% CI]	
Mean												
Protein	16.2	15.6	16.7	16.5	15.9	17.1	15.3	14.8	15.9	16.3	15.4	17.3
Carbohydrate	51.0	50.0	52.0	50.0	49.0	51.1	50.2	49.2	51.3	51.1	49.5	52.7
Total Fat	31.9	31.0	32.8	32.3	31.2	33.3	32.8	31.8	33.8	31.9	30.6	33.2
Saturated Fat	11.0	10.6	11.4	11.5	11.0	12.0	11.5	11.1	12.0	10.3	9.8	10.9
Polyunsaturated Fat	5.4	5.2	5.7	5.1	4.9	5.4	5.2	5.0	5.5	5.8	5.3	6.3
Monounsaturated Fat	12.5	12.1	12.9	12.6	12.1	13.1	12.9	12.4	13.4	12.6	11.8	13.0
Cholesterol	250.6	238.0	263.3	234.6	223.4	245.8	270.2	255.0	285.4	258.0	235.1	280.9
Fibre	15.0	14.2	15.9	14.4	13.5	15.4	15.4	14.3	16.4	14.3	12.9	15.6
Sodium	3020.0	2848.5	3189.4	2773.8	2621.4	2926.3	3230.4	3043.7	3417.0	3196.0	2898.4	3493.5
Potassium	2902.0	2761.1	3042.8	2784.7	2626.3	2943.1	3064.5	2899.3	3229.7	2822.5	2899.3	3230.0
Calcium	730.4	697.2	763.6	711.8	673.7	749.9	765.1	727.2	803.0	629.1	584.3	673.9
Phosphorus	1283.1	1218.5	1347.7	1237.0	1166.7	1307.3	1373.5	1295.1	1451.9	1235.5	1121.7	1349.4
Magnesium	277.7	265.3	290.1	269.7	255.2	284.1	302.8	285.9	319.7	271.0	248.2	2293.9
Iron	13.7	13.3	14.1	12.7	12.3	13.1	123.9	13.4	14.3	13.5	12.7	14.2
Zinc	9.7	9.5	10.0	9.4	9.1	9.7	10.0	9.6	10.3	10.0	9.4	10.5
Vitamin A	803.9	757.0	850.9	781.3	737.2	825.5	763.3	724.5	802.0	692.8	637.2	748.4
Thiamin	1.5	1.4	1.5	1.4	1.3	1.4	1.5	1.4	1.5	1.4	1.3	1.5
Riboflavin	1.7	1.6	1.8	1.6	1.5	1.6	1.8	1.7	1.9	1.6	1.5	1.7
Niacin	35.1	34.0	36.3	33.8	32.7	34.9	35.9	34.7	37.2	36.0	33.7	38.4
Vitamin B <sub>6</sub>	1.6	1.5	1.7	1.6	1.5	1.6	1.6	1.6	1.7	1.6	1.5	1.8
Vitamin B <sub>12</sub>	3.8	3.4	4.1	3.1	2.9	3.3	3.7	3.2	4.3	3.4	2.8	6.2
Pantothenic Acid	4.7	4.4	5.0	4.3	4.1	4.6	5.0	4.6	5.4	4.7	4.2	5.2
Folacin	214.8	20.4	226.1	201.3	189.5	213.2	230.8	214.5	247.0	206.8	188.1	225.4
Vitamin C	107.8	96.5	119.2	61.5	80.8	102.1	105.3	94.0	116.6	90.7	77.0	104.5
Alcohol	3.1	1.8	4.5	3.8	2.5	5.1	7.3	4.1	10.4	2.4	0.7	4.2
Caffeine	107.7	151.0	190.6	207.3	183.3	231.3	210.1	177.9	242.4	221.1	128.7	313.4

