

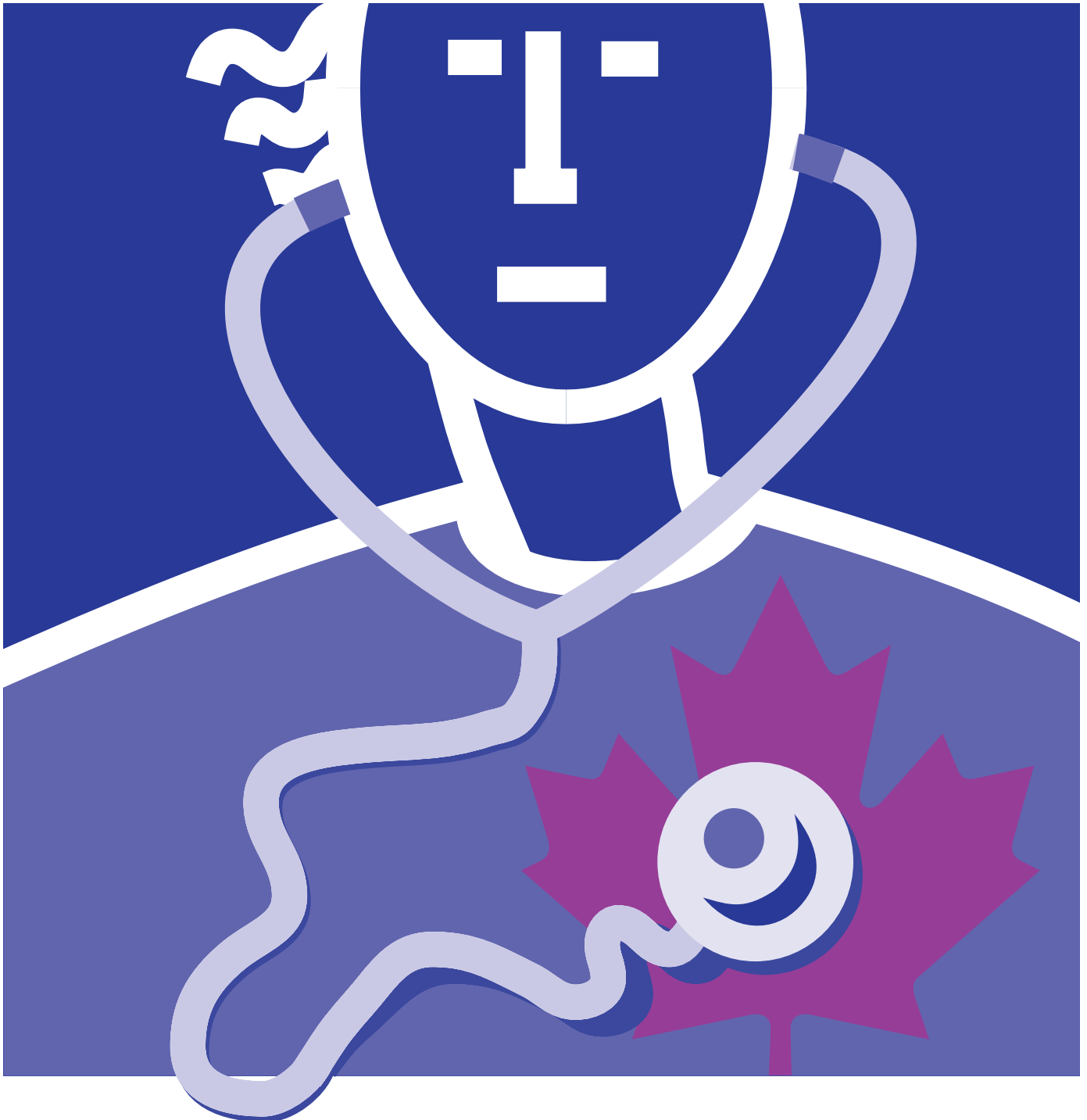


Catalogue no. 82-003-XIE

Health Reports

Vol. 15 No. 3

- Adolescent alcohol and drug use
- Proxy reporting
- Wheelchairs
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Alcohol and drug use in early adolescence

Tina Hotton and Dave Haans

Abstract

Objectives

This analysis presents the prevalence of substance use among young adolescents. The extent to which factors such as peer behaviour, parenting practices and school commitment and achievement are associated with drinking to intoxication and other drug use is investigated.

Data source

The data are from the 1998/99 National Longitudinal Survey of Children and Youth. Analysis is based on a cross-sectional file from 4,296 respondents aged 12 to 15.

Analytical techniques

Prevalence estimates for alcohol and drug use were calculated by sex. Logistic regression models were fitted to estimate the odds of drinking to intoxication and drug use, adjusted for socio-demographic factors, peer and parent substance use, parenting practices, school commitment/attachment, emotional health and religious attendance.

Main results

In general, drinking to intoxication and drug use were more common among 14- and 15-year-olds than among 12- and 13-year-olds. The odds of drinking to intoxication and drug use were highest among adolescents whose friends used alcohol or drugs or were often in trouble, who reported low commitment to school, or whose parents had a hostile and ineffective parenting style.

Key words

adolescent behaviour, alcoholic intoxication, marijuana

Authors

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Experimenting with alcohol and drugs is fairly common among adolescents. Young people cite many reasons for such behaviour, including peer pressure, curiosity, fun and availability; they may also use alcohol and/or drugs to deal with problems or negative feelings.^{1,2}

During the 1990s, adolescents seemed to become more accepting of drug and alcohol use. The Ontario Student Drug Use Survey found that between 1991 and 2001, opposition to regularly smoking marijuana fell from 61% to 42%.³ At the same time, the percentage who strongly disapproved of using cocaine “once or twice” dropped from 55% to 41%.³ As attitudes were changing, rates of alcohol and drug use, as well as heavy drinking, escalated among Ontario students.³ Similar increases have been documented in the Atlantic provinces,⁴ and outside Canada.⁵⁻⁷ Such changes may also be reflected in Youth Court statistics, which show sharp increases in the number of drug possession and trafficking cases between 1992/93 and 2001/02.⁸

Definitions

In the multivariate analysis of data from the National Longitudinal Survey of Children and Youth (NLSCY), *age* was used as a continuous variable with a range of 12 to 15 years.

Measures of peer influence were based on youth reports of *peer substance use*, as well as parental reports of the frequency with which their child associates with *friends who are frequently in trouble* (often/sometimes or seldom/never). Adolescents were asked whether none, a few, most, or all of their friends drank alcohol. Responses were collapsed into two categories: none/a few and most/all. Peer drug use was measured by asking adolescents if their friends had tried marijuana, other drugs such as glue, solvents (paint thinner, gasoline, etc.), heroin, speed, PCP, crack/cocaine, LSD, acid, ecstasy, etc. Responses were categorized as none/a few or most/all.

Parents were asked if *drinking is a source of family tension* (yes/no), and the person most knowledgeable (PMK) about the child—usually the mother—was asked if she/he *consumes five or more drinks on an average occasion* (those who did were compared with those who drank less).

Statistics Canada establishes *low-income cut-offs* (LICOs), which are thresholds calculated for different geographic and family-size categories using the Consumer Price Index. For this study, the LICO calculated in 1996 was used to determine if an adolescent's family income placed him or her below or at/above the low-income cut-off.

Urban/rural *residence* was treated as a dichotomous variable.

Several aspects of the parent-child relationship were examined. *Hostile parenting* was based on adolescents' answers to questions "that best describe the way your parents (or step-parents, foster parents or guardians) in general have acted toward you during the last six months," specifically, how often do their parents:

- "Nag you about little things?"
- "Enforce a rule or do not enforce a rule depending on their mood?"
- "Hit you or threaten to do so?"
- "Get angry and yell at you?"

Responses ranged from 0 (never) to 4 (always). The total scores could range from a low (0) to a high (16) level of parental hostility.

Parental supervision was measured using the *parental monitoring* scale. Adolescent respondents were asked four questions about their parents' knowledge of their whereabouts and activities; specifically, how often their parents:

- "Want to know exactly where you are and what you are doing."
- "Tell you what time to be home when you go out."

- "Find out about your misbehaviour."
- "Take interest in where you are going and who you are with."

Response options ranged from 0 (never) to 4 (often). Total scores could range from a low (0) to a high (16) level of parental monitoring.

Parent-child cohesion was based on eight items describing how often each week the parent and youth spent time together: eating; watching television; playing sports; playing cards or games; having discussions; doing family projects or chores; having family outings; and visiting relatives. Response options ranged from 0 (every day) to 5 (rarely or never), with the resulting score from the combined items ranging from a low (0) to a high (40) level of cohesion (reverse scored).

Family structure was collapsed into three groups: single-, step- or two-parent (including biological and adoptive parents).

The measure of school achievement was based on the adolescents' self-reported *grades*. Adolescents were asked, "How well do you think you are doing in your school work?" Responses were collapsed into three categories: poor/very poor; average; and good/very good.

School commitment comprises seven items describing the adolescent's attitudes to school: the importance of doing well academically; making new friends; participating in activities; showing up for class on time; learning new things; expressing opinions; and participating in student council. Response options ranged from 0 (very important) to 3 (not important at all). The total score could range from a low (0) to a high (21) commitment to school (reverse scored).

Emotional problems/Anxiety was assessed using the adolescent self-reported emotional disorder/distress scale. Respondents were asked how often they were:

- unhappy, sad or depressed
- not as happy as other people their age
- too fearful or anxious
- nervous, high strung or tense.

Adolescents were also asked how often they worry a lot; cry a lot; feel miserable, unhappy, tearful or distressed; or have trouble enjoying themselves. Response options ranged from 0 (never or not true) to 3 (often or very true). Total scores could range from a low (0) to a high (16) level of emotional problems/anxiety.

Religious attendance (services or meetings) was collapsed into three groups: weekly; monthly to a few times a year; and once a year or less.

Most health consequences of alcohol and drug use typically appear later in life, but early initiation can lead to earlier problems. A previous study found that within seven years of the onset of drug use, those who had started using drugs earlier in adolescence reported more health problems than those whose use began later.⁹ Earlier alcohol use has also been found to lead to more alcohol-related problems.^{10,11}

This analysis, based on cross-sectional data from cycle 3 of the National Longitudinal Survey of Children and Youth (NLSCY), investigates the prevalence of, and factors associated with, substance use among 12- to 15-year-olds in 1998/99 (see *Methods* and *Limitations*). The extent to which factors such as peer influences, parent alcohol use, parenting practices and commitment to school are related to drinking to intoxication and drug use is explored (see *Definitions* and *Alcohol and drug use*).

Prevalence of alcohol and drug use

In 1998/99, approximately 4 in 10 children aged 12 to 15 (42%) reported that they had consumed at least “one drink” of alcohol at some point in the past (that is, one bottle of beer or wine cooler, one

glass of wine, or one shot of liquor) (Table 1). While 17% of 12-year-olds said that they had had at least one alcoholic beverage, by age 15, the figure was 66%.

Drinking to intoxication was also common, as 22% of adolescents said that they had been drunk at least once. Again, among 12-year-olds, the proportion was low: 4%. At ages 14 and 15, the proportions who had been intoxicated were 29% and 44%, respectively.

Marijuana use, too, was fairly prevalent: 19% of 12- to 15-year-olds reported having used a cannabis product. As with alcohol consumption, use increased with age, from 3% of 12-year-olds to 38% of 15-year-olds.

Twelve- and thirteen-year-olds were not asked about hallucinogens, but 11% of teens aged 14 or 15 reported having tried them. Another 4% had used prescription drugs non-medically, and 4% had tried other drugs, such as ecstasy or cocaine.

Substance use varied somewhat by sex. Although boys were more likely to report having had a drink of alcohol, the proportions of girls who reported getting intoxicated or having used drugs were slightly higher than those for boys.

