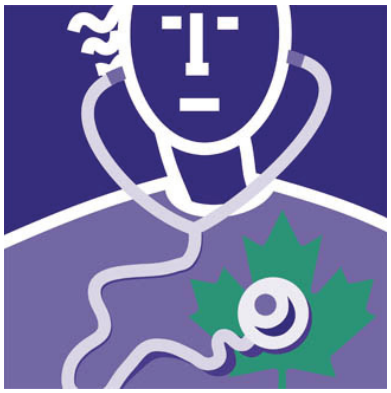
Component of Statistics Canada
Catalogue no. 82-003-X Health Reports

Article

Obesity and the eating habits of the Aboriginal population

by Didier Garriguet



January 2008

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Obesity and the eating habits of the Aboriginal population

Didier Garriguet

Abstract

Objectives

This article compares rates of overweight/obesity and obesity and food consumption patterns of off-reserve Aboriginal and non-Aboriginal people aged 19 to 50 in Ontario and the western provinces.

Data sources

The data are from the 2004 Canadian Community Health Survey: Nutrition (cycle 2.2).

Analytical techniques

Cross-sectional analyses were used to estimate the percentages of individuals who were overweight/obese or obese and average nutrient consumption, based on Aboriginal identity and other selected characteristics. Logistic regression was used to determine the independent influence of Aboriginal identity on overweight/obesity and obesity.

Main results

In 2004, the overweight/obesity and obesity rates of off-reserve Aboriginal people aged 19 to 50 were higher than those of the non-Aboriginal population. These overall differences primarily reflected higher rates of overweight/obesity and obesity among Aboriginal women. At ages 19 to 30, these differences can partly be explained by higher calorie intake by Aboriginal women, despite identical energy needs, based on height, weight, age and physical activity. Most of the excess calories are eaten as snacks and come from "other foods."

Keywords

Aboriginal, nutrition, obesity, physical activity, diet

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During the past 25 years, the prevalence of obesity in Canada has risen steadily.[1] This increase is part of a global phenomenon that the World Health Organization has described as an epidemic.[2] Obesity is recognized as a risk factor for a variety of serious health problems such as type 2 diabetes and cardiovascular diseases.[2-6]

While the causes of obesity are complex, excess weight is ultimately determined by the difference between energy consumed from food and drinks, and energy expended by an individual's basal metabolism and in daily physical activities. However, other factors—environmental and genetic, for example—can influence daily energy needs and expenditure.[7]

In Canada, the prevalence of overweight and obesity is much higher among Aboriginal people (data are available only for those living off-reserve) than among the rest of the population.[8,9] But high obesity rates among Aboriginal people are not unique to Canada: the same patterns are evident in the United States,[10] Australia,[11] New Zealand,[12] and the Pacific Islands.[13]

With data from the 2004 Canadian Community Health Survey (CCHS): Nutrition, this article analyses differences in overweight and obesity between off-reserve Aboriginal people and the non-Aboriginal population aged 19 to 50. Differences in the dietary habits of the two groups are also examined.

Methods

Data source

The data are from the 2004 Canadian Community Health Survey (CCHS): Nutrition, cycle 2.2. As the name implies, the 2004 CCHS collected information about the dietary habits of Canadians (http://www.statcan.ca/english/concepts/hs). And unlike previous CCHS cycles, rates of overweight and obesity from this cycle are based on direct measurements rather than on self-reports, which tend to be associated with underestimates.[8,14]

The CCHS excludes members of the regular Canadian Forces and people living in the territories, on Indian reserves, in institutions, in some remote regions, and all residents (military and civilian) of Canadian Forces bases. Detailed descriptions of the CCHS design, sample and interview procedures are available in a published report.[15]

Because geographic location can affect nutritional choices, it is important that Aboriginal and non-Aboriginal people be adequately represented in each province. A minimum of 25 adults aged 19 to 50 per province and per sex was needed to ensure minimal representation. But even though a supplementary sample of Aboriginal people was selected for the 2004 CCHS, the national sample of respondents substantially underrepresents Aboriginal people in Quebec and the Atlantic provinces. The sample of 19- to 50-year-olds for Quebec and the Atlantic provinces included only 76 Aboriginal people (Table 1). Consequently, this analysis is confined to Ontario, Manitoba, Saskatchewan, Alberta and British Columbia.

Table 1
Sample size of off-reserve Aboriginal respondents aged 19 to 50, by province and sex, 2004 Canadian Community Health Survey: Nutrition

Province	Sample size	
	Men	Women
Newfoundland and Labrador	9	24
Prince Edward Island	2	0
New Brunswick	9	10
Nova Scotia	3	9
Quebec	5	5
Ontario	26	64
Manitoba	68	117
Saskatchewan	34	33
Alberta	33	41
British Columbia	27	42

Analytical techniques

Descriptive statistics were used to estimate the percentages of people who were overweight/obese or obese by Aboriginal identity, sex, age group, level of leisure-time physical activity, highest level of education in the household, and household income. Logistic regression was used to determine associations between Aboriginal identity, these sociodemographic characteristics and overweight/obesity and obesity. Because of the low response rate (57.5%) for the measured height and weight component of the CCHS, an adjusted survey weight that accounted for non-response was used for the analyses dealing with anthropometric measures. The analyses of overweight/obesity and obesity in this article were based on 3,544 respondents aged 19 to 50 (Aboriginal and non-Aboriginal) for whom measured height and weight data had been collected.

Respondents were asked to list all the foods and drinks they had consumed the previous day (24-hour food recall). A five-step method, based on the *Automated Multiple-Pass Method (AMPM)* [16,17] developed in the United States, was used to maximize their recollection:

- a quick enumeration of the foods;
- questions about specific food categories and frequently forgotten foods;
- questions about the time and type of meal;
- a detailed description of the foods and the quantities consumed;
- a final review.

A total of 35,107 people completed the initial 24-hour food recall. The response rate was 76.5%. This analysis is based on 6,224 respondents aged 19 to 50. Five cases with invalid food intake and 4 cases for which intake was null were excluded, as were pregnant women (108) and women who were breastfeeding (77).

The nutrient profile of the foods and drinks respondents reported having consumed was determined according to the Canadian Nutrient Data File 2001b Supplement of Health Canada.[18] For this analysis, the quantity and percentage of daily calories (when applicable) of each of the following nutrients was examined: alcohol,* vitamin B_{12}, vitamin B_6, Vitamin C, caffeine, calcium, carbohydrates,* cholesterol, folate, vitamin D, total calories, linoleic fatty acid,* monounsaturated fatty acids,* linolenic fatty acid,* polyunsaturated fatty acids,* saturated fatty acids,* fats,* dietary fibre, folic acid, folacin, naturally occurring folate, iron, magnesium, water, niacin, phosphorous, potassium, protein,* vitamin A, riboflavin, sodium, thiamin, zinc. The asterisk (*) indicates that the nutrient was analyzed for both quantity and percentage of calories; for example, fats was analyzed in grams and as a percentage of daily calories.

The foods (basic foods, recipes or ingredients) were classified into one of the four food groups, according to the 1992 publication, *Canada's Food Guide to Healthy Eating for People Four Years Old and Over*[19]—vegetables and fruit, milk products, grain products, and meat and alternatives—or in the "other foods" category. No food was counted twice; for example, if a recipe was classified as "other foods," the recipe rather than the ingredients was used, and vice versa.