<sup>1</sup> intakes based on single day recalls from food sources only



**Table E.8 Mean Nutrient Intake<sup>1</sup> by Geographic Region - Part 2**

	Campbellton			Bathurst			Miramichi		
	Estimate	[95% CI]		Estimate	[95% CI]		Estimate	[95% CI]	
Mean									
Protein	17.9	15.4	20.5	17.6	16.7	18.5	16.5	15.5	17.4
Carbohydrate	49.3	46.4	52.2	48.1	16.5	49.8	49.2	47.3	51.1
Total Fat	30.2	28.3	32.1	32.6	31.3	33.9	33.4	31.8	35.0
Saturated Fat	10.6	9.7	11.6	11.1	10.5	11.7	11.4	10.7	12.1
Polyunsaturated Fat	5.0	4.4	5.6	5.5	5.1	5.9	5.5	4.9	6.1
Monounsaturated Fat	11.7	10.8	12.6	13.4	12.6	14.1	13.2	12.4	14.1
Cholesterol	282.8	247.7	317.9	296.5	276.4	316.6	296.5	276.5	316.6
Fibre	15.5	12.8	18.2	14.6	13.4	15.7	13.1	11.3	15.0
Sodium	2802.9	2451.3	3154.4	3295.8	2981.5	3611.0	3109.0	2777.9	3440.0
Potassium	3111.9	2749.7	3474.1	2964.0	2767.4	3160.6	2685.3	2471.8	2898.7
Calcium	722.6	992.0	783.3	723.5	667.1	779.8	686.3	614.6	757.9
Phosphorus	1380.2	1241.8	1518.7	1375.1	1276.7	1473.6	1256.9	1136.8	1377.0
Magnesium	308.0	271.5	344.6	279.5	261.2	297.9	254.5	233.7	275.2
Iron	14.5	12.7	16.4	14.1	13.4	14.9	13.4	12.7	14.2
Zinc	10.2	9.0	11.3	10.8	10.3	11.2	10.1	9.4	10.7
Vitamin A	817.1	697.9	936.3	937.9	865.2	1040.6	747.9	689.4	806.5
Thiamin	1.5	1.3	1.6	1.5	1.4	1.6	1.4	1.3	1.5
Riboflavin	1.7	1.6	1.9	1.9	1.8	2.0	1.7	1.6	1.9
Niacin	38.3	34.4	42.1	38.1	36.5	39.6	35.0	323.0	37.1
Vitamin B <sub>6</sub>	1.8	1.6	2.0	1.7	1.7	1.8	1.5	1.4	1.6
Vitamin B <sub>12</sub>	4.6	2.9	6.2	4.4	3.7	5.1	3.5	3.1	3.8
Pantothenic Acid	5.1	4.5	5.7	5.2	4.7	5.6	4.4	4.0	4.8
Folacin	237.5	203.5	271.4	235.5	205.3	265.6	189.5	175.0	204.0
Vitamin C	114.5	82.5	146.5	92.9	80.0	105.8	73.9	61.0	86.8
Alcohol	10.9	1.9	19.9	7.2	2.7	11.8	6.3	-0.9	13.5
Caffeine	124.9	188.4	161.5	141.6	119.7	163.5	196.0	153.7	238.3

