

Sodium consumption at all ages by Didier Garriguet

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Canadians consume a large amount of sodium. Although some sodium is needed to control blood volume and to help cells function properly,¹ most Canadians consume far more than is necessary, or recommended. Results from the 2004 Canadian Community Health Survey (CCHS)–Nutrition (see *Data source*) indicate that, among people aged 19 to 70, over 85% of men and 60% of women had sodium intakes exceeding the recommended upper

limit beyond which health risks increase (Table 1).

Most sodium is consumed as sodium chloride, usually called “table salt.” In fact, a US study has estimated that 90% of sodium intake comes from sodium chloride.² Processed foods are the main source, accounting for 77% of average daily sodium intake. Another 12% occurs naturally in foods, and salt added during cooking (6%) or at the table (5%) makes up the remainder.²

Recommended sodium intake

The Institute of Medicine (IOM)¹ recommends the following “adequate intakes,” or AIs, per day:

- 1,000 milligrams (mg) for children aged 1 to 3
- 1,200 mg for children aged 4 to 8
- 1,500 mg for people aged 9 to 50
- 1,300 mg for adults aged 51 to 70
- 1,200 mg for seniors over 70 years of age.

The IOM has also established a “tolerable upper intake level,” or UL (see *Definitions* and *Limitations*),

Table 1

Percentage of people with usual sodium intake above the tolerable upper intake level (UL), by age group and sex, household population aged 1 or older, Canada excluding territories, 2004

Age group	% above UL	95% confidence interval	UL
1 to 3	77.1	71.6 to 82.5	1,500
4 to 8	92.7*	88.8 to 96.5	1,900
9 to 13			
Male	96.9	94.7 to 99.1	2,200
Female	83.0†	77.8 to 88.1	2,200
14 to 18			
Male	97.1	95.4 to 98.8	2,300
Female	82.0†	76.8 to 87.2	2,300
19 to 30			
Male	98.8	96.9 to 100	2,300
Female	76.3†	66.5 to 86.2	2,300
31 to 50			
Male	91.7	87.3 to 96.1	2,300
Female	72.1†	66.3 to 78.0	2,300
51 to 70			
Male	85.7	81.5 to 89.9	2,300
Female	62.3†	56.2 to 68.4	2,300
71 or older			
Male	76.9	70.0 to 83.7	2,300
Female	45.1*†	37.6 to 52.6	2,300

* Significantly different from estimate for preceding age group of same sex ($p < 0.05$)

† Significantly different from estimate for males in same age group ($p < 0.05$)

Note: Excludes salt added at the table or while cooking.

Source: 2004 Canadian Community Health Survey - Nutrition

Definitions

Adequate intake (AI) is the recommended average daily intake of a nutrient, based on observation, testing or approximate estimates of the nutritional intake of one or more groups of apparently healthy people who appear to maintain an adequate level of nutrition.

Tolerable upper intake level (UL) represents the highest continuous daily intake of a nutrient that does not appear to carry risks of adverse health effects in most members of a given group, defined by stage of life and sex. The risk of adverse effects increases as intake exceeds the UL.

These reference values were established by Canadian and American scientists, and are part of a comprehensive set of nutrient reference values.³

which ranges from 1,500 mg to 2,200 mg of sodium per day for children and adolescents aged 1 to 13, up to 2,300 mg per day for people aged 14 or older. Consumption exceeding these limits increases the risks of adverse health effects, especially those linked to hypertension.¹

Dietary recall

Information on Canadians' sodium consumption was gathered as part of the 2004 CCHS–Nutrition 24-hour “dietary recall.” Respondents were asked to list everything they ate or drank the day before they were interviewed for the survey (see *The questions*). Information for children younger than 6

was collected from their parents, and interviews for children aged 6 to 11 were conducted with parental help. When parents were unable to provide the details (for example, foods/beverages eaten at daycare or at school), they were asked to get as much information as possible from those who had been in charge of their child(ren). The sodium content of food was taken from Health Canada's Canadian Nutrient File 2001b, Supplement.⁹

Data source

The 2004 Canadian Community Health Survey (CCHS)–Nutrition was designed to collect information about the household population's food and nutrient intake at the national and provincial levels. It excludes members of the regular Canadian Forces, residents of the three territories, people living on Indian reserves, in institutions, or in some remote areas, as well as 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.⁴

A total of 35,107 people completed an initial 24-hour dietary recall. A sub-sample of 10,786 people completed a second recall 3 to 10 days later. Response rates were 76.5% and 72.8%, respectively. A number of invalid and “null” recalls were excluded from the responses, as were records for breastfeeding children and children younger than 1 year of age.