Quantities expressed in grams were transformed into servings for vegetables and fruit, milk products and grain products, using the Canadian Nutrient Data File.[18] Quantities for the meat and alternatives group were expressed in terms of cooked meat, with one serving containing 50 to 100 grams of meat. Servings without a defined range (peanut butter, for example) were multiplied by a factor equal to 50 grams of cooked meat.

Descriptive statistics based on the 24-hour food recall were used to estimate average nutrient consumption. The original survey weights were used in order to maximize sample size.

The bootstrap method,[20,21] which accounts for the complex survey design, was used to estimate standard errors, coefficients of variation and confidence intervals. The significance level was set at $p < 0.05$.

Definitions

Ethnicity was determined with the following question: "People living in Canada come from many different cultural and racial backgrounds. Are you:

1. White?"
2. Chinese?"
3. South Asian (e.g., East Indian, Pakistani, Sri Lankan)?"
4. Black?"
5. Filipino?"
6. Latin American?"
7. Southeast Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)?"
8. Arab?"
9. West Asian (e.g., Afghan, Iranian)?"
10. Japanese?"
11. Korean?"
12. Aboriginal (North American Indian, Métis or Inuit)?"
13. Other – Specify."

Respondents could indicate more than one category. Category 12 was used to identify off-reserve *Aboriginal* people, including those who also self-identified with another group. The other categories together represented the *non-Aboriginal* population.

The definitions of *overweight* and *obesity* were based on body mass index (BMI), which is calculated by dividing weight in kilograms by height in metres squared. For this analysis, BMI categories for adults were established according to Health Canada guidelines.[22] Respondents whose BMI was equal to or greater than 30 kg/m^2 were considered to be obese, and those whose BMI was greater than or equal to 25kg/m^2 were considered to be overweight (overweight includes obese).

Level of *leisure-time physical activity* was based on total energy expenditure (EE) during leisure time. EE was calculated from the reported frequency and duration of all of a respondent's leisure-time physical activities in the three months before his or her 2004 CCHS interview and the metabolic energy demand (MET value) of each activity, which had been independently established:[23]

EE = $\sum$(Ni*Di*METi / 365 days) where
Ni = number of occasions of activity i in a year,
Di = average duration in hours of activity i, and
METi = a constant value for the metabolic energy cost of activity i.

For this analysis, respondents whose EE was less than 1.5 kilocalories per kilogram per day (KKD) were considered *inactive*, and those with higher EEs were considered *active*.

The highest level of e*ducation* in the household was defined according to whether at least one household member had graduated from secondary school.

Household income was based on the number of people living in the household and total income from all sources during the 12 months before the interview. For this analysis, two groups were defined:

Household income group	People in household	Total household income
Lowest	1 or 2	Less than $10,000
	3 or 4	Less than $15,000
	5 or more	Less than $20,000
Middle or high	1 or 2	$10,000 or more
	3 or 4	$15,000 or more
	5 or more	$20,000 or more

Regular (as opposed to diet) soft drinks and sandwiches were defined using the Bureau of Nutritional Sciences (BNS) groups developed at Health Canada and based on British and American food groups systems. *Regular soft drinks* refers to category 46A, and *sandwiches*, to categories 219, A through F.

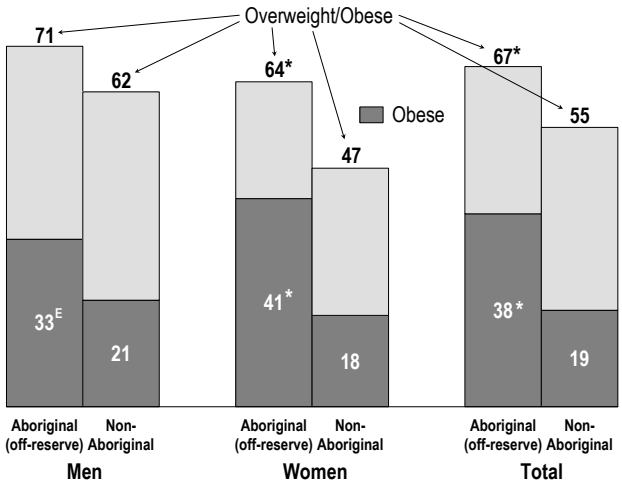
For each food that they had eaten, respondents specified the occasion: breakfast, lunch, dinner, or between-meal consumption. *Between-meal consumption* covers anything that was not reported as breakfast (or brunch), lunch or dinner. It includes snacks, drinks consumed outside of meal, extended consumption (eating or drinking something throughout the day), and other unspecified occasions.

Results

Overweight and obesity

In Ontario and the western provinces, the prevalence of overweight/obesity and obesity among 19- to 50-year-olds was much higher among off-reserve Aboriginal people than among non-Aboriginal people. To a considerable extent, this overall difference reflected higher rates among Aboriginal women; differences between Aboriginal and non-Aboriginal men were not significant (Chart 1).

Chart 1
Percentage overweight/obese (BMI ≥ 25) and obese (BMI ≥ 30), by sex and Aboriginal identity, household population aged 19 to 50, Ontario and western provinces, 2004



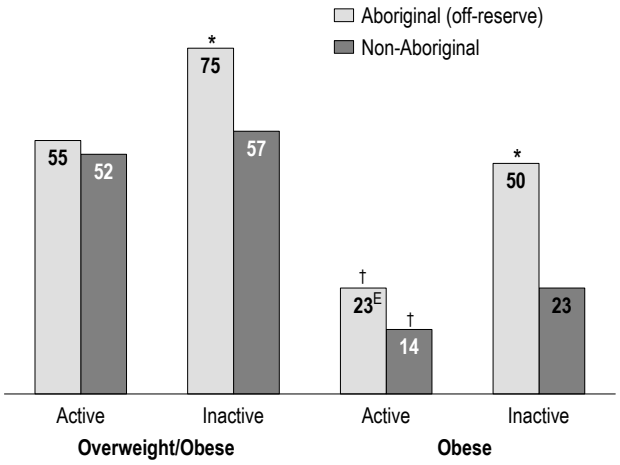
* significantly different from corresponding estimate for non-Aboriginal ($p < 0.05$)
E coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: BMI = body mass index
Source: 2004 Canadian Community Health Survey: Nutrition.

To some extent, these differences may reflect socio-demographic characteristics of Aboriginal and non-Aboriginal people that have previously been shown to be related to excess weight:[8] leisure-time physical activity, education, and income.

A majority—56%— of both Aboriginal and non-Aboriginal 19- to 50-year-olds were "inactive" during their leisure time (data not shown). And whether they were Aboriginal or non-Aboriginal, inactive people had high rates of overweight/obesity and obesity. However, the association seemed to be stronger for the Aboriginal population. Among those who were inactive, 50% of Aboriginal people were obese, compared with 23% of non-Aboriginal people (Chart 2).