Table 1
Prevalence of substance use, by age and sex, household population aged 12 to 15, Canada excluding territories, 1998/99

At some time, tried:	Total	Age				Sex	
		12	13	14	15	Boys	Girls
	%	%				%	
Alcohol							
At least one drink	42	17	29*	53*	66*	44 [†]	39
Intoxicated	22	4 ^{E1}	10*	29*	44*	20 [†]	24
Marijuana	19	3 ^{E1}	9*	25*	38*	20	19
Hallucinogens	11	...	...	9	13	10	12
Glue-sniffing	2	1 ^{E2}	3 ^{E2}	3 ^{E1}	2 ^{E2}	2 ^{E1}	2 ^{E1}
Non-medical use of prescription drugs	4	...	...	4 ^{E1}	4 ^{E1}	3 ^{E2}	5 ^{E1}
Other drugs[‡]	4 ^{E1}	...	...	3 ^{E2}	5 ^{E1}	3 ^{1E2}	5 ^{E1}

Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

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

[†] Significantly different from corresponding estimate for girls ($p < 0.05$)

[‡] For example, heroin, speed, PCP, crack/cocaine

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

... Not applicable

Methods

Data source

This analysis is based on cross-sectional data from the 1998/99 National Longitudinal Survey of Children and Youth (NLSCY), conducted every two years by Statistics Canada and Human Resources Development Canada.

The NLSCY is based on in-depth interviews with the “person most knowledgeable” about the child (the PMK—usually the mother), the PMK’s spouse, the child, and in some cases, the child’s teacher and principal.

The cycle 3 sample contains 32,158 children aged 0 to 15, living in the 10 provinces. This analysis focuses on a subgroup of 4,296 aged 12 to 15 in 1998/99 from the cross-sectional file (Appendix Table A), weighted to represent about 1.7 million. These adolescents comprise the oldest age cohort in cycle 3, and are the only respondents to have been asked detailed questions about their use of alcohol and drugs (see *Definitions* and Appendix Tables B and C). Data from the PMK of these adolescents are also used in the analysis.

Analytical techniques

The prevalence of lifetime alcohol and drug use was estimated for boys and girls aged 12 to 15. Among those who reported using alcohol or illicit drugs at some point, the mean age of first use was established, as well as use in relation to friends’ use of alcohol and illicit drugs. Logistic regression models were fitted to estimate the odds of drinking to intoxication and using drugs in the past 12 months, while adjusting for factors known to influence the likelihood of substance use: peer substance use and behaviour, parental practices, quality of the parent–child relationship, parental alcohol abuse, school attachment and achievement, emotional health of the adolescent, religiosity, and socio-demographic factors (age and sex of the adolescent, family structure, household income, and urban

or rural residence). The selection of variables was based on a review of the literature and availability on the NLSCY.

Records with missing data for any variable used in the logistic regression analysis were excluded. This reduced the sample size for analysis from 4,296 to 2,745 for the final alcohol model and from 4,296 to 2,907 for the final drug use model (see *Limitations*). Imputation was used to address the problem of partial data, or cases where respondents answered only some of the questions when the variable being measured was a scale or where a group of questions characterized a single concept. For example, the emotional problems/anxiety scale comprises eight questions. To avoid losing partial responses, scores were calculated based on the mean for the answers that were provided, but only if at least 50% of the questions had been answered. This reduced the non-response rate by up to 5% without altering the results for models fitted in this study. This method of imputation was applied to the school commitment, emotional problems/anxiety, parental monitoring, and hostile parenting scales.

Imputation was also employed for the prevalence of substance abuse. If a respondent reported never having used alcohol or various drugs or failed to answer this question, but later in the interview reported having used alcohol or drugs in the past 12 months, this positive response was imputed for such individuals in the lifetime prevalence estimates.

The data were weighted to represent the Canadian population aged 12 to 15 in 1998/99. The weights used account for unequal probabilities of sample selection, including non-response due to sample attrition. The NLSCY weights were revised in September 2003; this analysis was based on the weights prior to those revisions. To account for the complex sample design, the bootstrap technique was used to estimate coefficients of variation and confidence intervals, and to test for statistical significance of differences.¹²⁻¹⁴ A significance level of $p < 0.05$ was established.

Average age at first use

The average age at which adolescents reported having had their first drink was 12.4 years (Table 2). Boys were slightly younger than girls when they had alcohol for the first time: 12.3 versus 12.5 years. For youth who reported having been drunk, the average age of first-time intoxication was 13.2.

Among 12- to 15-year-olds who had tried drugs, glue-sniffing began at an average age of just over 12. For other drugs, including marijuana and hallucinogens, average age at first use was older—ranging from 13.1 to 13.8.

Table 2
Average age at first use, by substance and sex, household population aged 12 to 15 who reported substance use, Canada excluding territories, 1998/99

	Both sexes	Boys	Girls
Average age in years			
Alcohol			
At least one drink	12.4	12.3*	12.5
Intoxicated	13.2	13.2	13.2
Marijuana	13.1	13.2	13.0
Hallucinogens	13.7	13.8	13.6
Glue-sniffing	12.3	12.3	12.3
Non-medical use of prescription drugs	13.4	13.4	13.4
Other drugs [†]	13.8	13.1*	14.2

Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

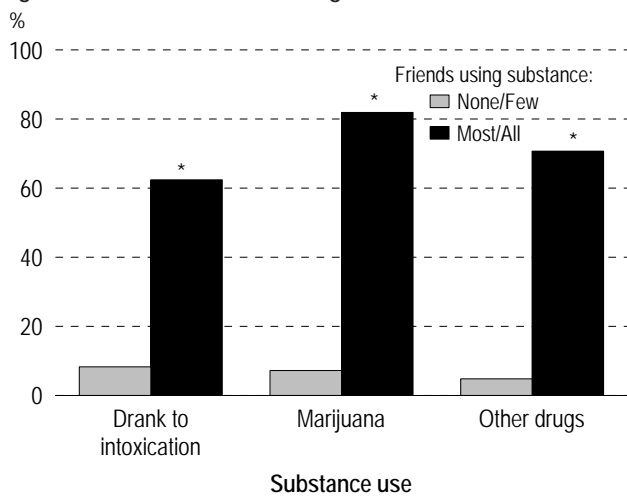
[†] For example, heroin, speed, PCP, crack/cocaine

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

Adolescents and peers

A majority of adolescents who reported that most or all of their friends used alcohol, marijuana or other drugs had used those substances themselves. When a few, or none, of their friends drank or used drugs, adolescents were far less likely to have been drunk or to have used drugs.

Chart 1
Percentage reporting intoxication, marijuana or other drug use in past year, by peers' substance use, household population aged 12 to 15, Canada excluding territories, 1998/99



Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

* Significantly different from value for "None/Few" ($p < 0.05$)

About 6 in 10 (62%) adolescents reported drinking to intoxication in the past year if most or all of their friends used alcohol, while only 8% of those with few or no friends who used alcohol reported being drunk in the past year (Chart 1).

Similar patterns were observed among adolescents whose peers used marijuana or other drugs: 82% used marijuana in the past year if most or all of their friends had done the same, compared with 7% with few or no marijuana-using friends.

Just over 7 in 10 (71%) adolescents reported other drug use in the past year if most or all of their friends used other drugs, while about 5% of those with few or no other drug-using friends had done so.

Alcohol and drug use

For this analysis of data from the 1998/99 National Longitudinal Survey of Children and Youth, *alcohol use* was based on responses to: "Have you ever had a drink of alcohol?" Respondents were told that a drink was one bottle or can of beer or a glass of draft, one glass of wine or a wine cooler, or one straight or mixed drink with one and a half ounces of hard liquor. Youth were asked if they had ever been *intoxicated*, at what age, and if they had been intoxicated in the past 12 months.

For *drug use*, youth were asked if they had ever tried drugs, how old they were when they first did so, and about use in the past year. Questions differed, depending on the child's age. The 12- and 13-year-olds were asked, "In the last 12 months, how often did you do: marijuana and cannabis products (joint, pot, grass, hash); glue or solvents (paint thinner, gasoline, etc.); or other drugs (heroin, speed, PCP, crack/cocaine, LSD, acid, ecstasy, etc.)?" Questions for 14- and 15-year-olds were broader: "In the last 12 months, how often did you do: marijuana and cannabis products (joint, pot, grass, hash); glue or solvents (paint thinner, gasoline, etc.); hallucinogens (LSD, acid, magic mushrooms, 'mesc' or PCP ['angel dust,' etc.]); drugs without a prescription or advice from a doctor (downers [seconal, Amytal, etc.], stimulants ['uppers,' 'Beans,' 'Christmas trees,' 'Black Beauties,' diet pills, etc.]; tranquilizers [Valium, Librium, Serax, '5/10s,' etc.]); or other drugs (like crack, cocaine, speed or ecstasy)?" Adolescents who had used any of these drugs in the past 12 months were compared with those who had not.

Peer influence persists

The influence of peer substance use is obviously strong (Appendix Table B), but it does not occur in isolation. This analysis also took into account several other factors that may be associated with adolescents' early use of alcohol or drugs (see *Methods*). Age, sex, peer behaviour, parental drinking, the parent-child relationship, family situation, school performance and commitment, emotional problems and religiosity were considered, along with socio-economic variables (household income, urban/rural residence and family structure).

The frequency with which the adolescent's friends engaged in substance use or were in trouble were important risk factors, even when the other potential confounders were taken into account (Table 3). Adolescents who reported that all or most of their friends had used alcohol had odds of having been intoxicated in the past year that were nearly 11 times as high as those with fewer friends who used alcohol. And the odds of using drugs were strikingly higher among youth who reported that all or most of their friends had used drugs. The odds of being drunk and using drugs were also higher—more than two times—among youth whose friends were frequently in trouble.

These findings reiterate the often-found strong relationship between peer and individual substance use. However, these results must be interpreted cautiously. In this, as in most studies of adolescent and peer drug use, the respondents reported on the perceived behaviour of their friends. This can be problematic because adolescents tend to project their own behaviours onto others, and this could be a large part of the observed relationship between individual and peer substance use.¹⁵

Further, when examining data from one point in time, it is impossible to determine a causal direction between individual and peer substance use. Although friendships may provide opportunities to learn through imitation and to reinforce behaviour, it could also be that adolescents seek friends with similar attitudes toward alcohol, drugs and “getting into trouble.” Nevertheless, the findings about peer influence are consistent with those of previous research.^{16,17}

Table 3
Adjusted odds ratios relating selected characteristics to reported intoxication and drug use, household population aged 12 to 15, Canada excluding territories, 1998/99

	Drank to intoxication		Used drugs	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Age [†]	2.12*	1.78, 2.52	1.74*	1.47, 2.05
Sex				
Boys [‡]	1.00	...	1.00	...
Girls	1.23	0.82, 1.84	0.77	0.54, 1.11
Peer substance use				
All/Most friends use alcohol/drugs	10.82*	6.93, 16.90	32.96*	21.62, 50.24
None/A few friends use alcohol/drugs [‡]	1.00	...	1.00	...
PMK reports child's friends frequently in trouble				
Yes	2.28*	1.41, 3.70	2.27*	1.39, 3.70
No [‡]	1.00	...	1.00	...
Drinking a source of family tension				
Yes	0.92	0.34, 2.51	1.44	0.79, 2.61
No [‡]	1.00	...	1.00	...
PMK consumes 5+ drinks on average				
Yes	1.99	0.97, 4.06	1.51	0.64, 3.52
No [‡]	1.00	...	1.00	...
Hostile parenting [†]	1.11*	1.03, 1.19	1.09*	1.02, 1.16
Parental monitoring [†]	0.99	0.93, 1.05	1.01	0.95, 1.08
Parent-child cohesion [†]	0.97	0.93, 1.01	0.98	0.95, 1.02
Grades				
Poor/Very poor	2.35*	1.21, 4.54	1.33	0.50, 3.50
Average	1.11	0.71, 1.73	0.94	0.67, 1.33
Good/Very good [‡]	1.00	...	1.00	...
School commitment [†]	0.93*	0.87, 0.99	0.96	0.90, 1.02
Emotional problems/Anxiety [†]	0.93*	0.87, 1.00	1.05	0.98, 1.12
Religious attendance				
Weekly	0.61*	0.39, 0.96	1.16	0.69, 1.94
Monthly/A few times a year	0.80	0.52, 1.24	1.03	0.68, 1.58
Once a year or less [‡]	1.00	...	1.00	...
Household income				
Below low-income cut-off	1.03	0.59, 1.79	1.45	0.86, 2.46
At/Above low-income cut-off [‡]	1.00	...	1.00	...
Residence				
Urban	0.79	0.52, 1.19	0.94	0.60, 1.47
Rural [‡]	1.00	...	1.00	...
Family structure				
Single-parent	1.05	0.61, 1.79	1.08	0.65, 1.77
Step-parent	1.18	0.60, 2.34	2.01*	1.06, 3.80
Two-parent [‡]	1.00	...	1.00	...

Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

[†] Continuous variable

[‡] Reference category

* Significantly different from reference category ($p < 0.05$)

Parental drinking

Researchers have clearly demonstrated the connection between substance use by youth and parental and peer attitudes towards drug and alcohol abuse, as well as parental and peer drinking and drug use patterns.¹⁸⁻²¹ In this study, peer influences emerged as a stronger risk factor for adolescent substance use than parental drinking. Adolescents in families where drinking was a source of tension were no more likely to drink to intoxication or use other drugs than their counterparts in families not affected by this situation (Table 3, Appendix Table B). Similarly, youth in families where the parent (usually the mother), reported consuming an average of five or more drinks per occasion were no more likely to report being drunk or using drugs than were adolescents whose parent consumed less than five drinks on average. Information about parental drug use is not available in the NLSCY (see *Limitations*).

Age, parenting style and family structure

Beyond the strong relationships with peer substance use and behaviour, several other factors were found to be associated with substance use among 12- to 15-year-olds. Not surprisingly, the odds of drinking to intoxication and drug use rose considerably with age. The odds of being drunk in the past year increased by a factor of 2.1 for every year of age; the odds for drug use, by 1.7 (Table 3).

Adolescent respondents in the NLSCY were asked several questions about their relationship with their parents. Three aspects were considered in this analysis: hostile parenting, parental monitoring and parent-child cohesion (see *Definitions*). When the influences of other factors were controlled, only youth whose parents had a negative or hostile parenting style were found to have significantly high odds of drinking to intoxication or drug use. That is, parent-child interactions were often characterized by anger, threats and inconsistent enforcement of rules. The odds of being drunk and engaging in drug use increased by a factor of approximately 1.1 for every point increase in the hostile parenting scale. The causal direction of the relationship between hostile parenting and substance use cannot be

inferred, however. It is possible that the parents' way of dealing with the adolescent may have changed following problem behaviours such as alcohol or drug use.

Compared with adolescents in two-parent families, those in step-parent families were more likely to have used drugs. The odds of drug use were almost double for adolescents in step-parent families than in other two-parent families. This is consistent with US research, which found that living in a step-parent family increased the risk of early delinquent behaviour.²²

No difference by sex emerged, and neither household income nor urban/rural locale were associated with youth intoxication or drug use.

School performance and commitment

A youth's self-reported performance in and commitment to school were associated with drinking to intoxication and drug use, findings similar to those of previous studies.^{23,24} Even when other possibly confounding factors were taken into account, the odds of drinking to intoxication in the past year were more than two times higher for youth who reported doing poorly or very poorly in school, compared with those who had good or very good grades (Table 3). As well, those with a stronger commitment to school were less likely to report being intoxicated than those with a weaker attachment. Neither school-related measure was associated with early drug use.

Life stressors and protective factors

Other research has found that high-risk behaviours may occur in the context of stress, as youth seek comfort, relief, or escape through drug use.²⁵⁻²⁷ In this study, by contrast, when other influences in the adolescents' life were considered, no relationship between drug use and emotional problems emerged. And the odds of being drunk in the past year were actually lower for adolescents reporting emotional problems (Table 3). This association is opposite to that suggested by the research literature. It may be that life stressors are stronger risk factors for developing substance abuse problems later in life than for early initiation and experimentation.

Limitations

The sample of 12- to 15-year-olds from the National Longitudinal Survey of Children and Youth (NLSCY) used for this analysis contained too few records to distinguish between one-time experimenters and regular users. Frequent drug use or the quantity used per occasion may be a better indication of serious problems than reports of any drug use in the past 12 months.

As with all longitudinal surveys, the NLSCY has lost sample through attrition. The level of non-response has gradually increased, particularly for the youth questionnaire: approximately 5% of children aged 10 to 13 in the cycle 2 longitudinal sample did not complete the questionnaire in cycle 3. It is possible that those who dropped out of the survey may be at higher risk for family, school and substance use problems. As well, the most vulnerable population, street youth, would not be tracked in the NLSCY. In addition, although respondents were assured anonymity and confidentiality, the response rate for the questions about alcohol and drug use was around 80%. Consequently, the potential for non-response bias exists.

Although the NLSCY is longitudinal, this analysis is cross-sectional because a number of important measures, such as peer influence and school commitment, were available only for 1998/99. Therefore, it is not possible to draw conclusions about the causal order of these relationships. Many factors—school commitment, school achievement, family relations and emotional anxiety—may have a reciprocal relationship with substance use. For example, while having a parent with a generally negative parenting approach may be associated with early substance use, getting caught with alcohol or drugs may exacerbate the tension.

Information about parental drug use is not available from the NLSCY, but parents were asked if drinking was a source of family tension, and the person most knowledgeable (PMK) about the child—usually the mother—was asked if she/he consumed five or more drinks on an average occasion. The PMK was also asked the same question about her/his current spouse, but this was not included in the final model, as data were available only for two-parent families.

Drug use by older siblings may demystify and legitimize substance use and inspire earlier initiation. A recent study found that having older siblings who smoke increases the odds of adolescent tobacco use.²⁸ Similarly, a recent Ontario study found strong between-sibling associations for tobacco, alcohol and marijuana use.²⁹ However, data on alcohol and drug use by siblings are not available in the NLSCY.

The validity of self-reported data is unknown. Self-report of behaviours that are influenced by social norms and perceptions may be problematic. For example, youth may exaggerate their alcohol or drug use to show bravado, or they may underreport, because of embarrassment or fear of repercussions. Because the phrase “get drunk” was not explained to respondents, it is possible that this aspect of alcohol use may have been misreported.

Attendance at religious services was found to be protective against youth intoxication. The odds of being drunk in the past year were considerably lower among young people who attended religious services weekly than among those who did so once a year or less. Although other studies have suggested that involvement in religious activities is protective against drug use,^{30,31} regular attendance at religious services did not translate into a lower odds of drug use.

Concluding remarks

According to data from the 1998/99 National Longitudinal Survey of Children and Youth, the main factors associated with early alcohol and drug use among adolescents involve friends, parents, and school. The odds of drinking to intoxication and other drug use were highest among 12- to 15-year-olds who reported that all or most of their friends engaged in the use of the same intoxicants, whose friends were often in trouble, or who were subject to a hostile parenting style.

This study adds to evidence suggesting that peer behaviour is closely related to an adolescent's own alcohol and drug use. While these results echo other research, the data must be interpreted cautiously as the actual level of peer use is unknown. It is also not possible to determine whether “birds of a feather flock together” or a peer-influence effect is contributing to the strength of these findings.

One aspect of the parent-child relationship was strongly associated with both alcohol and other drug use. If interactions were characterized by negative reinforcement and inconsistent enforcement of rules, the odds of adolescents getting drunk and using drugs were higher. Parental monitoring, however, was not associated with drinking to intoxication or drug use, when the effects of other influences were taken into account.

Self-reported performance in school and school commitment were important risk factors for drinking to intoxication, but not for drug use. A higher level of school commitment and better self-reported grades were related to lower odds of drinking to intoxication among adolescents. The same relationship was not found for drug use when other factors were taken into consideration.

Following the NLSCY respondents as they move through high school and beyond may reveal more about the relationships between certain risk factors

and adolescent alcohol and drug use, as well as the long-term impact of early substance use on later substance use patterns and overall health. ●

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Appendix

Table A
Distribution of selected characteristics, by sex, household population aged 12 to 15, Canada, 1998/99

	Both sexes			Boys			Girls		
	Sample size	Estimated population	%	Sample size	Estimated population	%	Sample size	Estimated population	%
Total	4,296	1,660	100.0	2,155	855	100.0	2,141	805	100.0
Age of child									
12	1,259	460	27.7	635	239	27.9	624	221	27.4
13	872	323	19.5	428	163	19.0	444	160	19.9
14	1,256	479	28.8	629	249	29.2	627	229	28.5
15	909	399	24.0	463	205	23.9	446	195	24.2
Drunk in past year									
Yes	624	232	14.0	274	108	12.7	350	124	15.4
No	2,819	1,091	65.7	1,448	563	65.9	1,371	527	65.5
Missing	853	338	20.3	433	184	21.5	420	154	19.1
Used drugs in past year									
Yes	633	251	15.1	302	128	15.0	331	123	15.2
No	2,924	1,107	66.7	1,465	558	65.2	1,459	549	68.3
Missing	739	302	18.2	388	169	19.8	351	133	16.5
Peer alcohol use									
All/Most friends use alcohol	761	279	16.8	335	127	14.9	426	152	18.8
None/A few friends use alcohol†	2,811	1,086	65.4	1,434	561	65.6	1,377	524	65.2
Missing	724	296	17.8	386	167	19.6	338	129	16.0
Peer drug use									
All/Most friends use drugs	468	196	11.8	220	93	10.9	248	103	12.8
None/A few friends use drugs†	3,011	1,137	68.5	1,500	581	67.9	1,511	556	69.1
Missing	817	327	19.7	435	181	21.2	382	146	18.2
PMK reports child's friends frequently in trouble									
Often/Sometimes	528	194	11.7	287	114	13.3	241	80	9.9
Seldom/Never	3,424	1,320	79.5	1,701	668	78.1	1,723	652	81.0
Missing	344	146	8.8	167	74	8.6	177	73	9.1
Drinking a source of family tension									
Yes	216	80	4.8	109	44	5.1	107	36	4.5
No†	3,967	1,531	92.2	1,995	783	91.5	1,972	748	93.0
Missing	113	49 ^{E1}	3.0	51	29 ^{E2}	3.4	62	21 ^{E1}	2.6
PMK consumes 5+ drinks on average									
Yes	197	52	3.1	112	33	3.9	85	19	2.3
No†	3,974	1,557	93.7	1,987	796	93.0	1,987	761	94.5
Missing	125	52 ^{E1}	3.1	56	27 ^{E2}	3.1	69	25 ^{E1}	3.1
Household income									
Below low-income cut-off	610	245	14.8	312	116	13.6	298	129	16.0
At/Above low-income cut-off†	3,609	1,379	83.1	1,799	715	83.5	1,810	665	82.6
Missing	77	36 ^{E1}	2.2	44	25 ^{E1}	2.9	33	11 ^{E1}	1.4
Residence									
Urban	3,200	1,398	84.2	1,598	712	83.3	1,602	685	85.1
Rural†	1,054	238	14.4	530	123	14.4	524	115	14.3
Missing	42	25 ^{E1}	1.5	27	20 ^{E2}	2.3	15	5 ^{E2}	0.6
Hostile parenting scale									
0-16	3,548	1,352	81.4	1,765	685	80.1	1,783	667	82.9
Missing	748	308	18.6	390	170	19.9	358	138	17.1
Parental monitoring scale									
0-16	3,551	1,352	81.5	1,768	685	80.1	1,783	667	82.9
Missing	745	308	18.6	387	170	19.9	358	138	17.1
Parent-child cohesion scale									
0-40	3,986	1,531	92.2	2,003	786	91.9	1,983	744	92.4
Missing	310	130	7.8	152	69	8.1	158	61	7.6
Family structure									
Single parent	842	329	19.8	420	167	19.5	422	162	20.1
Step-parent	374	141	8.5	183	66	7.7	191	75	9.3
Two-parent†	3,080	1,191	71.7	1,552	623	72.8	1,528	568	70.6
Grades									
Poor/Very poor	175	58	3.5	98	34	4.0	77	24 ^{E1}	3.0
Average	1,074	396	23.8	580	221	25.8	494	175	21.7
Good/Very good†	2,324	907	54.7	1,101	432	50.5	1,223	476	59.1
Missing	723	299	18.0	376	169	19.8	347	130	16.1
School commitment scale									
0-21	3,610	1,378	83.0	1,799	697	81.4	1,811	682	84.7
Missing	686	282	17.0	356	159	18.6	330	123	15.3
Emotional problems/Anxiety scale									
0-16	3,627	1,389	83.7	1,811	706	82.6	1,816	683	84.8
Missing	669	271	16.3	344	149	17.4	325	122	15.2
Religious attendance									
Weekly	1,060	398	24.0	517	205	24.0	543	193	24.0
Monthly to a few times per year	1,434	522	31.4	728	271	31.7	706	251	31.1
Once per year or less†	1,698	697	42.0	863	356	41.6	835	342	42.5
Missing	104	44 ^{E1}	2.7	47	24 ^{E2}	2.8	57	20 ^{E1}	2.5

Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

Note: Because of rounding, detail may not add to totals

E1 Coefficient of variation between 16.6 and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

† Reference category

Table B
Percentage of youth reporting intoxication and drug use, by selected characteristics, household population aged 12 to 15, Canada excluding territories, 1998/99

	In past year:	
	Drank to intoxication	Used drugs
	%	%
Age group		
12-13	4.3*	6.0*
14-15 [†]	30.2	29.3
Sex		
Boys	16.1	18.7
Girls [†]	19.0	18.3
Peer substance use		
All/Most friends use alcohol/drugs	62.4*	81.2*
None/A few friends use alcohol/drugs	8.3	7.9
PMK reports child's friends frequently in trouble		
Often/Sometimes	30.1*	38.1*
Seldom/Never [†]	15.0	14.7
Drinking a source of family tension		
Yes	23.9 ^{E1}	26.8 ^{E1}
No [†]	17.3	18.0
PMK consumes 5+ drinks on average		
Yes	25.0 ^{E1}	23.7 ^{E1}
No [†]	17.3	18.4
Grades		
Poor/Very poor	40.0*	42.3*
Average	22.6*	22.9*
Good/Very good [†]	14.8	15.2
Religious attendance (%)		
Weekly	11.3*	12.3*
Monthly/A few times a year	17.2	18.3
Once a year/Never [†]	21.7	22.4
Household income		
Below low-income cut-off	17.0	20.8
At/Above low-income cut-off [†]	17.8	18.3
Residence		
Urban	16.7*	18.3
Rural [†]	22.8	20.2
Family structure		
Single-parent	21.2	24.2*
Step-parent	24.4	29.3*
Two-parent [†]	15.8	15.6

Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

[†] Reference category

* Significantly different from reference category ($p < 0.05$)

^{E1} Coefficient of variation between 16.6% and 25.0%

Table C
Mean scores for parent-child relationship, school commitment and emotional health, by reported drinking to intoxication and drug use, household population aged 12 to 15, Canada excluding territories, 1998/99

In past year:	Scale				
	Hostile parenting [†]	Parental monitoring [†]	Parent-child cohesion [‡]	School commitment [§]	Emotional problems/Anxiety [†]
Drank to intoxication					
Yes	6.3*	11.5*	17.2*	14.6*	3.4
No ^{††}	5.1	12.4	18.4	16.3	3.0
Used drugs					
Yes	6.3*	11.5*	17.0*	14.3*	3.7*
No ^{††}	5.1	12.4	18.4	16.3	3.1

Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

[†] Range 0 (low) to 16 (high)

[‡] Range 0 (low) to 40 (high)

[§] Range 0 (low) to 21 (high)

^{††} Reference category

* Significantly different from reference category

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Proxy reporting of health information

Margot Shields

Abstract

Objectives

This article documents the extent of proxy reporting in Statistics Canada's National Population Health Survey (NPHS) and explores associations between reporting status and the prevalence and incidence of selected health problems.

Data sources

Data are from the household cross-sectional (1994/95, 1996/97 and 1998/99) and longitudinal (1994/95 to 2000/01) components of the NPHS. Supplemental data are from the 2000/01 Canadian Community Health Survey.

Analytical techniques

Estimates of health conditions from the two cross-sectional files that are produced for each NPHS cycle were compared. The file with the lower proxy reporting rate was expected to yield higher prevalence rates. Multivariate analyses of the longitudinal data were used to examine associations between changes in reporting status and the incidence of the selected conditions.

Main results

Compared with the 1998/99 General file, in which proxy reporting was more common, the 1998/99 Health file yields higher estimates of certain health conditions. Declines in proxy reporting rates over time are generally associated with greater increases in estimates. Analyses based on the longitudinal file suggest that the incidence of some conditions may also be subject to a proxy effect.

Key words

chronic conditions, people with disabilities, health surveys, longitudinal studies

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An important decision that must be made in the design and implementation of a health survey is whether to accept proxy responses. While common sense suggests that it is best to question people directly about their health, many surveys allow one knowledgeable respondent to answer on behalf of others.

The reasons for accepting proxy responses fall into two categories: necessity and convenience. "Proxy by necessity" refers to situations in which individuals selected to be interviewed are unable to respond on their own behalf because of physical or mental conditions. Excluding such people from a health survey would bias estimates. "Proxy by convenience" refers to the acceptance of proxy responses for people capable of providing their own information. If information about everyone in a household is collected from one person, it is possible to obtain a large sample size with just one contact, thereby improving response rates and reducing costs. Eliminating the need for several call-backs to interview people who are difficult to reach also helps reduce costs.

Methods

Data sources

National Population Health Survey

Since 1994/95, Statistics Canada's biennial National Population Health Survey (NPHS) has collected information about household and institutional residents in all provinces and territories, except residents of Indian reserves, Canadian Forces bases, and some remote areas.^{1,2} This analysis is based on the household population aged 18 or older in the 10 provinces.

For each of the first three cycles (1994/95, 1996/97 and 1998/99), two cross-sectional files were produced: General and Health. The General file contains socio-demographic and basic health information, collected using the General questionnaire, for every member of each participating household. The Health file contains in-depth health information, collected using the Health questionnaire, for one randomly selected member of each household, as well as the information about that person in the General file.

For each cycle, two cross-sectional response rates are calculated: household and person. The *household* response rate is based on the number of households for which at least the General questionnaire was completed for the randomly selected member. The *person* response rate is based on the number of responding households for which the Health questionnaire was completed for the randomly selected member.

	Response rate	
	Household	Person
	%	
1994/95	88.7	96.1
1996/97	82.6	95.6
1998/99	87.6	98.5

A longitudinal file is also produced. In 1994/95, a panel of 17,276 respondents (a subset of the randomly selected household members) was chosen to be followed over subsequent cycles. In cycle 4, the NPHS became strictly longitudinal, and the General and Health questionnaires were combined. This analysis uses the cycle 4 (2000/01) longitudinal "square" file, which contains records for all originally selected panel members about whom information is available in the cycle 1 General file, regardless of whether information about them was obtained in later cycles.

Canadian Community Health Survey

Arthritis prevalence rates for 2000/01 are from cycle 1.1 of Statistics Canada's Canadian Community Health Survey (CCHS). The CCHS covers the household population aged 12 or older in all provinces and territories, except residents of Indian reserves, Canadian Forces bases, and some remote areas.³ Data collection began in September 2000 and continued over 14 months. The sample size was 131,535; the response rate was 84.7%. The CCHS data for this article were reported by 116,171 respondents aged 18 or older in the 10 provinces.

Analytical techniques

Proxy reporting rates, based on weighted data, are presented for the cross-sectional files (General and Health) for the first three NPHS cycles, as well as for the cycle 4 longitudinal file.^{4,5} Sample sizes and unweighted counts by proxy status for all files can be found in Appendix Tables A and B.

To investigate the possibility of a proxy effect on the prevalence of health conditions, estimates from the cross-sectional General and Health files were compared for cycles 1 and 3. It was hypothesized that because of its lower proxy response rate, the cycle 3 (1998/99) Health file would yield higher estimates than the General file. Estimates for the two files were expected to be closer for cycle 1 (1994/95) because of the similar proxy rates.

Multiple logistic regression models were used to explore the possibility of a proxy effect on the incidence of health problems. Each model examined the two-year incidence of selected conditions (new cases in a two-year period) in relation to changes in reporting status in the same period. Based on NPHS respondent selection rules and a review of the literature on proxy reporting, several control variables were included: sex, age, living arrangements, education, household income, employment status, and the Health Utilities Index. All regressions were run on the 1994/95 to 2000/01 longitudinal square file. An incident case was defined as a health problem reported in cycle 2, 3 or 4 from a respondent who had not reported the problem in the previous cycle. For every two-year interval (1994/95-to-1996/97, 1996/97-to-1998/99 and 1998/99-to-2000/01), a new record was created for each respondent who had not reported the condition in the previous cycle. Consequently, one respondent could contribute up to three records to the analyses for each health condition: one for every two-year interval. Approximately 30,000 records were used in each model (ranging from 27,204 to 34,995).

To account for the effects of survey design, the variance on prevalence and incidence rates, on differences between rates, and on odds ratios was calculated using the bootstrap technique.⁶⁻⁸ In comparing rates across NPHS cycles, bootstrap weights that account for the overlap among samples were used.

Limitations

It is generally assumed that differences between self- and proxy reports of health problems reflect under-reporting by proxy reporters. Comparisons with medical records have shown that under-reporting is more common in proxy reports than in self-reports.⁹⁻¹¹ However, while even self-respondents may under-report health and health care events,⁹⁻¹³ in some cases, self-respondents may over-report. For example, the criteria for chronic conditions in the NPHS are: "long-term conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health professional." Although interviewers specify these criteria, a respondent who, for instance, has been suffering back pain for several months may report a back problem even if it has not been diagnosed by a health professional. If this is more likely to happen for self- than proxy respondents, the effect would be over-reporting.

The models in the analysis that consider incident health conditions in relation to changes in reporting status controlled for socio-demographic and other confounders that might be related an individual's reporting status. The results could be misleading if important variables related to morbidity and to reporting status were inadvertently excluded, or are not available from the NPHS.

Although residents of long-term care institutions were interviewed in the NPHS, this analysis was not carried out for that population. Proxy responses were accepted for residents of health care institutions only by necessity, and therefore, it was not possible to assess potential biases related to proxy reporting.

Although reasons for accepting proxy responses are often compelling, the result may be lower estimates of some health problems. Proxy reporters tend to have less knowledge about another's health than that person him- or herself. Lower estimates of chronic conditions, disability, activity restriction, pain, medication use, physician visits, and hospitalization have been found for proxy reports, indicating a downward bias.^{10,11,14-22} However, comparisons with administrative data such as medical records suggest that even self-respondents may under-report health events.⁹⁻¹³

Research on people who are elderly or frail suggests that such a bias may be in the opposite direction. That is, proxies responding for these groups may report more impairment than self-respondents.^{21,23-28} Over-reporting is especially common when proxy responses are accepted for residents of health care institutions.

Based on cross-sectional and longitudinal data from Statistics Canada's National Population Health Survey (NPHS), this article investigates the possibility of a "proxy effect" (biased estimates) as a result of proxy reporting. The article focuses on the population aged 18 or older who were living in private households at the time of the interview (see *Methods* and *Definitions*).

Guidelines

When the NPHS was first conducted in 1994/95, proxy responses by necessity and by convenience were both accepted, depending on the information sought.

Originally, the NPHS had two questionnaires: General and Health. The General questionnaire was used to collect socio-demographic information and basic health information (chronic conditions, long-term disability, two-week disability, and health care utilization) for every member of each household. Because the information was generally factual and objective, proxy by convenience was accepted.

As well, one member of each household was chosen at random to respond to the Health questionnaire, which covered topics such as smoking, physical activity, medication use, social support and mental health. Because the questions

were detailed and often personal, proxy responses were accepted only by necessity. Some highly subjective and personal questions were skipped if the responses were being provided by a proxy reporter.

These guidelines were in effect for the first two cycles (1994/95 and 1996/97). In cycle 3 (1998/99), a modification was introduced because of the longitudinal component—the subset of the randomly selected respondents who are followed over time. As a result of concern that variations in reporting status across cycles might confound measures of change, cycle 3 interviewers were instructed to collect information directly from longitudinal panel members for **both** the General and Health questionnaires. If longitudinal panel members could not be contacted throughout the entire collection period, interviewers could accept a proxy response for the General questionnaire, but for the Health questionnaire, it was proxy by necessity only. (For other household members, the previous rules still applied.)

In cycle 4 (2000/01), when the NPHS became strictly longitudinal, the General and Health questionnaires were combined, and proxy responses were accepted only by necessity.

Proxy reporting rates

For each of the first three NPHS cycles, two cross-sectional files were created: General and Health. The General file has a record for every member of each responding household, and contains information collected with the General questionnaire. The Health file has a record for each randomly selected respondent (just one record per household), and contains the Health questionnaire information for that person along with information collected about him or her in the General questionnaire.

Because the information in the Health file comes from two questionnaires that have different guidelines for proxy reporting, records on this file can have a "mixed" reporting status. For example, if a married man was the selected respondent, he may have answered the Health questionnaire himself, but his wife may have provided answers on his

behalf for the General questionnaire. Therefore, two proxy reporting rates are calculated for the Health file: one for the Health questionnaire and one for the General questionnaire.