The proportion of the population exceeding the tolerable upper intake level (UL) for sodium was estimated from the data collected during the two interviews using the Software for Intake Distribution program (SIDE).^{5,6}

The bootstrap method, which takes into account the complex survey design, was used to estimate standard errors, coefficients of variation and confidence intervals.^{7,8} The significance level was set at $p < 0.05$.

The questions

This article is based on data from the 24-hour dietary recall component of the 2004 Canadian Community Health Survey–Nutrition. Respondents were asked to list all foods and beverages consumed during the 24 hours before the day of their interview; specifically, from midnight to midnight. Interviewers used the Automated Multi-pass Method,^{10,11} with a five-step approach to help respondents remember what they had had to eat/drink:

- a quick list (respondents reported all items in whatever order they wished)
- questions about specific food categories and frequently forgotten foods
- questions about the time and type of meal
- questions seeking more detailed, precise descriptions of foods/beverages and quantities consumed
- a final review

A sub-sample of the population responded to a second 24-hour recall a few days later to help assess the day-to-day variation in an individual's food/beverage intake.

People who replied “None” when asked “What type of salt do you usually add to your food at the table?” were classified as never *adding salt at the table*. Otherwise, respondents were asked how often they added salt to their food: rarely, occasionally, or very often.

Respondents were asked about certain long-term health conditions that were expected to last or had already lasted six months or more and that had been diagnosed by a health professional. Those who answered “yes” to “Do you have high blood pressure?” were defined as having *hypertension*.

All ages exceed recommended levels

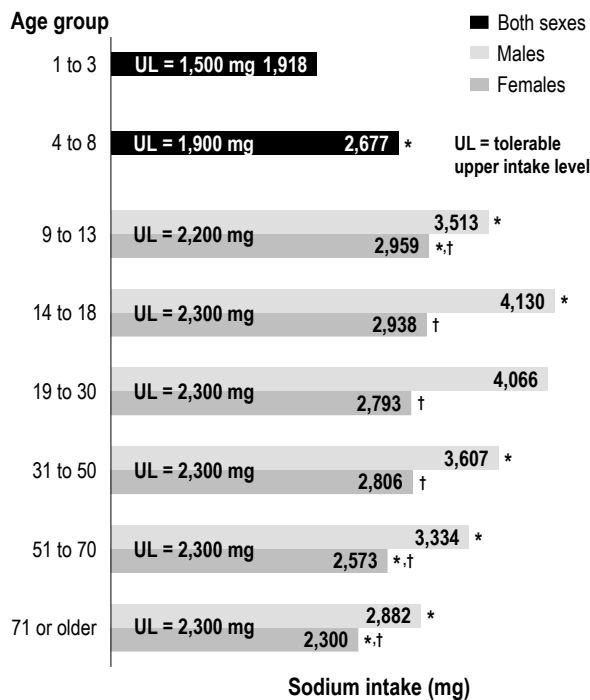
In 2004, regardless of their age, Canadians' average daily intake of sodium was far beyond the recommended UL (Chart 1). Males consumed more sodium than females, with intakes above 4,000 mg/day for those aged 14 to 30. Among people aged 9 to 70, over 85% of males and between 60% to 80% of females had usual sodium intakes that surpassed the recommended UL (Table 1).

Even young children consume too much sodium. Children aged 1 to 3 averaged close to 2,000 mg a day in 2004. In this age group, 77% of children exceeded the recommended daily UL. Among 4-

to 8-year-olds, daily intake averaged 2,700 mg, and 93% had consumed more than the UL. For most of these children, adding salt at the table was not contributing to the high sodium intake levels. According to the CCHS, 69% of 1- to 3-year-olds and 52% of 4- to 8-year-olds "never" added salt to their food.

By age 9, children were beginning to adopt the adult habit of adding salt to their food. From this age onwards, the percentage of people saying they "never" salted their food at the table dropped to around 30% (Table 2).

Chart 1
Average daily sodium intake (milligrams), by age group and sex, household population aged 1 or older, Canada excluding territories, 2004



* Significantly different from estimate for preceding age group of same sex ($p < 0.05$)

† Significantly different from estimate for males in same age group ($p < 0.05$)

Note: Excludes salt added at table or while cooking.