The association between education and excess weight differed for Aboriginal and non-Aboriginal people. Among non-Aboriginal people, excess

Chart 2
Percentage overweight/obese (BMI ≥ 25) or obese (BMI ≥ 30), by leisure-time physical activity and Aboriginal identity, household population aged 19 to 50, Ontario and western provinces, 2004



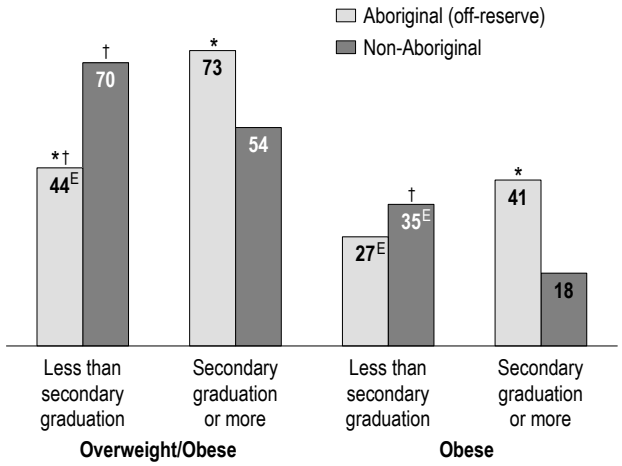
* significantly different from corresponding estimate for non-Aboriginal (p < 0.05)
† significantly different from estimate for "inactive" in same Aboriginal identity group (p < 0.05)
E coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: BMI = body mass index
Source: 2004 Canadian Community Health Survey: Nutrition.

weight was more common in households where no member had graduated from high school (Chart 3). By contrast, Aboriginal people in such households were less likely than those living in higher-education households to be overweight/obese. In fact, among residents of lower-education households, Aboriginal people were actually less likely than non-Aboriginal people to be overweight/obese.

Living in a low-income household was associated with a higher rate of obesity for Aboriginal people, but household income was not related to obesity among non-Aboriginal people (Chart 4).

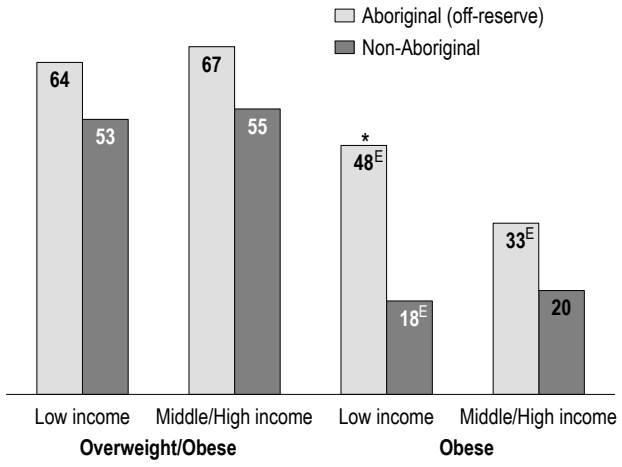
Separate multivariate models for Aboriginal and non-Aboriginal people confirm some of these univariate results (Table 2). Even when the other variables were taken into account, the odds of obesity among people who were inactive in their leisure time, whether they were Aboriginal or non-Aboriginal, were significantly higher than those for active people. The association between household educational attainment and overweight also persisted: among Aboriginal people, the odds of overweight/obesity were significantly lower for

Chart 3
Percentage overweight/obese (BMI ≥ 25) or obese (BMI ≥ 30), by highest level of schooling and Aboriginal identity, household population aged 19 to 50, Ontario and western provinces, 2004



* significantly different from corresponding estimate for non-Aboriginal (p < 0.05)
† significantly different from estimate for "secondary graduation or more" in same Aboriginal identity group (p < 0.05)
E coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: BMI = body mass index
Source: 2004 Canadian Community Health Survey: Nutrition

Chart 4
Percentage overweight/obese (BMI ≥ 25) or obese (BMI ≥ 30), by household income and Aboriginal identity, household population aged 19 to 50, Ontario and western provinces, 2004



* significantly different from corresponding estimate for non-Aboriginal (p < 0.05)
E coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: BMI = body mass index
Source: 2004 Canadian Community Health Survey: Nutrition.

Table 2
Adjusted odds ratios relating overweight/obesity and obesity to selected characteristics, by Aboriginal identity, household population aged 19 to 50, Ontario and western provinces, 2004

	Overweight/Obesity (BMI ≥ 25)				Obesity (BMI ≥ 30)			
	Aboriginal (off-reserve)		Non-Aboriginal		Aboriginal (off-reserve)		Non-Aboriginal	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Sex								
Men	1.7	0.6 to 4.5	1.9*	1.5 to 2.5	0.9	0.3 to 2.5	1.2	0.9 to 1.7
Women†	1.0	...	1.0	...	1.0	...	1.0	...
Leisure-time physical activity								
Active†	1.0	...	1.0	...	1.0	...	1.0	...
Inactive	2.8*	1.1 to 7.2	1.2	1.0 to 1.6	3.2*	1.3 to 7.7	1.8*	1.3 to 2.4
Education								
Less than secondary graduation	0.3*	0.1 to 0.9	1.9	1.0 to 3.5	0.4	0.1 to 1.4	2.1*	1.1 to 4.0
Secondary graduation or more†	1.0	...	1.0	...	1.0	...	1.0	...
Household income								
Low	0.9	0.3 to 2.6	1.0	0.6 to 1.6	1.7	0.7 to 4.5	0.8	0.5 to 1.5
Middle/High†	1.0	...	1.0	...	1.0	...	1.0	...

† reference category
* significantly different from reference category ($p < 0.05$)
... not applicable
Note: BMI = body mass index
Source: 2004 Canadian Community Health Survey: Nutrition.

Table 3
Adjusted odds ratios relating overweight/obesity and obesity to selected characteristics, household population aged 19 to 50, Ontario and western provinces, 2004

	Overweight/Obesity (BMI ≥ 25)		Obesity (BMI ≥ 30)	
	Adjusted odds ratios	95% confidence interval	Adjusted odds ratios	95% confidence interval
Sex				
Men	1.9*	1.5 to 2.4	1.2	0.9 to 1.6
Women†	1.0	...	1.0	...
Leisure-time physical activity				
Active†	1.0	...	1.0	...
Inactive	1.3	1.0 to 1.6	1.9*	1.4 to 2.5
Education				
Less than secondary graduation	1.6	0.9 to 2.9	1.8	1.0 to 3.5
Secondary graduation or more†	1.0	...	1.0	...
Household income				
Low	1.0	0.6 to 1.5	0.9	0.5 to 1.5
Middle/High†	1.0	...	1.0	...
Aboriginal identity				
Aboriginal (off-reserve)	1.8*	1.1 to 2.9	2.6*	1.5 to 4.3
Non-Aboriginal†	1.0	...	1.0	...

† reference category
* significantly different from estimate for reference category ($p < 0.05$)
... not applicable
Note: BMI = body mass index
Source: 2004 Canadian Community Health Survey: Nutrition.

those in households with a low level of education, whereas non-Aboriginal people in such households had significantly higher odds of obesity. By contrast, the association between excess weight and low household income was no longer significant for Aboriginal people.

Despite the associations between these factors and excess weight, when their effects were controlled, Aboriginal identity emerged as being related to overweight/obesity and obesity among people aged 19 to 50 in Ontario and the western provinces (Table 3). In fact, the odds of obesity were more than two and a half times greater for Aboriginal people.

Calorie consumption

Differences between the average daily calorie intake of Aboriginal and non-Aboriginal people aged 19 to 50 were relatively minor (131 calories more for Aboriginal men; 103 calories more for Aboriginal women) and not statistically significant (Appendix Table A). However, these overall results hide a significant discrepancy among women aged 19 to 30. In this age range, Aboriginal women's average daily intake exceeded that of non-Aboriginal women by 359 calories (Appendix Table B). Yet these

Aboriginal women did not expend more energy or have greater caloric needs, and were not more likely to be active during leisure time (data not shown). The average age of the two groups was the same (24 years), as was their average height (1.64 metres or 5 feet 4.5 inches), and the difference in their average weight (70.3 kilograms or 154.7 pounds for Aboriginal women versus 66.7 kilograms or 146.7 pounds for non-Aboriginal women) accounted for only 37 of the 359 excess calories[24] (data not shown). Therefore, Aboriginal women's higher rates of overweight/obesity and obesity were, in part, associated with higher calorie intake.