In the General file, the proxy reporting rates for the General questionnaire were fairly stable across survey cycles at approximately 35% (Table 1). By contrast, in the Health file, the proxy rate for the information derived from the General questionnaire file dropped substantially from 31% in 1994/95 to 15% in 1998/99. Proxy reporting rates for the Health questionnaire were under 5% for all three cycles.

Table 1
Percentage of proxy responses to National Population Health Survey, cross-sectional files, by sex, household population aged 18 or older, Canada excluding territories, 1994/95, 1996/97 and 1998/99

	General questionnaire		Health questionnaire
	General File	Health File	Health File
	%	%	%
Total			
1994/95	36.0	31.1	4.9
1996/97	37.9	23.7	2.3
1998/99	34.5	14.6	2.2
Men			
1994/95	51.1	45.6	7.1
1996/97	50.5	33.4	3.0
1998/99	47.9	22.0	3.1
Women			
1994/95	21.4	17.2	2.8
1996/97	25.9	14.4	1.6
1998/99	21.6	7.6	1.4

Data sources: 1994/95 to 1998/99 National Population Health Survey, cross-sectional sample, General and Health files

Effect on prevalence of health problems

With their different proxy reporting rates, the General and Health files offer an opportunity to investigate the “proxy effect.” Although the number of records on each file varies considerably, both files have been weighted so that they can be used to produce estimates for exactly the same populations. As well, each record in the Health file is automatically included in the General file, and the data for the

other records in the General file were collected using the same methods, at the same time, and by the same interviewers. However, the proxy reporting rates differ: in 1998/99, 35% for the General file and 15% for the Health file; in 1994/95, 36% and 31%, respectively. If people responding on their own behalf are more likely to report health problems, estimates for 1998/99 based on the Health file, with its low proxy rate, should be higher than those based on the General file. By contrast, estimates from the two files for 1994/95, when the proxy reporting rates were similar, might be expected to be closer.

And in fact, the 1994/95 Health and General file estimates of chronic conditions, long-term disability and two-week disability are very close: the only significant difference between the estimates is for the prevalence of non-food allergies (Table 2). The same is not true for 1998/99: as well as non-food allergies, the Health file estimates are higher for the prevalence of asthma, arthritis, back problems, migraine, stomach or intestinal ulcers, urinary incontinence, thyroid disorder, activity restriction, long-term disability, and cutting down on normal activities in the past two weeks because of illness or injury.

Previous studies have found that proxy reports are most accurate for conditions that are serious, painful, persistent or potentially life-threatening.^{9,15,16,19} Consistent with such findings, the 1998/99 General and Health file estimates do not differ significantly for diabetes, epilepsy, heart disease, need for assistance with activities of daily living, and having spent at least a day in bed during the previous two weeks because of illness or injury.

Changes in prevalence

Before the NPHS became strictly longitudinal, one reason for conducting it every two years was to monitor the prevalence of health conditions over time. However, apparent changes in prevalence might reflect variations in reporting status. As noted, the proxy reporting rate for the General file remained fairly stable, while the rate for the General questionnaire portion of the Health file fell from 31% in 1994/95 to 15% in 1998/99. If a proxy effect does exist, this reduction in the proportion

of proxy responses might result in sharper increases in the prevalence of some conditions in the Health file, particularly conditions that are less serious and/or noticeable. And indeed, data from the Health file show larger increases in non-food allergies, asthma, arthritis, migraine, urinary incontinence, and cut-down day(s) in the previous two weeks (Table 2). The prevalence of activity restriction and long-term disability decreased on both files, but the decrease was smaller for the Health file, again suggesting a proxy effect.

Men and women

In 1998/99, the difference between the General and Health files in proxy reporting rates was greater for men than for women. For men, the proxy reporting rate for the General file was 26 percentage points higher than the rate for General questionnaire portion of the Health file; for women, the difference was 14 percentage points (Table 1). Therefore, the proxy effect on the prevalence of health conditions might be expected to be stronger for men. Nonetheless, results for men and women were

Table 2
Estimates of chronic conditions and disability in General and Health files of National Population Health Survey, household population aged 18 or older, Canada excluding territories, 1994/95 and 1998/99

	1994/95		1998/99		Change between cycles
	General file	Health file	General file	Health file	
	%		%		
Chronic conditions					
Non-food allergies	16.5	17.2*	21.3	23.9*	ch
Arthritis	13.7	14.2	14.9	16.8*	ch
Back problems	14.6	15.1	14.3	15.0*	
High blood pressure	9.7	9.7	11.9	12.1	
Migraine	7.3	7.6	7.4	8.2*	ch
Asthma	5.6	5.7	7.0	7.7*	ch
Food allergies	5.4	5.4	6.6	6.8	
Heart disease	4.4	4.2	4.6	4.7	
Thyroid disorder	...	...	4.3	4.6*	...
Diabetes	3.4	3.4	3.9	3.8	
Cataract	2.7	2.7	3.5	3.5	
Stomach/Intestinal ulcers	3.5	3.6	2.7	3.1*	
Chronic bronchitis/Emphysema	3.0	3.3	2.5	2.7	
Urinary incontinence	1.1	1.2	2.0	2.3*	ch
Bowel disorder	...	...	1.7	1.8	...
Cancer	1.7	1.7	1.6	1.6	
Glaucoma	1.1	1.1	1.4	1.3	
Effects of stroke	0.9	1.0	1.1	1.2	
Epilepsy	0.6	0.7	0.6	0.7	
Alzheimer's disease/Other dementia	0.1	0.1 ^{E1}	0.3	0.3	
Long-term					
Activity restriction	17.3	17.4	14.1	15.0*	ch
Disability	15.4	15.8	12.4	13.6*	ch
Activity restriction or disability	21.1	21.5	17.4	18.9*	ch
Dependency in instrumental activities of daily living	9.1	9.2	11.9	12.3	
Dependency in activities of daily living	1.6	1.5	2.2	2.2	
Two-week					
At least one cut-down day	12.7	12.5	10.8	11.5*	ch
At least one bed-day	6.8	6.8	5.8	5.9	
Proxy reporting rate to General questionnaire (%)	36.0	31.1	34.5	14.6	
Sample size (number of respondents)	41,045	16,291	34,543	14,150	

Data sources: 1994/95 and 1998/99 National Population Health Survey, cross-sectional sample, General and Health files

* Significantly higher than General file estimate for corresponding cycle ($p < 0.05$)

ch Change between 1994/95 and 1998/99 in Health file estimates significantly different from change in General file estimates ($p < 0.05$)

E1 Coefficient of variation 16.6% to 25.0%

... Not applicable

similar (Table 3). A possible explanation is that previous research has found women to be more accurate than men in reporting health events,^{10,14} and men are more likely than women to have a female proxy reporter (see *Who provides the information?*).

Table 3
Estimates of chronic conditions and disability, by sex, in General and Health files of National Population Health Survey, household population aged 18 or older, Canada excluding territories, 1998/99

	Men		Women	
	General file	Health file	General file	Health file
	%		%	
Chronic conditions				
Non-food allergies	17.5	19.9*	25.0	27.8*
Arthritis	10.5	12.5*	19.1	20.9*
Back problems	13.7	14.1	14.8	15.8*
High blood pressure	9.8	10.0	13.9	14.0
Migraine	3.3	3.9*	11.3	12.3*
Asthma	5.8	6.6*	8.1	8.7*
Food allergies	5.1	5.3	8.1	8.3
Heart disease	4.9	4.9	4.2	4.4
Thyroid disorder	1.4	1.7*	7.1	7.5
Diabetes	4.3	4.3	3.6	3.3
Cataract	2.6	2.9*	4.3	4.1
Stomach/Intestinal ulcers	2.5	2.9*	2.9	3.3*
Chronic bronchitis/Emphysema	2.2	2.4	2.8	3.1
Urinary incontinence	1.2	1.4*	2.7	3.0*
Bowel disorder	1.2	1.3	2.2	2.2
Cancer	1.4	1.4	1.7	1.8
Glaucoma	1.2	1.0	1.6	1.7
Effects of stroke	1.1	1.2	1.0	1.1 ^{E1}
Epilepsy	0.6	0.6 ^{E1}	0.6	0.8 ^{E1}
Alzheimer's disease/Other dementia	0.2 ^{E1}	0.3 ^{E1}	0.3 ^{E1}	0.3 ^{E1}
Long-term				
Activity restriction	12.7	13.7*	15.3	16.2*
Disability	12.2	13.5*	12.6	13.7*
Activity restriction or disability	16.2	17.9*	18.6	20.0*
Dependency in instrumental activities of daily living	8.4	8.9	15.3	15.6
Dependency in activities of daily living	1.8	2.0	2.5	2.5
Two-week				
At least one cut-down day	8.8	8.9	12.7	14.1*
At least one bed-day	4.7	4.6	6.9	7.2
Proxy reporting rate to General questionnaire (%)	47.9	22.0	21.6	7.6
Sample size (number of respondents)	16,519	6,446	18,024	7,704

Data source: 1998/99 National Population Health Survey, cross-sectional sample, General and Health files

* Significantly higher than General file estimate ($p < 0.05$)

E1 Coefficient of variation 16.6% to 25.0%

Seniors

Some studies have suggested that the proxy effect for seniors may be in the opposite direction—that is, proxy reporters for elderly people are more likely to report impairment than seniors would themselves.^{21,23,24,26-28} Estimates of the prevalence of health conditions based on NPHS data, however, do not support this finding. When there were significant differences between the 1998/99 General and Health files, the Health file estimates were higher (Table 4). The reason may be that the NPHS sample

Who provides the information?

The characteristics of proxy reporters (the people providing information on behalf of others) for the General questionnaire of the National Population Health Survey were closely associated with the age and sex of proxy respondents (the people about whom information was provided).

Information about young proxy respondents (ages 18 to 24) tended to come from a parent: in about 60% of cases, their mother, and in an additional 15%, their father.

Information about proxy respondents aged 25 or older was typically provided by a spouse: for more than 80% of male respondents, their wife; for 64% of female respondents, their husband. For an additional 17% of female proxy respondents, information was provided by "other female relatives," usually a daughter (data not shown).

Distribution of proxy respondents to 1998/99 National Population Health Survey, General questionnaire, by age, sex and relationship to proxy reporter, household population aged 18 or older, Canada excluding territories

	Ages 18-24		Ages 25+	
	Men	Women	Men	Women
	%		%	
Total	100.0	100.0	100.0	100.0
Spouse	9.9	10.6	82.2	63.6
Mother	59.9	59.0	4.6	5.2
Father	15.3	14.5	1.2	1.3
Other relative				
Female	6.3	8.0	5.9	16.7
Male	5.4	3.2	4.2	10.4
Non-relative	3.3	4.7	2.0	2.9

Data source: 1998/99 National Population Health Survey, cross-sectional sample, General file

Note: Because of rounding, columns may not add to 100.0%

pertains to the household population. Previous studies often concerned institutional residents whose proxy reporters are typically younger people who, viewing chronic conditions from their own perspective, may be more likely to report a senior as being impaired.²³ Proxy reporters for elderly NPHS respondents, however, tended to be of a similar age: close to three-quarters were that person's spouse (data not shown).

Table 4
Estimates of chronic conditions and disability in General and Health files of National Population Health Survey, household population aged 65 or older, Canada excluding territories, 1998/99

	General file	Health file
	%	
Chronic conditions		
Arthritis	41.6	44.9*
High blood pressure	35.7	36.5
Cataract	17.6	18.1
Heart disease	17.5	17.3
Back problems	16.6	17.8*
Non-food allergies	15.4	15.9
Diabetes	11.7	11.5
Thyroid disorder	8.8	9.2
Urinary incontinence	7.0	7.5
Food allergies	6.2	6.1
Chronic bronchitis/Emphysema	5.8	5.9
Asthma	5.7	6.3
Glaucoma	5.4	5.1
Stomach/Intestinal ulcers	5.2	6.0*
Cancer	4.6	4.4
Effects of stroke	4.2	4.4
Migraine	3.3	3.8
Bowel disorder	3.0	3.2
Alzheimer's disease/Other dementia	1.1	1.3 ^{E1}
Epilepsy	0.7 ^{E1}	1.1 ^{E2*}
Long-term		
Activity restriction	29.2	29.8
Disability	25.0	26.6*
Activity restriction or disability	34.6	36.2*
Dependency in instrumental activities of daily living	37.2	38.2
Dependency in activities of daily living	6.9	7.2
Two-week		
At least one cut-down day	12.9	12.8
At least one bed-day	6.4	6.1
Proxy reporting rate to General questionnaire (%)		
	26.6	15.0
Sample size (number of respondents)		
	4,728	2,851

Data source: 1998/99 National Population Health Survey, cross-sectional sample, General and Health files

* Significantly higher than General file estimate ($p < 0.05$)

E1 Coefficient of variation 16.6% to 25.0%

E2 Coefficient of variation 25.1% to 33.3%

Effect on incidence of health problems

For every NPHS cycle, a longitudinal file was created, which includes the General and Health questionnaire data for members of the longitudinal panel. The proxy reporting rate for the General questionnaire portion of the longitudinal file dropped from 33% in 1994/95 to 14% in 1998/99. In 2000/01, when the NPHS became strictly longitudinal and proxy responses were accepted only by necessity, the rate declined to 4% (Table 5).