Source: 2005 Canadian Community Health Survey - Nutrition

Table 2
Percentage of people who never add salt to food at the table, by age group and sex, household population aged 1 or older, Canada excluding territories, 2004

Age group	Never add salt to food at table %	95% confidence interval
1 to 3	69	66 to 72
4 to 8	52*	49 to 55
9 to 13		
Male	37*	33 to 40
Female	35*	32 to 38
14 to 18		
Male	27*	24 to 30
Female	29*	26 to 32
19 to 30		
Male	29	26 to 33
Female	28	25 to 31
31 to 50		
Male	31	27 to 34
Female	31	28 to 34
51 to 70		
Male	31	28 to 34
Female	29	27 to 32
71 or older		
Male	31	27 to 34
Female	34*	31 to 38

* Significantly different from estimate for preceding age group of same sex ($p < 0.05$)

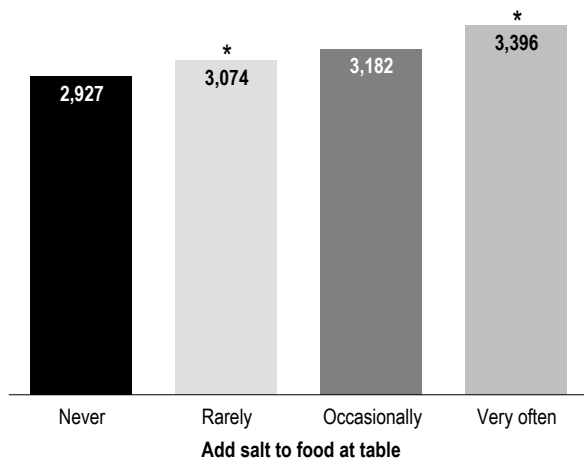
Source: 2004 Canadian Community Health Survey - Nutrition

Salt and more salt

The amount of salt people added to their food was not measured by the CCHS, and it was not included in daily sodium intake. Yet it was the people who were already consuming the highest amounts of

sodium in the foods they ate who reported most frequently (“very often”) adding salt (Chart 2). Respondents who said they “never” added extra salt were consuming much less sodium in a day. Even so, the percentage in this group with levels beyond the recommended UL was almost the same as that for the population as a whole (data not shown).

Chart 2
Average daily sodium intake (milligrams), by frequency of salt added at the table, household population aged 1 or older, Canada excluding territories, 2004



* Significantly different from estimate for preceding category ($p < 0.05$)
 Note: Excludes salt added at table or while cooking.
 Source: 2004 Canadian Community Health Survey - Nutrition

Risk of hypertension

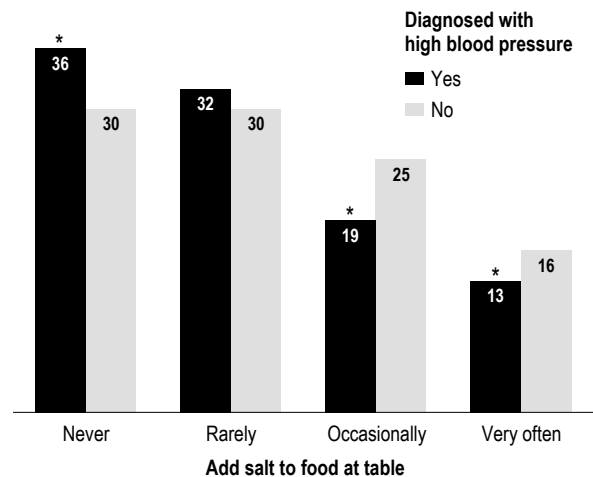
A number of studies have shown a link between sodium intake and hypertension.¹ When sodium intake rises in susceptible individuals, blood pressure tends to increase. Hypertension is usually diagnosed sometime after age 31; in the 2004 CCHS–Nutrition, 6% of 31- to 50-year-olds reported having been diagnosed with high blood pressure. For the 51-to-70 and 70-or-older age groups, the estimates rose to 27% and 47%, respectively.

The results from the CCHS question about adding salt to food at the table suggest that people aged 31 or older who had been diagnosed with hypertension seem to be aware that they should reduce their salt consumption. They were significantly less likely to report salting their food either “occasionally” or “very often” (Chart 3).

Although it may be more visible, salt added at the table actually accounts for only a small amount (5%) of daily sodium intake.² When the source of sodium was less obvious because it was already in the food, the intake of adults with hypertension was similar to that of people without the condition (data not shown). Excluding added salt, the usual sodium intake of adults with hypertension was well above the recommended UL.

Increased sodium intake has been linked with high blood pressure, but increased potassium intake can help reduce blood pressure.¹ However, the CCHS results indicate that Canadians’ potassium intake, regardless of age and sex, is lower than recommended (data not shown).

Chart 3
Percentage of people who reported adding salt to food at the table, by frequency and high blood pressure status, household population aged 31 or older, Canada excluding territories, 2004



* Significantly different from estimate for no diagnosed high blood pressure ($p < 0.05$)
 Source: 2004 Canadian Community Health Survey - Nutrition

Provincial differences

Sodium consumption exceeds the recommended levels throughout the country, but two provinces stand out. In Quebec and British Columbia, the 2004 average daily intake for residents aged 1 or older was more than 3,300 mg versus 3,092 mg for Canadians overall. In Ontario, the only province where average daily sodium consumption was significantly below the Canadian figure, average intake was 2,871 mg (Chart 4)—still above the recommended daily UL. Provincial differences did not change when the sexes were considered separately (data not shown). (The CCHS–Nutrition did not cover the three territories.)