Food groups

When the 2004 CCHS was conducted, *Canada's Food Guide to Healthy Eating for People Four Years Old and Over*,[19] which had been prepared in 1992, was in effect. The *Guide* identified four food groups: vegetables and fruit, milk products, grain products, and meat and alternatives. Items not belonging to one of these groups (for example, candy, oils, soft drinks, condiments) were categorized as "other foods." The *Guide* recommended a certain number of servings from each of the four groups, and suggested that consumption of "other foods" be limited.

Table 4
Average daily servings (or grams) from the four food groups, by sex and Aboriginal identity, household population aged 19 to 50, Ontario and western provinces, 2004

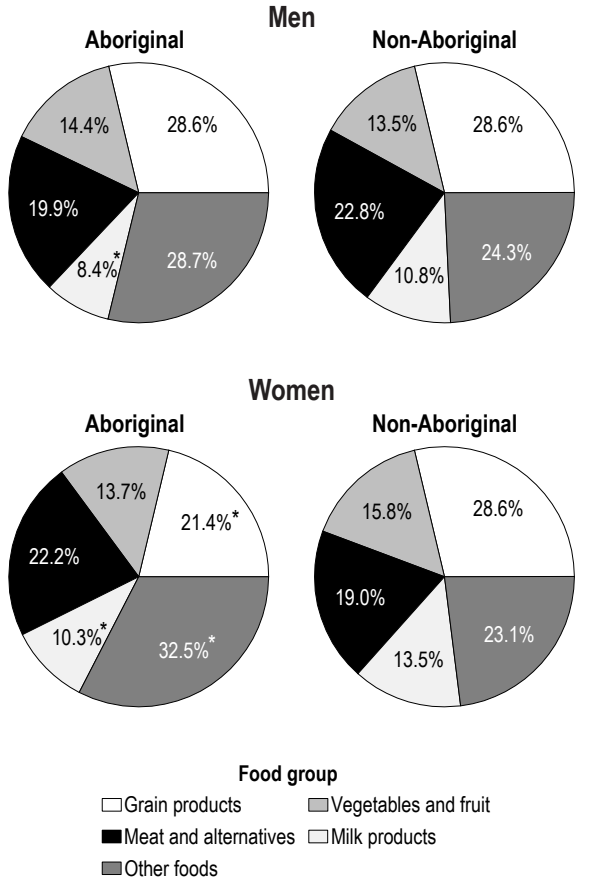
	Aboriginal (off-reserve)		Non-Aboriginal	
	Servings	95% confidence interval	Servings	95% confidence interval
Men				
Grain products	7.3	5.7 to 8.8	6.8	6.5 to 7.1
Vegetables and fruit	4.6	3.2 to 6.1	5.1	4.8 to 5.3
Milk products	1.2*	0.9 to 1.5	1.6	1.5 to 1.7
Meat and alternatives (g)	230	176 to 284	261	248 to 273
Women				
Grain products	3.9*	3.2 to 4.6	4.9	4.7 to 5.1
Vegetables and fruit	3.6*	3.0 to 4.3	4.7	4.5 to 4.9
Milk products	1.3	0.8 to 1.8	1.5	1.4 to 1.6
Meat and alternatives (g)	182	155 to 209	159	152 to 166

* significantly different from corresponding estimate for non-Aboriginal ($p < 0.05$)
Notes: Meats and alternatives are expressed in grams (g) of cooked meat. Excludes pregnant or breastfeeding women.
Source: 2004 Canadian Community Health Survey: Nutrition.

Aboriginal men consumed significantly less milk products than did non-Aboriginal men—about half a serving less per day (Table 4). Among women, those who were Aboriginal had one serving less per day of vegetables and fruit and of grain products than did those who were non-Aboriginal.

The impact of these differences is evident in the share of daily calories coming from the various food groups and from "other foods." Among men, the difference in the proportion of calories derived from milk products was statistically significant (Chart 5). Among women, those who were Aboriginal obtained a smaller percentage of their calories from grain products and from milk products, but a larger

Chart 5
Percentage distribution of sources of calories, by food group, sex and Aboriginal identity, household population aged 19 to 50, Ontario and western provinces, 2004



* significantly different from corresponding estimate for non-Aboriginal ($p < 0.05$)
Source: 2004 Canadian Community Health Survey: Nutrition.

percentage from "other foods." In fact, at ages 19 to 30, "other foods" made up more than 35% of the average daily calories of Aboriginal women, compared with 24% for non-Aboriginal women (data not shown). This difference alone explains 90% of the higher daily caloric intake of Aboriginal women aged 19 to 30.

Soft drinks and sandwiches

An earlier analysis of the 2004 CCHS showed that regular (as opposed to diet) soft drinks were the leading source of calories from "other foods" for the Canadian population overall.[25] Among 19- to 50-year-olds, the soft drink consumption of Aboriginal people significantly exceeded that of non-Aboriginal people. For example, at ages 19 to 30, Aboriginal women averaged 450 grams of regular soft drinks a day, about three times as much as non-Aboriginal women (139 grams) (Table 5).

Table 5
Daily consumption of regular soft drinks, by Aboriginal identity, age group and sex, household population aged 19 to 50, Ontario and western provinces, 2004

	Aboriginal (off-reserve)		Non-Aboriginal	
	Estimate	95% confidence interval	Estimate	95% confidence interval
Ages 19 to 30				
Men				
% of consumers	42.4[E]	24.1 to 60.7	47.0	42.5 to 51.6
Average consumption (g)				
Consumers	961*	712 to 1,211	632	589 to 674
Total aged 19 to 30	408[E]	206 to 609	297	264 to 330
Women				
% of consumers	61.6*	47.4 to 75.8	26.3	22.2 to 30.4
Average consumption (g)				
Consumers	732[E]	488 to 975	529	465 to 594
Total aged 19 to 30	450*[E]	267 to 634	139	113 to 165
Ages 31 to 50				
Men				
% of consumers	56.2*	38.6 to 73.9	29.4	25.7 to 33.0
Average consumption (g)				
Consumers	725	518 to 931	598	534 to 661
Total aged 31 to 50	407*[E]	243 to 572	176	148 to 203
Women				
% of consumers	38.0*[E]	22.7 to 53.2	18.5	15.4 to 21.6
Average consumption (g)				
Consumers	641	452 to 830	473	411 to 536
Total aged 31 to 50	243*[E]	129 to 358	88	70 to 106

* significantly different from corresponding estimate for non-Aboriginal ($p < 0.05$)
[E] coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: Excludes pregnant or breastfeeding women; g = gram.
Source: 2004 Canadian Community Health Survey: Nutrition.

Higher average intake generally reflected a larger proportion of Aboriginal people reporting having consumed soft drinks the day before the interview. When the daily intake of "consumers" was compared, the difference between Aboriginal and non-Aboriginal people was not statistically significant. The exception was men aged 19 to 30: at these ages, Aboriginal and non-Aboriginal men were equally likely to consume soft drinks, but among those who did, Aboriginal men consumed significantly more (961 grams versus 632 grams).