Table 5
Percentage of proxy responses to National Population Health Survey, longitudinal file, household population aged 18 or older in 1994/95, Canada excluding territories, 1994/95 to 2000/01

	General questionnaire	Health questionnaire
	%	
1994/95	32.7	4.8
1996/97	16.4	1.7
1998/99	13.5	2.2
2000/01	4.0	4.0

Data sources: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (square)

The longitudinal file is frequently used to produce two-year incidence rates of health conditions. However, changes in reporting status from one cycle to the next could affect these estimates.

To quantify changes in reporting status over time, a set of records was created for each two-year interval over the four NPHS cycles (1994/95-to-1996/97, 1996/97-to-1998/99, and 1998/99-to-2000/01). When these three sets of records were compiled, in the majority of cases, the reporting status for the General questionnaire did not change from one cycle to the next. In close to three-quarters of cases (73.5%), respondents provided their own information over two consecutive cycles (self-self), and for a small percentage of cases (6.1%), cycle-to-cycle information was provided by proxy (proxy-proxy) (Table 6). However, in about 5% of cases, reporting status changed from self to proxy, and in 15%, from proxy to self.

If self-respondents have a greater tendency to report health problems, people whose status changed from proxy in one cycle to self in the next

Definitions

In the National Population Health Survey (NPHS), *proxy responses* are those obtained for a particular person from another household member (the *proxy reporter*); for example, a parent may provide answers for a child, or a wife may respond on behalf of her husband.

Self-responses are those obtained directly from the individuals selected for the survey.

The *General questionnaire* contains questions about demographic and socio-economic characteristics, as well as basic health information such as two-week disability, activity restriction, and chronic conditions. This information is obtained for each person in the household from one member.

The *Health questionnaire* contains questions on topics such as medication use, smoking, alcohol consumption, mental health, social support, height and weight, physical activity, and injuries. Given the detailed and often personal nature of this information, the selected respondent usually answers on his or her own behalf.

To measure *chronic conditions*, individuals were asked about long-term conditions that had lasted or were expected to last six months or longer and that had been diagnosed by a health professional. Interviewers read a list of conditions.

Activity restriction due to a long-term physical or mental health problem was based on a positive response to any of the following: "Because of a long-term physical or mental condition or a health problem, are you limited in the kind or amount of activity you can do: at home? at school? at work? in other activities?"

Long-term disability was determined by asking, "Do you have any long-term disabilities or handicaps?"

Respondents were classified as dependent in *instrumental activities of daily living* if they needed help preparing meals, shopping for groceries or other necessities, doing normal everyday housework, or doing heavy household chores such as washing walls or yard work.

To determine dependency in *activities of daily living*, respondents were asked if, because of a health problem, they needed help with personal care such as washing, dressing or eating, or with moving about inside the house.

Two-week disability was measured in terms of *bed-days* and *cut-down days* over the past two weeks. Respondents were asked about days they had stayed in bed because of illness or injury (including nights in hospital) and about days they had cut down on normal activities because of illness or injury.

Living arrangements were defined as living alone or living with others.

Education was grouped into four categories, based on the highest level attained: less than secondary graduation, secondary graduation, some postsecondary, and postsecondary (trade school, college or university) graduation.

Individuals who were currently working at a job or business were considered to be *employed*.

Household income was defined based on the number of people in the household and total household income from all sources in the 12 months before the interview.

Household income group	People in household	Total household income
Lowest	1 or 2	Less than \$15,000
	3 or 4	Less than \$20,000
	5 or more	Less than \$30,000
Lower-middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or more	\$80,000 or more

Daily smokers were defined as those who indicated that they smoked cigarettes daily.

The *Health Utilities Index* (HUI3) is a summary measure that incorporates functional health and societal preferences for health states.^{29,30} Based on responses to 30 questions about eight aspects of functional health (vision, hearing, speech, mobility, dexterity, emotions, cognition, and pain and discomfort) together with a valuation component, an overall score, or index, is produced for each individual. Perfect health is rated 1.000, and death, 0.000; negative scores reflect health states considered worse than death. Possible HUI3 values range from -0.360 to 1.000. The HUI3 score was used as a continuous variable.

To measure *psychological distress*, respondents were asked to reply to six statements on a five-point scale: all of the time (score 4), most of the time (3), some of the time (2), a little of the time (1), or none of the time (0). "During the past month, about how often did you feel:

- so sad that nothing could cheer you up?"
- nervous?"
- restless or fidgety?"
- hopeless?"
- worthless?"
- that everything was an effort?"

The responses were summed, with higher scores indicating more distress (Cronbach's alpha = 0.77). Respondents with a score that fell in the upper quartile of the distribution (5 or more) were considered to be experiencing high psychological distress.

Weight was defined in terms of body mass index (BMI), which was calculated by dividing weight in kilograms by the square of height in metres. BMI was grouped into two categories: obese (30 or more) and not obese (less than 30). BMI was not calculated for pregnant women.

Table 6
Distribution of cycle-to-cycle reporting status to General questionnaire, National Population Health Survey, longitudinal file, household population aged 18 or older in 1994/95, Canada excluding territories, 1994/95 to 2000/01

	%
Total	100.0
Self-self	73.5
Proxy-self	15.2
Self-proxy	5.2
Proxy-proxy	6.1

Data sources: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (square)

(proxy-self) might be more likely to report a new condition than those who reported on their own behalf in both cycles (self-self). Similarly, respondents whose information was provided by someone else in both cycles (proxy-proxy) and those whose reporting status changed from self to proxy (self-proxy) would be less likely report a new condition.

To investigate this possibility, a multiple logistic regression model was run for each chronic condition for which the cross-sectional analyses suggested a proxy effect (non-food allergies, asthma, arthritis, back problems, migraine, ulcers, and incontinence), as well as for an activity restriction or long-term disability. Because reporting status is related to variables such as sex, living arrangements, education, income and employment,³¹ these characteristics were included as control variables.

Previous studies that used this approach have been limited by an inability to control for health status.^{21,32} For example, some people whose information is provided by proxy may actually have a health advantage, in that they are healthy enough to be busy and away from home. With NPHS data, it is possible to control for this potentially confounding factor by using the Health Utilities Index, a summary measure based on responses to questions about eight aspects of functional health that are asked as part of the Health questionnaire (where proxy response was rare). In the regression models, the Health Utilities Index and two-year changes in the Health Utilities Index were also entered as control variables.

Even when the effects of all these factors were taken into account, in several cases, a change in

Table 7
Two-year incidence rates of selected health conditions and adjusted odds ratios relating reporting status to incidence of conditions, household population aged 18 or older, Canada excluding territories, 1994/95 to 2000/01

	Two-year incidence rate	Two-year reporting status	Adjusted odds ratio	95% confidence interval
	%			
Non-food allergies	12.3	Self-Self†	1.0	...
		Proxy-Self	1.5*	1.3, 1.8
		Self-Proxy	0.8	0.6, 1.1
		Proxy-Proxy	0.9	0.7, 1.2
Back problems	9.1	Self-Self†	1.0	...
		Proxy-Self	1.1	0.9, 1.2
		Self-Proxy	0.7*	0.5, 0.9
		Proxy-Proxy	0.5*	0.4, 0.7
Arthritis	6.2	Self-Self†	1.0	...
		Proxy-Self	1.1	0.9, 1.4
		Self-Proxy	0.5*	0.3, 0.7
		Proxy-Proxy	0.4*	0.3, 0.6
Migraine	3.0	Self-Self†	1.0	...
		Proxy-Self	1.2	0.9, 1.5
		Self-Proxy	0.5*	0.3, 0.9
		Proxy-Proxy	0.6	0.3, 1.1
Asthma	1.9	Self-Self†	1.0	...
		Proxy-Self	1.3	1.0, 1.8
		Self-Proxy	0.9	0.6, 1.5
		Proxy-Proxy	0.5	0.3, 1.1
Urinary incontinence	1.6	Self-Self†	1.0	...
		Proxy-Self	1.0	0.7, 1.5
		Self-Proxy	0.3*	0.2, 0.5
		Proxy-Proxy	0.7	0.4, 1.2
Stomach/Intestinal ulcers	1.4	Self-Self†	1.0	...
		Proxy-Self	1.4	1.0, 1.9
		Self-Proxy	0.5*	0.3, 0.9
		Proxy-Proxy	0.5*	0.3, 0.9
At least one of 7 chronic conditions	24.7	Self-Self†	1.0	...
		Proxy-Self	1.4*	1.3, 1.6
		Self-Proxy	0.7*	0.6, 0.8
		Proxy-Proxy	0.8*	0.7, 0.9
Activity restriction or disability	8.1	Self-Self†	1.0	...
		Proxy-Self	1.2	1.0, 1.4
		Self-Proxy	0.7*	0.5, 1.0
		Proxy-Proxy	0.8	0.6, 1.1

Data sources: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (square)

Notes: Presents results of nine separate regression models, each controlling for sex, age, living alone, education, household income, employment status, Health Utilities Index, and changes in Health Utilities Index (see Definitions).

† Reference category

* Significantly different from Self-Self ($p < 0.05$)

... Not applicable

reporting status from one survey cycle to the next was associated with the incidence of health problems (Table 7). Compared with respondents answering

on their own behalf in consecutive cycles (self-self), those whose reporting status changed from proxy to self (proxy-self) were more likely to report incident cases of non-food allergies. For arthritis, back problems and ulcers, the proxy-proxy group and the self-proxy group were less likely than the self-self group to report incident cases. As well, the self-proxy group was less likely to report migraine, incontinence and disability.

Because the number of incident cases of most conditions was generally small, especially when divided among the four reporting status categories, it is difficult to achieve statistical significance. But when the combined incidence of at least one of the seven conditions is considered, all reporting categories are significant and suggest a proxy effect, with the proxy-self group more likely to report a new condition, and the proxy-proxy and self-proxy groups less likely to do so.

Convenience versus necessity

A health survey obviously cannot exclude people unable to provide their information because of a physical or mental health problem; that is, proxy by necessity. Proxy by convenience, however, can be avoided by increasing resources at the collection stage and allowing adequate time to contact all respondents directly. Therefore, an important element of a proxy effect is the extent to which it is due to proxy by necessity versus convenience.

For the 1998/99 cross-sectional General and Health files, the circumstances under which proxy by necessity was accepted for the General questionnaire were identical. Consequently, systematic differences in estimates of health problems between the two files must be attributable to proxy by convenience (Tables 2 to 4).

On the longitudinal file, it is possible to differentiate between convenience and necessity. Records with a proxy response for the General questionnaire and a self-response for the Health questionnaire were convenience cases, since these individuals were obviously able to respond on their own behalf. Likewise, it can be concluded that records with a proxy response for both questionnaires were out of necessity.

To study the potential impact of proxy by convenience on incidence measures, the regression models were rerun on the longitudinal file, this time excluding proxy by necessity. The results were similar to those for the full models, suggesting that accepting proxy responses by convenience has an effect on incidence measures of some health conditions.