<sup>1</sup> intakes based on single day recalls from food sources only

**Table E.9 Mean Nutrient Intake<sup>1</sup> by Education**

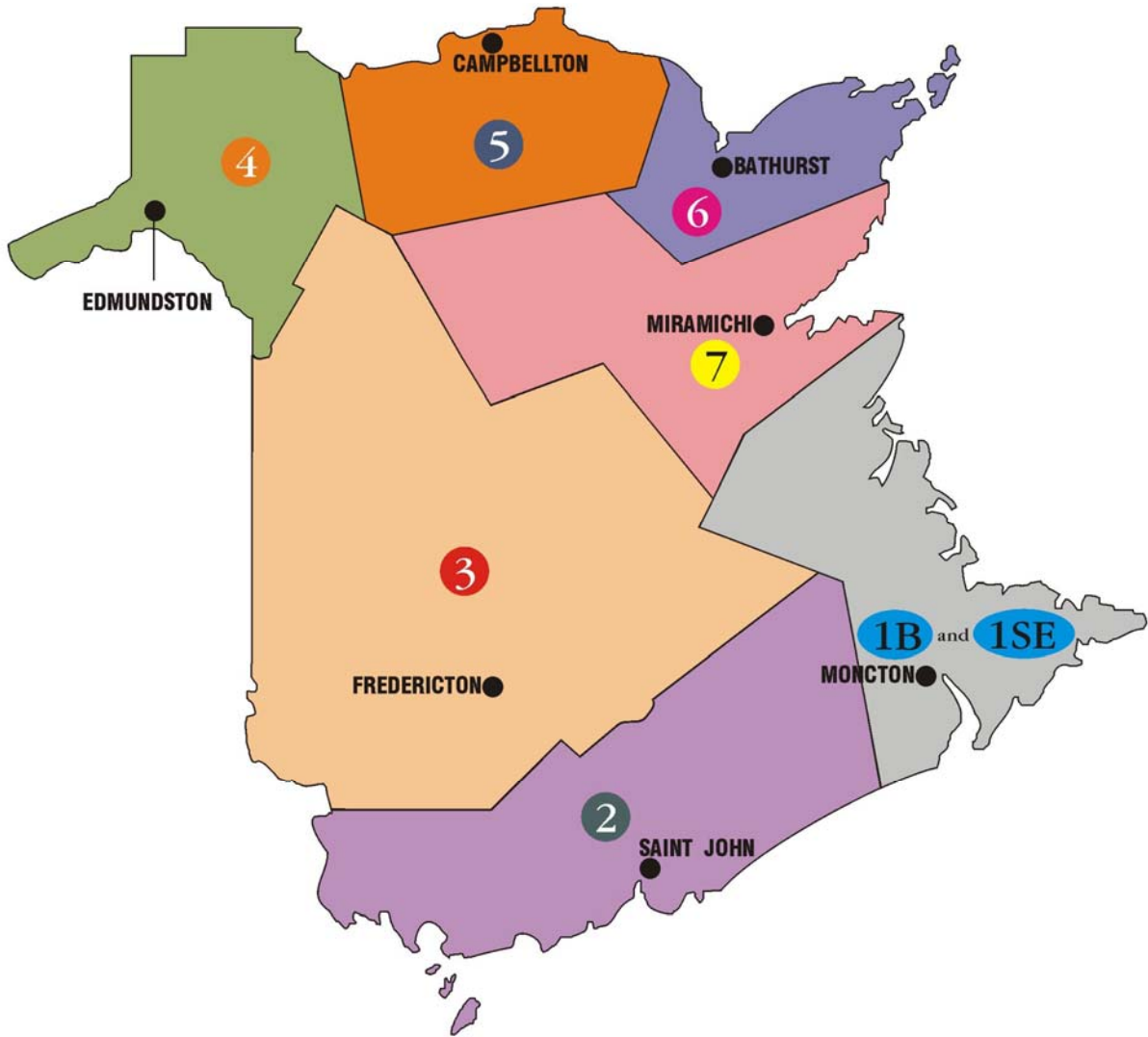
Mean	Elementary			Secondary			Post-Secondary		
	Estimate	[95% Confidence Int]		Estimate	[95% Confidence Int]		Estimate	[95% Confidence Int]	
Protein	16.8	15.8	17.8	16.4	15.9	16.7	16.1	15.8	16.5
Carbohydrate	51.1	49.5	52.7	49.6	48.8	50.4	50.5	49.7	51.2
Total Fat	31.8	30.5	33.1	32.8	32.1	33.5	32.0	31.3	32.6
Saturated Fat	10.5	9.9	11.1	11.2	10.9	11.6	11.3	11.0	11.6
Polyunsaturated Fat	5.2	4.9	5.6	5.3	5.1	5.5	5.4	5.2	5.6
Monounsaturated Fat	12.4	11.7	13.2	13.1	12.7	13.4	12.5	12.2	12.8
Cholesterol	248.5	230.7	266.3	262.1	252.6	271.7	260.6	251.2	270.7
Fibre	15.4	13.9	16.9	14.3	13.6	15.0	15.0	14.4	15.6
Sodium	2624.7	2379.6	2869.8	3066.0	2938.9	3193.1	3108.7	2986.4	3230.9
Potassium	2812.7	2628.5	2997.0	2835.6	2723.2	2948.0	2978.8	2877.2	3080.5
Calcium	603.2	564.5	642.0	693.2	666.7	719.6	762.3	737.6	787.0
Phosphorus	1171.8	1094.0	1249.7	1277.9	1227.2	1328.6	1339.1	1290.3	1387.8
Magnesium	264.2	244.2	284.1	273.9	263.7	284.1	289.2	279.2	299.1
Iron	13.5	121.8	14.1	13.5	13.2	13.9	13.6	13.3	13.9
Zinc	9.8	9.1	10.5	9.9	9.7	10.0	9.9	9.7	10.1
Vitamin A	876.2	807.1	945.4	783.8	753.9	813.6	782.1	748.0	816.2
Thiamin	1.4	1.3	1.5	1.4	1.4	1.5	1.4	1.4	1.5
Riboflavin	1.6	1.5	1.7	1.7	1.6	1.7	1.8	1.7	1.8
Niacin	34.4	32.7	36.1	35.4	34.5	36.2	35.8	35.0	36.6
Vitamin B <sub>6</sub>	1.6	1.5	1.7	1.6	1.6	1.7	1.6	1.6	1.7
Vitamin B <sub>12</sub>	3.4	3.0	3.8	3.8	3.5	4.1	3.5	3.3	3.8
Pantothenic Acid	4.6	4.2	4.9	4.6	4.4	4.8	4.9	4.6	5.1
Folacin	208.0	192.1	223.8	203.5	195.6	211.4	228.0	216.8	239.1
Vitamin C	86.0	72.9	99.0	86.9	79.7	94.1	110.1	102.2	118.0
Alcohol	1.2	0.0	2.3	5.0	3.1	6.9	5.8	4.1	7.5
Caffeine	195.4	156.3	234.5	202.8	176.7	229.0	177.4	162.6	192.1

<sup>1</sup> intakes based on single day recalls from food sources only

## APPENDIX F

### Map of New Brunswick Health Regions

**Figure F.1 Map of New Brunswick Health Regions\***



\* Current map at time of survey: 1996/97

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