The previous analysis of the eating habits of the total population[25] also found that the "sandwich" category (which includes not only sandwiches per se, but also pizza, submarines, hamburgers and hot dogs) contributed more fat to the Canadian diet than did any other single category. This type of food

Table 6
Daily consumption of pizza, sandwiches, submarines, hamburgers and hot dogs, by Aboriginal identity, age group and sex, household population aged 19 to 50, Ontario and western provinces, 2004

	Aboriginal (off-reserve)		Non-Aboriginal	
	Estimate	95% confidence interval	Estimate	95% confidence interval
Ages 19 to 30				
Men				
Percentage of consumers	67.5	47.7 to 87.2	59.3	54.7 to 63.9
Percentage of calories				
Consumers	29.0	20.5 to 37.5	24.6	23.1 to 26.0
Total aged 19 to 30	20.0[E]	11.5 to 28.5	15.5	14.0 to 16.9
Women				
Percentage of consumers	68.3*	56.3 to 80.4	48.0	43.4 to 52.6
Percentage of calories				
Consumers	24.7	18.6 to 30.8	24.2	22.2 to 26.2
Total aged 19 to 30	18.5*	13.6 to 23.5	12.5	10.9 to 14.0
Ages 31 to 50				
Men				
Percentage of consumers	69.2	54.7 to 83.7	55.3	51.0 to 59.6
Percentage of calories				
Consumers	24.9	20.8 to 29.0	25.2	23.6 to 26.8
Total aged 31 to 50	16.8	11.9 to 21.7	14.8	13.4 to 16.2
Women				
Percentage of consumers	34.8[E]	20.8 to 48.8	40.6	36.6 to 44.6
Percentage of calories				
Consumers	25.9	21.6 to 30.2	23.7	22.1 to 25.3
Total aged 31 to 50	8.5[E]	4.5 to 12.6	10.3	9.1 to 11.5

* significantly different from corresponding estimate for non-Aboriginal ($p < 0.05$)
[E] coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: Excludes pregnant or breastfeeding women.
Source: 2004 Canadian Community Health Survey: Nutrition.

was also a popular choice for Aboriginal people aged 19 to 50. However, differences in consumption between Aboriginal and non-Aboriginal people were significant only for women aged 19 to 30 (Table 6). Aboriginal women in this age range were more likely to have consumed "sandwiches" the day before their CCHS interview (68% versus with 48%) and derived a greater share of their calories from such foods (19% versus 13%). But if only consumers are considered, the proportion of calories was the same.

Snacks

A closer examination of women's eating habits also shows a significant difference in between-meal food consumption. At ages 19 to 30, Aboriginal women got 36% of their daily calories between meals, compared with 28% of calories for non-Aboriginal women (data not shown). The pattern was similar at ages 31 to 50, with Aboriginal women deriving 28% of their calories from snacks, compared with 24% for non-Aboriginal women. No significant differences in between-meal calorie intake were evident among men (data not shown).

Aboriginal and non-Aboriginal women aged 19 to 30 also differed in their choice of snacks. "Other foods" accounted for 63% of the calories consumed between meals by Aboriginal women in this age range, compared with 43% of the calories of their non-Aboriginal contemporaries.

Macronutrients and nutrients

A balanced diet requires adequate, but not excessive, intake of "macronutrients" (fats, carbohydrates and proteins) and "nutrients" (vitamins and minerals).[24]

Overall, Aboriginal men derived a lower percentage of their calories from protein and consumed less calcium and vitamin A than did non-Aboriginal men (Table A). However, the significant differences in calories from protein and in calcium consumption reflected the dietary choices of men aged 19 to 30 (Table B). As well, at ages 19 to 30, Aboriginal men consumed less riboflavin than did non-Aboriginal men. By contrast, the macronutrient and nutrient consumption of Aboriginal and non-Aboriginal men aged 31 to 50 did not differ significantly (Table C).

As noted above, the excess calories consumed by Aboriginal women aged 19 to 30 were mainly attributable to "other foods." These foods tend to be high in fat, sugar and salt. And indeed, significant differences in the consumption of fat and sodium were evident between Aboriginal and non-Aboriginal women in this age range (Table B). As well, carbohydrate consumption and the proportion of calories derived from carbohydrates were higher among Aboriginal women. Aboriginal women aged 19 to 30 derived fewer calories from proteins, but consumed more grams of fat, than did non-Aboriginal women.

At ages 31 to 50, Aboriginal women consumed less fibre, magnesium, vitamin A, folic acid, naturally occurring folic acid and dietary folate equivalent than did non-Aboriginal women (Table C).

Discussion

Conclusion

This analysis of data from the 2004 Canadian Community Health Survey shows that off-reserve Aboriginal people aged 19 to 50 in Ontario and the western provinces had significantly higher rates of overweight/obesity and obesity than did non-Aboriginal people. A similar discrepancy between Aboriginal and non-Aboriginal people was reported in an earlier study using 2004 CCHS data to examine the entire adult population aged 18 or older.[8] Moreover, analyses of self-reported data from the 2001 and 2003 CCHS showed higher rates of overweight and obesity among Aboriginal people than among any other ethnic group.[9]

However, in this study, the relationships between sociodemographic factors and obesity among Aboriginal people were not necessarily the same as those reported for the total population in previous analyses. Inactive leisure time was associated with excess weight for the total adult population[8] and also for Aboriginal people. But while the proportions reporting inactivity were the same, the consequences seemed somewhat stronger for Aboriginal people.

Low educational attainment has been related to obesity for adults overall,[8] but for Aboriginal people,

excess weight tended to be more common among those in households where the level of education was relatively high. As well, for the total adult population, low household income has been linked to lower rates of overweight and obesity,[8] but the trend was the opposite for Aboriginal people—those in lower-income households were more likely to be obese. Nonetheless, as was found in the earlier study based on self-reported data,[9] when sex, physical activity, education and household income were taken into account, Aboriginal identity remained significantly associated with overweight/obesity and obesity.

In this study, the overall differences in overweight/obesity and obesity between the Aboriginal and non-Aboriginal populations were largely attributable to Aboriginal women, specifically those aged 19 to 30. Despite identical energy needs, they consumed more calories than did non-Aboriginal women, mainly foods not belonging to one of the four food groups in the *Food Guide*.[19] Much of the consumption of these "other foods," as was noted in an earlier report,[25] occurred between meals as snacks. "Other foods" also explain differences in carbohydrate, fat and sodium intake between Aboriginal and non-Aboriginal women in this age range.

Links between obesity among Aboriginal women aged 19 to 30 and their high consumption of fat are not unexpected. However, several other dietary patterns among Aboriginal people may be related to obesity. Higher protein consumption has been associated with lower rates of abdominal obesity,[26] but Aboriginal men consumed less protein than did non-Aboriginal men. High fibre consumption, too, has been associated with lower levels of obesity,[26] and Aboriginal women consumed significantly less than did non-Aboriginal women. And although it is not directly related to excess weight, overconsumption of sodium, which was common among Aboriginal women aged 19 to 30, has been associated with an increased risk of hypertension.[27]

Nonetheless, there were many similarities between the health-related characteristics of the Aboriginal and non-Aboriginal populations in Ontario and the western provinces. As was the case for Canadians overall,[25] many Aboriginal people did not follow the recommendations of the *Food Guide*. For example, a substantial percentage do not consume the suggested number of servings of vegetables and fruit, grain products, and milk products.