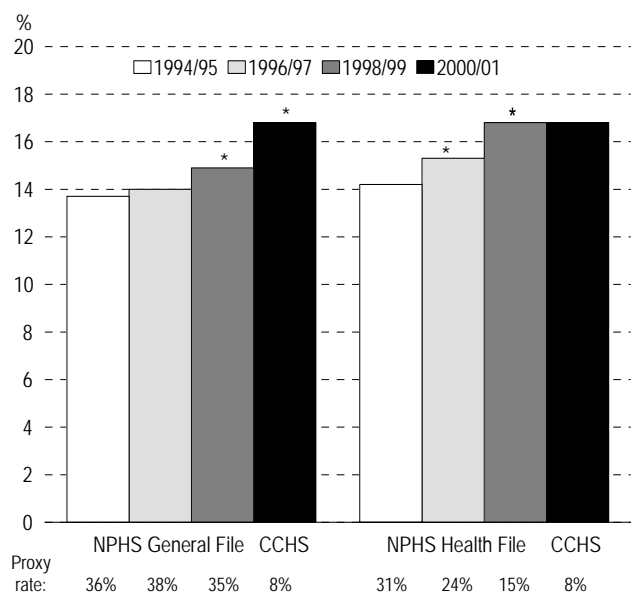
Does the proxy effect matter?

This analysis indicates that accepting proxy responses can affect estimates of health conditions. For prevalence rates, the difference between the 1998/99 General and Health files is generally less than a percentage point. The implication for analysis, however, is that small changes in prevalence across survey cycles must be interpreted cautiously, even when they attain statistical significance. This can be illustrated by examining trends in the prevalence of arthritis.

Estimates based on the General file show a gradual increase in the arthritis prevalence rate from 13.7% in 1994/95 to 14.9% in 1998/99: 1.2 percentage points. The increase based on the Health file was greater, at just over 2.5 percentage points, likely owing to the decline in proxy reporting rates in the Health file over this period.

In 2000/01, the Canadian Community Health Survey (CCHS) replaced the NPHS as the source of cross-sectional health data. Proxy responses are accepted in the CCHS only by necessity. When data from the 2000/01 CCHS are compared with data from the 1998/99 NPHS Health file, the prevalence of arthritis remains constant. However, when the CCHS data are compared with the 1998/99 NPHS General file, the increase in the prevalence of arthritis over the two years is close to two percentage points (Chart 1). This apparent increase is likely attributable to the much lower proxy reporting rate for the CCHS: 8% compared with 35% for the 1998/99 NPHS General file. These findings suggest a need for care in reporting changes over time in the prevalence of arthritis, particularly when such increases coincide with sharp decreases in proxy reporting rates.

Chart 1
Prevalence rates of arthritis, household population aged 18 or older, Canada excluding territories, 1994/95 to 2000/01



Data sources: 1994/95, 1996/97 and 1998/99 National Population Health Survey (NPHS), cross-sectional samples, Health and General files; 2000/01 Canadian Community Health Survey (CCHS)
* Significantly greater than previous period

The NPHS longitudinal file is often used to study relationships between risk factors and the incidence of health conditions. An important concern is whether those relationships are altered by reporting status. To investigate this possibility, incident arthritis was examined in two multivariate models: the first controlled for factors that have been shown to be associated with incident arthritis such as age, sex and obesity;³³ the second, for changes in reporting status as well.

The results suggest that although estimates of the two-year incidence of arthritis are affected by reporting status, this does not alter relationships with risk factors. The odds ratios for all variables in the model remained virtually the same when reporting status was taken into account (Table 8). Furthermore, when the second model was rerun, testing for interactions between arthritis risk factors and reporting status, none of the interaction terms was significant.

Table 8
Adjusted odds ratios relating selected characteristics to two-year incidence of arthritis, without and with control for reporting status, household population aged 18 or older, Canada excluding territories, 1994/95 to 2000/01

	Without control for reporting status		With control for reporting status	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Reporting status				
Self-Self [†]	1.0	...
Proxy-Self	...	...	1.2*	1.0, 1.5
Self-Proxy	...	...	0.6*	0.4, 0.8
Proxy-Proxy	...	...	0.6*	0.4, 0.9
Sex				
Women [†]	1.0	...	1.0	...
Men	0.7*	0.6, 0.8	0.7*	0.6, 0.8
Age				
	1.1*	1.0, 1.1	1.1*	1.0, 1.1
Household income				
Lowest/Lower-middle [†]	1.0	...	1.0	...
Upper-middle	1.1	1.0, 1.3	1.1	1.0, 1.3
Highest	1.0	0.9, 1.3	1.0	0.9, 1.3
Doctor contacts in past year				
0 to 6 [†]	1.0	...	1.0	...
7 or more	1.8*	1.6, 2.1	1.8*	1.6, 2.1
Daily smoker				
	1.3*	1.1, 1.5	1.3*	1.1, 1.5
Psychological distress				
Low [†]	1.0	...	1.0	...
High	1.4*	1.2, 1.6	1.4*	1.2, 1.6
Obese				
	1.5*	1.2, 1.7	1.5*	1.2, 1.7

Data sources: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (square)

Notes: Missing categories for income, psychological distress and obese variables were included in models to maximize sample size, but coefficients are not shown.

[†] Reference category. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is not daily smoker.

* Significantly different from reference category (p < 0.05)

... Not applicable

Concluding remarks

The results of this analysis of data from the National Population Health Survey and the Canadian Community Health Survey suggest that accepting proxy- rather than self-response may result in lower estimates of certain health conditions. Trends in prevalence may also be affected, as declines in proxy reporting rates between 1994/95 and 1998/99

coincided with increases in estimates. Incidence rates may be subject to a proxy effect as well, since changes in reporting status were associated with new reports of health conditions. However, based on the example of arthritis, the proxy effect does not alter associations with known risk factors.

Proxy responses are unavoidable, particularly in a health survey. Excluding people who are unable to respond because of ill health would bias the results. However, the practice of accepting proxy

responses to reduce the number of call-backs, and thereby, survey costs, may unnecessarily introduce bias.

Implementation of new procedures in 2000/01 meant that proxy responses will be accepted only by necessity in all future cycles of the National Population Health Survey, as well as for the Canadian Community Health Survey, which is now the source for cross-sectional estimates. ●

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Appendix

Table A
Number of respondents aged 18 or older in General and Health files, by reporting status, National Population Health Survey, 1994/95, 1996/97 and 1998/99

	Total	With proxy response
1994/95		
General file	41,045	15,455
Health file		
General questionnaire	16,291	4,158
Health questionnaire	16,291	601
1996/97		
General file	153,380	61,621
Health file		
General questionnaire	68,282	16,928
Health questionnaire	68,282	1,497
1998/99		
General file	34,543	12,835
Health file		
General questionnaire	14,150	1,721
Health questionnaire	14,150	252

Table B
Number of respondents aged 18 or older in Longitudinal file, by reporting status, National Population Health Survey, Longitudinal file, 1994/95 to 2000/01

	Total	With proxy response
Cycle 1 - 1994/95		
General questionnaire	14,117	3,782
Health questionnaire	13,677	506
Cycle 2 - 1996/97		
General questionnaire	12,879	1,846
Health questionnaire	12,763	210
Cycle 3 - 1998/99		
General questionnaire	11,888	1,386
Health questionnaire	11,792	259
Cycle 4 - 2000/01	10,987	417

Note: In cycle 4, the General and Health questionnaires were combined.

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A stylized, high-contrast graphic in shades of gray. The top portion shows a person's face with large, white, geometric features: two small squares for eyes, a vertical bar for a nose, and a horizontal bar for a mouth. Below the face is a large, white, stylized gear or cogwheel. The background is dark gray with white outlines and shapes.

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USE OF WHEELCHAIRS AND OTHER MOBILITY SUPPORT DEVICES

by Margot Shields

About 155,000 Canadians who were living in private households in 2000/01 needed a wheelchair to get around. This represents 0.6% of the total household population aged 12 or older (Table A). An additional 540,000 individuals (2.1%) needed other devices such as braces, canes or crutches. These figures on the use of “mobility support devices” in the household population are from the first cycle of the Canadian Community Health Survey, a general health survey conducted by Statistics Canada between September 2000 and October 2001.

Use rises with age

As might be expected, the use of mobility support devices rises with age. Wheelchair users made up just 0.3% of the household population aged 12 to 44, but by age 85 or older, the proportion was 7%. The use of other mobility support devices also increases with age from 0.3% of 12- to 44-year-olds to 32% of the most elderly.

Overall, a slightly higher percentage of females than males reported using mobility support devices: 3.1% versus 2.3%. This difference likely reflects the higher proportions of women in the older age groups. In fact, the association between being female and using a mobility support device disappeared when the older age distribution of women was taken into account.

Household income

The use of mobility support devices was associated with household income. People in low-, lower-middle- and middle-income households were more

likely than the overall population to use wheelchairs or other support devices, while those in upper-middle- or high-income households were less likely to do so. Although a relatively large share of older people were in lower-income households, the relationship between income and the use of mobility support devices persisted even when the effects of age were taken into account.

Variations across the country

The proportions of Ontario, Nova Scotia, Manitoba and Saskatchewan residents using mobility support devices exceeded the national average. In Québec, Alberta and the Northwest Territories, proportions were comparatively low. Québec and the Northwest Territories were the only jurisdictions where the use of both wheelchairs and other mobility support devices was below the national level. The low rate for Québec is reflected in the province’s “disability-free life expectancy” (the number of years a person is expected to live without a disability), which is the highest in the country.¹

Percentage of people using mobility support devices		
	Wheelchair	Other
Total	0.6	2.1
Age 12-44	0.3	0.3
Age 45-64	0.5	1.7
Age 65-74	1.2	4.6
Age 75-84	2.8	14.6
Age 85+	7.2	31.7

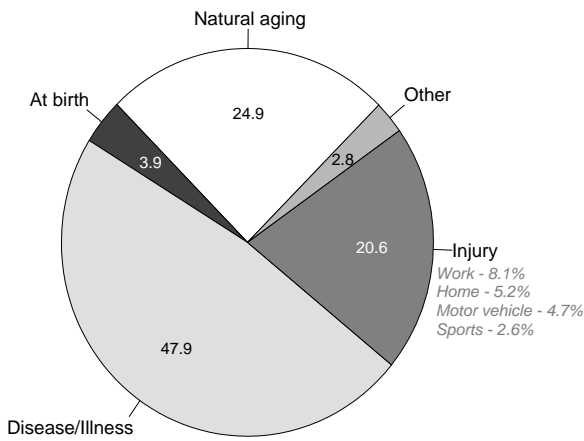
*Data source: 2000/01 Canadian Community Health Survey
Note: Estimate for each age group significantly higher than estimate for younger age group(s)*

Disability and its causes

Almost all people who reported using mobility support devices (96%) said that they had a disability. The main cause—reported by about half of them—was disease or illness. Natural aging was cited by one-quarter, and one-fifth said that their disability stemmed from an injury.

More than half of males in the 12-to-44 age group who needed a mobility support device reported that

Causes of disability among mobility support device users



Data source: 2000/01 Canadian Community Health Survey

Percentage of mobility support device users whose disability was attributable to . . .

	Injury	Disease/ Illness	Natural aging	Existed at birth
Total				
Males	28*	45*	20*	4
Females	15	50	28	4
Age 12-44				
Males	55*	21* ^{E1}	F	18 ^{E1}
Females	24	52	F	21 ^{E1}
Age 45-64				
Men	43*	46*	F	3 ^{E2}
Women	28	60	4 ^{E2}	5 ^{E1}
Age 65-74				
Men	20	59	15* ^{E1}	F
Women	13	59	24	F
Age 75-84				
Men	16 ^{E1}	54	28	F
Women	11	49	34	F
Age 85+				
Men	5 ^{E2}	33	62	F
Women	7 ^{E1}	29	64	F

Data source: 2000/01 Canadian Community Health Survey
 * Significantly different from estimate for women (p < 0.05)
 E1 Coefficient of variation 16.6 to 25.0%
 E2 Coefficient of variation 25.1 to 33.3%
 F Coefficient of variation greater than 33.3%

Use of mobility support devices in health care institutions

According to the 1996/97 National Population Health Survey, over 6 in 10 residents of health care institutions required mobility support devices. Just under half of residents—49%, or an estimated 109,000—used wheelchairs. An additional 14% (31,000) used other devices such as braces, crutches or canes. The 1996/97 data are the most recent available on the use of mobility support devices in health care institutions.

Residents' use of mobility support devices increased from 37% at ages 12 to 64 to 74% at age 85 or older. Although female residents were more likely than their male counterparts to use these devices, the older age distribution of women accounted for the difference.