Limitations

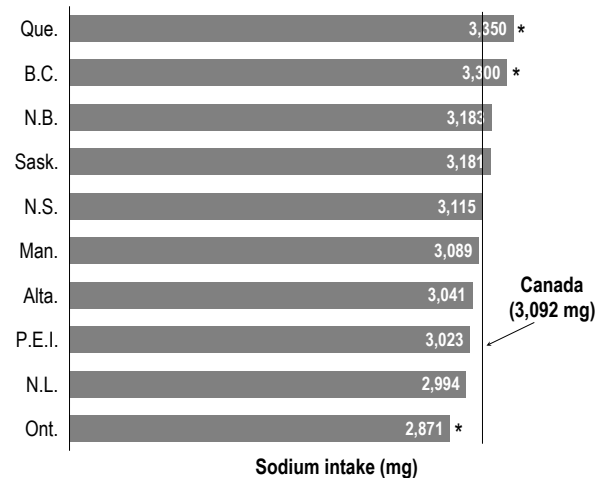
The recommended daily intakes for sodium are based on moderately active people and do not apply to everyone.¹ For example, individuals who participate in intense physical activity need more sodium because of losses through sweat. However, the 2004 Canadian Community Health Survey–Nutrition did not ask respondents about their activity level, so differences in sodium consumption by level of physical activity could not be examined.

The amount of salt added at the table or during cooking is likely less than that reported by a US study, which found that all participants added salt at the table and when cooking.² In addition, the study was conducted in the United States and may differ from the Canadian reality.

The estimated prevalence of hypertension for 2004 was based on self-reports of a diagnosed condition. Some people may have had hypertension but were not yet aware of it, so they would not have changed their salt consumption in response to a diagnosis of hypertension.

Although the salt content of recipes could not be adjusted based on how often salt was added to cooking, there was no difference by hypertension status in the frequency with which salt was added. Moreover, the proportion of sodium intake from salt added during cooking is relatively low,² and only 15% of respondents reported never adding salt when cooking.

Chart 4
Average daily sodium intake (milligrams), by province, household population aged 1 or older, Canada excluding territories, 2004



* Significantly different from estimate for Canada ($p < 0.05$)

Note: Excludes salt added at the table or while cooking.

Source: 2004 Canadian Community Health Survey - Nutrition

The Canadian diet—10 main sources of sodium

Results from the 2004 CCHS–Nutrition indicate that the following 10 groupings of foods/beverages accounted for over half (55%) of all sodium that Canadians consumed:

	% of total sodium intake
Pizza, sandwiches, submarines, hamburgers and hotdogs	19.1
Soups	7.4
Pasta	5.7
Liquid milk and milk-based beverages	4.0
Poultry and poultry dishes	3.8
Potatoes	3.4
Cheese	3.2
Cereals	3.0
Beef	3.0
Sauces	2.9

Slightly below US intake

A comparison of estimates based on the 2004 CCHS and results based on the 2001-2002 National Health and Nutrition Examination Survey (NHANES) in the United States¹² indicates that Canadians consume slightly less sodium than do Americans. Canadian levels were lower for children aged 1 to 8, men aged 31 to 70, and women aged 19 to 30. No Canada-US differences were observed for the other groups (Table 3).

These differences may have been slightly greater if the Canadian and US surveys had made the same adjustments when processing their data. The US approach adjusted the salt content of recipes downward, based on the frequency with which salt is added to foods during cooking, but the CCHS did not do so.

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Table 3

Average daily sodium intake (milligrams), by age group and sex, Canada excluding territories, 2004 and United States, 2001-2002

Age group	Canada (mg)	United States (mg)
1 to 3	1,918*	2,140
4 to 8	2,677*	2,831
9 to 13		
Male	3,513	3,549
Female	2,959	2,806
14 to 18		
Male	4,130	4,086
Female	2,938	2,799
19 to 30		
Male	4,066	4,141
Female	2,793*	3,098
31 to 50		
Male	3,607*	4,252
Female	2,806	3,011
51 to 70		
Male	3,334*	3,645
Female	2,573	2,652
71 or older		
Male	2,882	3,051
Female	2,300	2,404

* Significantly different from estimate for United States ($p < 0.05$)

Note: Excludes salt added at the table or while cooking.

Sources: 2004 Canadian Community Health Survey - Nutrition; 2001-2002 NHANES - What We Eat in America