Further study may be needed to determine whether recommendations for the total population are appropriate for Aboriginal people living off-reserve. Other factors, environmental or genetic, for example, could influence rates of overweight and obesity in the Aboriginal population.

Limitations

For various reasons, the weight and height of many respondents to the 2004 CCHS could not be measured directly. Although this non-response was taken into account, the estimates could still be biased if the characteristics of respondents who were not measured differed systematically from those of respondents from whom direct measurements were obtained.

Reliance on body mass index (BMI) to identify overweight and obesity is problematic. BMI is a good measure at the population level, but not necessarily for individuals. It may misclassify young adults who are still growing, people who are very thin, very muscular, very heavy or very small, and some ethnic or racial groups.[9] BMI cannot assess the distribution of fatty tissue, notably excess abdominal fat, which is associated with increased health risks.[22] And because of the small sample size, people who were classified as overweight (BMI 25.0 to 29.9), but not obese, could not be examined separately in this analysis.

Respondents' leisure-time activities pertained only to the three months before the CCHS interview, and it is possible that these results were subject to recall errors. As well, leisure-time does not reflect an individual's total physical activity; activity at work, at school or for transportation (for example, bicycling) was not considered in this analysis.

The nutrition data are self-reported, and respondents may not recall exactly what they ate or how much. To minimize recall errors, the 2004 CCHS used the five-step multiple-pass method.[16,17] Under controlled conditions, this method has

effectively assessed average calorie intake.[28,29] However, under other conditions, some studies have found under-reporting,[30-32] and others, over-reporting.[33-35]

Despite efforts to ensure an equitable representation of days of the week during data collection, some days could be under-represented. This could affect the results for average dietary intake.

The results for Aboriginal people indicate a high prevalence of overweight/obesity and obesity. However, the data pertain only to the off-reserve population in Ontario and the western provinces.

As well, the small sample size precluded separate analyses of specific Aboriginal groups (North American Indians, Métis and Inuit).

Because the CCHS is a cross-sectional survey, no cause-and-effect relations between obesity and health-related behaviour or other factors can be inferred.

As well, the term "cultural and racial background" in the CCHS questionnaire may have been a source of confusion for some respondents.[36] ●

More information about the limitations of the survey is available in *Canadian Community Health Survey (CCHS) Cycle 2.2, Nutrition Focus, A Guide to Accessing and Interpreting the Data*, published by Health Canada (http://www.hc-sc.gc.ca/fn-an/surveill/nutrition/commun/index_f.html).

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Appendix

Table A
Average daily nutrient intake, by sex and Aboriginal identity, household population aged 19 to 50, Ontario and western provinces, 2004

	Men				Women			
	Aboriginal (off-reserve)		Non-Aboriginal		Aboriginal (off-reserve)		Non-Aboriginal	
	Average intake	95% confidence interval	Average intake	95% confidence interval	Average intake	95% confidence interval	Average intake	95% confidence interval
Energy (kilocalories)	2,652	2,389 to 2,915	2,521	2,452 to 2,590	1,913	1,711 to 2,115	1,810	1,762 to 1,858
Carbohydrates (g)	333	293 to 372	305	296 to 314	237	211 to 264	226	220 to 233
% of calories	49.9	46.7 to 53.1	48.4	47.7 to 49.2	49.4	47.2 to 51.6	50.0	49.3 to 50.8
Proteins (g)	99	81 to 118	105	102 to 109	73	63 to 82	73	71 to 75
% of calories	14.2*	12.5 to 16.0	16.8	16.4 to 17.2	15.5	13.9 to 17.1	16.3	15.9 to 16.7
Fats (g)	93.1	79.9 to 106.3	90.6	87.2 to 94.1	71.6	61.6 to 81.5	66.0	63.5 to 68.5
% of calories	30.3	27.2 to 33.4	31.0	30.4 to 31.7	32.2	30.6 to 33.9	31.4	30.8 to 32.0
Monounsaturated fats (g)	39.5	33.4 to 45.6	37.2	35.6 to 38.7	29.1	25.2 to 33.1	26.4	25.3 to 27.5
% of calories	12.7	11.2 to 14.2	12.6	12.3 to 13.0	13.0	12.2 to 13.8	12.5	12.2 to 12.7
Polyunsaturated fats (g)	17.0	13.8 to 20.3	16.2	15.4 to 17.0	12.4	10.6 to 14.2	12.0	11.5 to 12.5
% of calories	5.4	4.5 to 6.3	5.5	5.3 to 5.7	5.5	5.1 to 6.0	5.7	5.5 to 5.8
Saturated fats (g)	28.6	24.4 to 32.8	28.6	27.4 to 29.8	23.2	18.9 to 27.6	21.3	20.4 to 22.1
% of calories	9.5	8.5 to 10.5	9.9	9.6 to 10.1	10.4	9.4 to 11.3	10.2	9.9 to 10.4
Linoleic acid (g)	14.0	11.3 to 16.7	13.0	12.4 to 13.7	9.9	8.4 to 11.4	9.5	9.1 to 9.9
% of calories	4.4	3.7 to 5.2	4.4	4.3 to 4.6	4.4	4.0 to 4.8	4.5	4.3 to 4.6
Linolenic acid (g)	2.4	1.8 to 3.1	2.3	2.0 to 2.5	1.7	1.4 to 2.0	1.7	1.6 to 1.8
% of calories	0.8	0.6 to 0.9	0.7	0.7 to 0.8	0.8	0.7 to 0.9	0.8	0.8 to 0.8
Dietary fibre (g)	17.8	14.9 to 20.7	19.2	18.4 to 19.9	13.1*	11.2 to 14.9	15.2	14.6 to 15.9
Sodium (mg)	3,798	3,224 to 4,372	3,611	3,473 to 3,749	2,807	2,511 to 3,103	2,702	2,603 to 2,801
Water (g)	3,339	2,988 to 3,690	3,116	3,033 to 3,198	2,895	2,611 to 3,179	2,754	2,673 to 2,835
Caffeine (mg)	293	201 to 384	255	238 to 272	243	195 to 291	201	187 to 215
Vitamin A to retinol activity equivalent (mcg)	535*	431 to 639	662	620 to 704	496	400 to 591	596	561 to 630
Vitamin B_6 (mg)	2.0	1.8 to 2.3	2.2	2.2 to 2.3	1.5	1.3 to 1.7	1.6	1.6 to 1.6
Vitamin B_{12} (mcg)	4.5	3.5 to 5.4	5.3	4.9 to 5.8	3.3	2.6 to 4.1	3.6	3.2 to 4.1
Riboflavin (mg)	2.1	1.8 to 2.3	2.2	2.2 to 2.3	1.6	1.4 to 1.9	1.7	1.6 to 1.7
Thiamine (mg)	2.1	1.7 to 2.5	2.0	2.0 to 2.1	1.4	1.2 to 1.5	1.4	1.4 to 1.5
Niacin (mg)	46.8	38.8 to 54.8	48.5	46.9 to 50.1	33.5	29.8 to 37.1	33.8	32.8 to 34.7
Vitamin C (mg)	151[E]	98 to 203	131	123 to 139	113	90 to 136	117	112 to 123
Calcium (mg)	801*	695 to 908	950	910 to 989	742	555 to 928	806	775 to 836
Cholesterol (mg)	343	253 to 434	341	321 to 362	273	207 to 340	237	224 to 251
Dietary folate equivalent (mcg)	545	454 to 637	531	510 to 552	375	329 to 422	405	390 to 419
Vitamin D (mcg)	5.4	4.3 to 6.5	5.7	5.4 to 6.1	4.8	3.3 to 6.3	4.6	4.4 to 4.9
Folic acid (mcg)	185	127 to 243	159	150 to 169	93	71 to 115	109	103 to 115
Naturally occurring folate (mcg)	245	207 to 282	259	250 to 269	185*	156 to 214	216	206 to 226
Total folacin (mcg)	433	368 to 499	425	410 to 440	285*	247 to 323	330	319 to 342
Iron (mg)	16.8	14.0 to 19.5	16.7	16.1 to 17.2	11.6	10.3 to 12.9	12.1	11.7 to 12.4
Magnesium (mcg)	350	309 to 391	372	361 to 384	262*	232 to 292	294	286 to 302
Phosphorus (mg)	1,514	1,332 to 1,696	1,566	1,517 to 1,616	1,151	986 to 1,316	1,183	1,150 to 1,216
Potassium (mg)	3,418	2,849 to 3,987	3,463	3,359 to 3,566	2,539	2,263 to 2,816	2,738	2,667 to 2,808
Zinc (mg)	14.2	11.0 to 17.4	14.0	13.4 to 14.5	9.5	8.3 to 10.6	9.6	9.3 to 9.9

* significantly different from corresponding estimate for non-Aboriginal ($p < 0.05$)
[E] coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: Excludes pregnant or breastfeeding women; g = gram; mg = milligram; mcg = microgram.
Source: 2004 Canadian Community Health Survey: Nutrition.

Table B
Average daily nutrient intake, by sex and Aboriginal identity, household population aged 19 to 30, Ontario and western provinces, 2004

	Men				Women			
	Aboriginal (off-reserve)		Non-Aboriginal		Aboriginal (off-reserve)		Non-Aboriginal	
	Average intake	95% confidence interval	Average intake	95% confidence interval	Average intake	95% confidence interval	Average intake	95% confidence interval
Energy (kilocalories)	2,673	2,296 to 3,049	2,665	2,556 to 2,774	2,176*	1,886 to 2,467	1,817	1,743 to 1,890
Carbohydrates (g)	355	286 to 423	328	315 to 342	295*	252 to 338	236	226 to 245
% of calories	52.6	47.5 to 57.8	49.8	48.7 to 50.8	54.2*	52.1 to 56.3	51.9	50.8 to 52.9
Proteins (g)	91*	75 to 106	107	102 to 113	74	62 to 86	71	67 to 74
% of calories	13.5*	12.0 to 15.0	16.1	15.6 to 16.7	13.5*	12.2 to 14.8	15.8	15.3 to 16.3
Fats (g)	89.7	70.4 to 109.0	94.9	89.6 to 100.3	76.0*	65.2 to 86.8	63.1	59.7 to 66.6
% of calories	29.2	24.7 to 33.7	30.8	29.9 to 31.6	30.5	28.6 to 32.4	30.2	29.3 to 31.1
Monounsaturated fats (g)	38.7	28.8 to 48.6	39.3	36.8 to 41.7	31.3*	26.7 to 35.9	24.9	23.5 to 26.4
% of calories	12.3	10.1 to 14.5	12.6	12.2 to 13.0	12.6	11.6 to 13.5	11.9	11.4 to 12.3
Polyunsaturated fats (g)	16.3	11.7 to 20.9	16.9	15.8 to 18.1	14.3*	11.4 to 17.2	11.2	10.4 to 11.9
% of calories	5.1	4.0 to 6.2	5.5	5.2 to 5.7	5.6	4.9 to 6.4	5.3	5.1 to 5.6
Saturated fats (g)	26.7	21.4 to 32.1	29.9	28.1 to 31.6	23.2	19.3 to 27.0	21.0	19.6 to 22.3
% of calories	9.2	7.4 to 11.0	9.8	9.4 to 10.2	9.3	8.2 to 10.4	10.0	9.6 to 10.4
Linoleic acid (g)	13.0	9.7 to 16.4	13.7	12.8 to 14.6	11.5*	9.2 to 13.8	9.0	8.3 to 9.6
% of calories	4.1	3.3 to 4.9	4.4	4.2 to 4.6	4.5	3.9 to 5.1	4.2	4.0 to 4.4
Linolenic acid (g)	2.7[E]	1.5 to 3.9	2.4	2.2 to 2.6	1.9	1.5 to 2.4	1.5	1.4 to 1.6
% of calories	0.8[E]	0.5 to 1.1	0.8	0.7 to 0.8	0.8	0.6 to 0.9	0.7	0.7 to 0.7
Dietary fibre (g)	17.9	13.2 to 22.5	19.1	18.1 to 20.1	13.5	10.9 to 16.2	13.9	13.1 to 14.6
Sodium (mg)	3,681	2,810 to 4,552	3,884	3,665 to 4,103	3,226*	2,750 to 3,702	2,617	2,481 to 2,753
Caffeine (mg)	222[E]	92 to 352	176	155 to 198	194[E]	129 to 258	144	127 to 162
Vitamin A to retinol activity equivalent (mcg)	546	397 to 696	683	616 to 749	511	357 to 664	531	492 to 570
Vitamin B_6 (mg)	2.0	1.7 to 2.4	2.3	2.2 to 2.4	1.5	1.2 to 1.7	1.5	1.5 to 1.6
Vitamin B_{12} (mcg)	4.3	3.1 to 5.5	5.4	4.7 to 6.1	3.0	2.4 to 3.7	3.4	2.8 to 4.0
Riboflavin (mg)	2.0*	1.7 to 2.3	2.3	2.2 to 2.4	1.8	1.5 to 2.2	1.7	1.6 to 1.7
Thiamine (mg)	1.9	1.5 to 2.4	2.1	2.0 to 2.2	1.5	1.3 to 1.7	1.4	1.3 to 1.5
Niacin (mg)	43.1	35.3 to 50.9	49.7	47.3 to 52.1	34.8	29.5 to 40.1	32.3	30.7 to 33.9
Vitamin C (mg)	168[E]	99 to 237	146	131 to 160	142[E]	95 to 190	126	116 to 136
Calcium (mg)	847*	696 to 998	1,047	983 to 1,111	883	668 to 1,098	826	775 to 877
Cholesterol (mg)	293	226 to 359	348	324 to 372	210	172 to 248	209	195 to 222
Dietary folate equivalent (mcg)	593	400 to 787	565	535 to 596	438	365 to 510	387	368 to 406
Vitamin D (mcg)	5.3	3.9 to 6.6	6.0	5.4 to 6.5	4.6[E]	3.0 to 6.3	4.4	4.0 to 4.8
Folic acid (mcg)	215[E]	101 to 329	177	160 to 193	117	91 to 142	110	103 to 118
Naturally occurring folate (mcg)	252	188 to 315	265	248 to 282	194	135 to 253	199	187 to 211
Total folacin (mcg)	467	348 to 586	448	421 to 474	319	254 to 384	315	300 to 330
Iron (mg)	16.0	12.6 to 19.4	17.3	16.5 to 18.1	12.9	11.0 to 14.9	11.8	11.3 to 12.4
Magnesium (mcg)	353	292 to 414	373	356 to 390	271	226 to 316	275	263 to 288
Water (g)	3,451	2,782 to 4,121	3,157	3,034 to 3,281	2,824	2,405 to 3,244	2,558	2,453 to 2,662
Phosphorus (mg)	1,479	1,270 to 1,688	1,625	1,556 to 1,694	1,230	1,022 to 1,438	1,150	1,099 to 1,201
Potassium (mg)	3,282	2,635 to 3,929	3,445	3,286 to 3,603	2,647	2,136 to 3,159	2,573	2,462 to 2,685
Zinc (mg)	13.0	10.5 to 15.4	14.2	13.5 to 15.0	9.7	8.2 to 11.1	9.3	8.8 to 9.8

* significantly different from corresponding estimate for non-Aboriginal ($p < 0.05$)
[E] coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: Excludes pregnant or breastfeeding women; g = gram; mg = milligram; mcg = microgram.
Source: 2004 Canadian Community Health Survey: Nutrition.

Table C
Average daily nutrient intake, by sex and Aboriginal identity, household population aged 31 to 50, Ontario and western provinces, 2004

	Men				Women			
	Aboriginal (off-reserve)		Non-Aboriginal		Aboriginal (off-reserve)		Non-Aboriginal	
	Average intake	95% confidence interval	Average intake	95% confidence interval	Average intake	95% confidence interval	Average intake	95% confidence interval
Energy (kilocalories)	2,638	2,265 to 3,011	2,444	2,358 to 2,531	1,734	1,462 to 2,007	1,807	1,747 to 1,867
Carbohydrates (g)	317	271 to 364	293	281 to 304	198	170 to 226	222	214 to 230
% of calories	48.0	43.9 to 52.1	47.7	46.7 to 48.8	46.2	43.3 to 49.1	49.1	48.1 to 50.2
Proteins (g)	105	77 to 134	104	99 to 109	72	57 to 86	74	71 to 76
% of calories	14.8	12.2 to 17.3	17.2	16.6 to 17.8	16.9	14.6 to 19.2	16.5	16.0 to 17.0
Fats (g)	95.5	77.5 to 113.6	88.3	83.9 to 92.7	68.6	53.1 to 84.0	67.3	64.0 to 70.7
% of calories	31.1	26.9 to 35.2	31.1	30.3 to 32.0	33.4	31.1 to 35.7	32.0	31.2 to 32.8
Monounsaturated fats (g)	40.0	32.2 to 47.9	36.0	34.1 to 38.0	27.7	21.8 to 33.6	27.0	25.6 to 28.5
% of calories	13.0	11.1 to 15.0	12.6	12.2 to 13.1	13.3	12.2 to 14.4	12.7	12.4 to 13.1
Polyunsaturated fats (g)	17.6	13.1 to 22.1	15.8	14.8 to 16.8	11.1	8.8 to 13.3	12.4	11.7 to 13.1
% of calories	5.6	4.3 to 6.9	5.5	5.3 to 5.7	5.5	4.9 to 6.0	5.8	5.6 to 6.0
Saturated fats (g)	29.9	23.9 to 35.9	27.9	26.4 to 29.4	23.3	16.4 to 30.2	21.4	20.2 to 22.5
% of calories	9.8	8.6 to 10.9	9.9	9.6 to 10.2	11.1	9.8 to 12.4	10.2	9.9 to 10.6
Linoleic acid (g)	14.7	10.7 to 18.7	12.7	11.8 to 13.5	8.8	6.9 to 10.8	9.7	9.2 to 10.2
% of calories	4.7	3.6 to 5.8	4.4	4.2 to 4.6	4.3	3.8 to 4.9	4.6	4.4 to 4.8
Linolenic acid (g)	2.3	1.7 to 2.9	2.2	1.9 to 2.5	1.5	1.2 to 1.9	1.8	1.7 to 2.0
% of calories	0.7	0.5 to 0.9	0.7	0.7 to 0.8	0.8	0.6 to 0.9	0.8	0.8 to 0.9
Dietary fibre (g)	17.7	13.8 to 21.6	19.2	18.2 to 20.2	12.7*	10.2 to 15.3	15.9	15.0 to 16.8
Sodium (mg)	3,880	3,104 to 4,656	3,466	3,297 to 3,634	2,522	2,137 to 2,908	2,742	2,610 to 2,874
Caffeine (mg)	342[E]	223 to 460	296	273 to 319	276	205 to 347	228	210 to 247
Vitamin A to retinol activity equivalent (mcg)	527	383 to 671	651	600 to 703	486*	355 to 616	626	579 to 673
Vitamin B_6 (mg)	2.0	1.7 to 2.3	2.2	2.1 to 2.3	1.5	1.3 to 1.8	1.6	1.6 to 1.7
Vitamin B_{12} (mcg)	4.6	3.2 to 6.1	5.3	4.7 to 5.8	3.6[E]	2.3 to 4.8	3.8	3.2 to 4.3
Riboflavin (mg)	2.1	1.7 to 2.5	2.2	2.1 to 2.3	1.5	1.2 to 1.8	1.7	1.6 to 1.8
Thiamine (mg)	2.2	1.6 to 2.7	2.0	1.9 to 2.1	1.2	1.0 to 1.5	1.4	1.4 to 1.5
Niacin (mg)	49.3	37.3 to 61.4	47.9	45.8 to 50.0	32.5	27.5 to 37.6	34.5	33.3 to 35.6
Vitamin C (mg)	139[E]	62 to 215	124	114 to 134	93	73 to 113	113	106 to 120
Calcium (mg)	769	619 to 919	898	851 to 945	646[E]	369 to 923	796	757 to 835
Cholesterol (mg)	379[E]	239 to 519	338	310 to 366	316[E]	212 to 420	251	233 to 269
Dietary folate equivalent (mcg)	512	432 to 592	513	486 to 539	333*	275 to 391	413	394 to 432
Vitamin D (mcg)	5.4	3.8 to 7.1	5.6	5.1 to 6.1	4.9[E]	2.7 to 7.1	4.7	4.4 to 5.1
Folic acid (mcg)	164[E]	108 to 221	150	139 to 161	77[E]	45 to 110	108	100 to 116
Naturally occurring folate (mcg)	240	188 to 291	256	245 to 268	179*	153 to 206	224	212 to 236
Total folacin (mcg)	410	332 to 488	413	394 to 431	262*	218 to 306	338	323 to 352
Iron (mg)	17.3	13.4 to 21.2	16.3	15.6 to 17.0	10.7	9.0 to 12.3	12.2	11.7 to 12.7
Magnesium (mcg)	348	291 to 406	372	358 to 387	256*	215 to 297	303	293 to 314
Water (g)	3,260	2,875 to 3,645	3,093	2,987 to 3,200	2,943	2,530 to 3,357	2,847	2,737 to 2,956
Phosphorus (mg)	1,538	1,261 to 1,815	1,535	1,470 to 1,600	1,097	848 to 1,346	1,199	1,157 to 1,240
Potassium (mg)	3,514	2,649 to 4,378	3,472	3,341 to 3,604	2,466	2,115 to 2,817	2,816	2,729 to 2,902
Zinc (mg)	15.1[E]	10.1 to 20.0	13.9	13.1 to 14.6	9.4	7.7 to 11.0	9.8	9.4 to 10.2

* significantly different from corresponding estimate for non-Aboriginal ($p < 0.05$)
[E] coefficient of variation 16.6% to 33.3% (interpret with caution)
Note: Excludes pregnant or breastfeeding women; g = gram; mg = milligram; mcg = microgram
Source: 2004 Canadian Community Health Survey: Nutrition.