Use of mobility support devices by residents of health care institutions, Canada, 1996/97

	Estimated population	Wheelchair		Other [†]		Total mobility support devices	
		'000	%	'000	%	'000	%
Total	222.6	109.4	49.1	31.3	14.1	140.7	63.2
Men	71.9	32.1	44.6	8.1	11.3	40.2	55.9
Women	150.7	77.3	51.3*	23.2	15.4*	100.5	66.7*
Age 12-64	37.1	12.6	33.9	F	3.5 ^{E1}	13.8	37.3
Men	21.4	6.8 ^{E1}	31.5	F	3.4 ^{E2}	7.5	34.9
Women	15.6	5.8 ^{E1}	37.1	F	3.6 ^{E2}	6.4	40.7
Age 65-84	92.5	46.4	50.1 [‡]	11.9	12.8 [‡]	58.3	63.0 [‡]
Men	32.8	15.9	48.5	4.5 ^{E1}	13.7	20.4	62.2
Women	59.7	30.5	51.0	7.4	12.4	37.9	63.4
Age 85+	92.6	50.2	54.2	18.1	19.6 [‡]	68.4	73.8 [‡]
Men	17.6	9.3	53.1	2.9 ^{E1}	16.6	12.2	69.6
Women	75.1	40.9	54.5	15.2	20.3	56.1	74.8

Data source: 1996/97 National Population Health Survey
 Note: Detail does not add to total because of missing values.
[†] Excluding those who also use wheelchair
[‡] Significantly higher than younger age group(s) (p < 0.05)
 * Significantly higher than men (p < 0.05)
 E1 Coefficient of variation 16.6% to 25.0%
 E2 Coefficient of variation 25.1% to 33.3%
 F Coefficient of variation greater than 33.3%

their disability resulted from an injury, reflecting the high prevalence of injury among males of these ages.² Men aged 45 to 64 were as likely to cite disease/illness as injury. From age 65 up to 84, disease/illness was the most common reason. Men older than this, however, cited natural aging as the cause.

For female users of mobility support devices, the causes of disability varied less by age. Up to age 85, the most common reason was illness. At 85 and beyond, women, like men, tended to attribute their disability to natural aging.

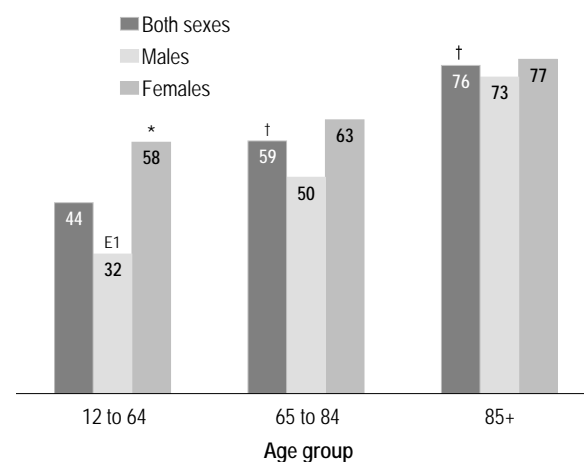
Needing help at home

Among wheelchair users, about two-thirds (67%) of males and three-quarters (74%) of females required assistance with basic activities of daily living (ADL); that is, personal care such as washing, getting dressed, and moving about inside their home. An additional 20% of both males and females required assistance with “instrumental” activities of daily living (IADL)—grocery shopping, meal preparation and everyday housework, for example. Nonetheless, a surprisingly high percentage of male wheelchair users (14%) said that they required neither type of help; the corresponding percentage for females was 6%.

People using other mobility support devices were less likely than wheelchair users to be ADL-dependent: about 30% for both sexes. But about one-third of males (32%) and close to half (47%) of females who used devices other than wheelchairs were IADL-dependent. Again, males were more likely than females to report that they required neither type of help. This male advantage is more evident at younger ages, and may be related to type of disability. For younger males, injury is most likely to be the cause of disability. But for females, disease/illness tends to be the cause, which may indicate general poor health.

Over half of wheelchair users needed help getting around in the wheelchair. This percentage ranged from just over 40% at ages 12 to 64 to more than three-quarters (76%) among users aged 85 or older. Females were more likely than males to say they

Percentage of wheelchair users needing help to get around



Data source: 2000/01 Canadian Community Health Survey

* Significantly higher than estimate for men ($p < 0.05$)

† Significantly higher than younger age group(s) ($p < 0.05$)

E1 Coefficient of variation 16.6% to 25.0%

needed such help—a difference largely reflecting the situation of the younger population of wheelchair users (ages 12 to 64). In this age group, the percentage of females needing help was almost double that of males.

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The Questions

The percentages of people who *used wheelchairs*, *needed help with their wheelchairs*, and *used other mobility support devices* were based on “Yes/No” responses to the following questions:

- Do you require a wheelchair to get around?
- Do you require the help of another person to get around in the wheelchair?
- Do you require mechanical support such as braces, a cane or crutches to be able to walk around the neighbourhood?

To estimate the percentage of people with a *disability*, responses to the following four items were considered:

- Do you have any difficulty hearing, seeing, communicating, walking, climbing stairs, bending, learning or doing similar activities?
- Does a long-term physical or mental condition or health problem reduce the amount or the kind of activity you can do:
 - ... at home?
 - ... at work or school?
 - ... in other activities, for example, transportation or leisure?

Respondents could choose “sometimes,” “often” or “never” to answer these questions. Those who replied “sometimes” or “often” to at least one item were categorized as disabled.

The percentage of people who needed *help with activities of daily living (ADL)* was based on at least one “Yes” response to these two questions:

- Do you need the help of another person ...
 - ... in personal care such as washing, dressing or eating?
 - ... in moving about inside the house?

The percentage of people who needed *help with instrumental activities of daily living (IADL)* was based on at least one “Yes” response to the following:

- Do you need the help of another person ...
 - ... in preparing meals?
 - ... in shopping for groceries or other necessities?
 - ... in doing normal everyday housework?

Data sources

Canadian Community Health Survey

Use of mobility support devices—that is, wheelchairs and other aids to mobility—in the Canadian household population was estimated with data from the first cycle of the Canadian Community Health Survey (CCHS).³ Cycle 1 was conducted between September 2000 and October 2001. The survey covers the population aged 12 or older who were living in private households at the time. It does not include people on Indian reserves, on Canadian Forces bases, or in some remote areas.

The overall response rate for cycle 1 was 85%; the total sample size was 131,535. All differences were tested to ensure statistical significance; that is, they did not occur simply by chance. To account for survey design effects, standard errors and coefficients of variation were estimated using the bootstrap technique.^{4,5}

Because of a different collection methodology, Statistics Canada’s *Participation and Activity Limitation Survey (PALS)* yields higher estimates of the use of mobility support devices than the CCHS. The CCHS asked respondents if they **required** mobility support devices to get around, but for PALS, screening questions were first asked to determine if respondents had a mobility limitation, which included restrictions such as an inability to stand for long periods. Those identified as having a limitation were asked about the use of aids or specialized equipment, including items not covered in the CCHS such as orthopedic footwear, grab bars and bathroom aids. More PALS information on the use of disability supports can be found at www.statcan.ca/english/freepub/89-581-XIE/free.htm.

National Population Health Survey

Use of mobility support devices among residents of health care institutions was estimated using the most recent data available: the 1996/97 National Population Health Survey institutional component. In all, 213 facilities were selected for the survey. Complete information was obtained for 2,118 residents, representing a response rate of 88.9%. Standard errors and coefficients of variation were estimated using a variance formula that accounted for the two-stage sampling design.

Table A
Use of mobility support devices, household population aged 12 or older, Canada

	Estimated population	Wheelchair		Other†		Total mobility support devices	
	'000	'000	%	'000	%	'000	%
Total	25,802	155.4	0.6	540.0	2.1	695.4	2.7
Males	12,705	69.2	0.5	216.7	1.7	285.9	2.3
Females	13,096	86.2	0.7	323.3	2.5*	409.5	3.1*
Age 12-44	14,867	39.8	0.3	49.9	0.3	89.7	0.6
Males	7,504	24.1 ^{E1}	0.3 ^{E1}	25.9	0.4	50.1	0.7
Females	7,363	15.7 ^{E1}	0.2 ^{E1}	23.9	0.3	39.6	0.5
Age 45-64	7,287	34.2	0.5[†]	123.0	1.7[†]	157.1	2.2[†]
Men	3,607	15.9	0.4	55.0	1.5	70.9	2.0
Women	3,680	18.3	0.5	67.9	1.9	86.2	2.3
Age 65-74	2,157	26.4	1.2[†]	99.5	4.6[†]	125.9	5.8[†]
Men	1,005	11.1	1.1	45.6	4.5	56.8	5.7
Women	1,152	15.3	1.3	53.9	4.7	69.2	6.0
Age 75-84	1,199	34.0	2.8[†]	175.0	14.6[†]	209.0	17.4[†]
Men	484	11.0 ^{E1}	2.3 ^{E1}	59.8	12.4	70.8	14.7
Women	715	23.0	3.2	115.1	16.1*	138.1	19.3*
Age 85+	292	20.9	7.2[†]	92.7	31.7[†]	113.6	38.9[†]
Men	106	7.1 ^{E2}	6.7 ^{E2}	30.3	28.6	37.3	35.3
Women	186	13.9 ^{E1}	7.4	62.4	33.5	76.3	40.9
Household income							
Low	890	14.6	1.6 [§]	33.3	3.7 [§]	47.9	5.4 [§]
Lower-middle	1,778	27.1	1.5 [§]	87.7	4.9 [§]	114.8	6.5 [§]
Middle	5,142	44.6	0.9 [§]	176.3	3.4 [§]	220.9	4.3 [§]
Upper-middle	8,172	29.6	0.4 [§]	116.5	1.4 [§]	146.0	1.8 [§]
High	7,074	21.6 ^{E1}	0.3 ^{§E1}	50.0	0.7 [§]	71.6	1.0 [§]
Province/Territory							
Newfoundland	461	3.7 ^{E2}	0.8 ^{E2}	8.6	1.9	12.4	2.7
Prince Edward Island	116	0.9 ^{E2}	0.8 ^{E2}	1.9	1.6 [§]	2.7	2.4
Nova Scotia	788	4.2 ^{E1}	0.5 ^{E1}	22.0	2.8 [§]	26.2	3.3 [§]
New Brunswick	634	3.8 ^{E1}	0.6 ^{E1}	12.3	1.9	16.1	2.5
Québec	6,231	22.8	0.4 [§]	106.1	1.7 [§]	128.9	2.1 [§]
Ontario	9,877	68.9	0.7 [§]	232.2	2.4 [§]	301.0	3.1 [§]
Manitoba	907	6.6 ^{E1}	0.7 ^{E1}	24.0	2.7 [§]	30.6	3.4 [§]
Saskatchewan	806	5.7 ^{E1}	0.7 ^{E1}	20.5	2.5 [§]	26.2	3.3 [§]
Alberta	2,482	13.8	0.6	38.9	1.6 [§]	52.7	2.1 [§]
British Columbia	3,422	24.9	0.7	72.3	2.1	97.2	2.8
Yukon	25	F	F	0.4 ^{E2}	1.8 ^{E2}	0.6 ^{E1}	2.4 ^{E1}
Northwest Territories	32	0.1 ^{E2}	0.3 ^{E2§}	0.4 ^{E1}	1.2 ^{E1§}	0.5	1.5 [§]
Nunavut	19	F	F	F	F	F	F

Data source: 2000/01 Canadian Community Health Survey

† Excluding those who also use wheelchair

 ‡ Significantly higher than younger age group(s) ($p < 0.05$)

 § Significantly different from estimate for total ($p < 0.05$)

 * Significantly higher than estimate for males ($p < 0.05$)

E1 Coefficient of variation 16.6% to 25.0%

E2 Coefficient of variation 25.1% to 33.3%

F Coefficient of variation greater than 33.3%

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INJURIES by Kathryn Wilkins and Evelyn Park

In 2000/01, an estimated 3.4 million Canadians aged 12 or older (13%) were seriously injured (Table A). That is, they sustained an injury severe enough to limit their usual activities—a broken bone, a sprain, a bad cut or burn, or a poisoning, for example. The Canadian Community Health Survey, a general health survey conducted by Statistics Canada between September 2000 and October 2001, asked respondents several questions about these types of injuries.

Overall, males were at higher risk than females: 15% of males reported sustaining at least one activity-limiting injury in the previous year, compared with 11% of females.

Higher among adolescents

Of all age groups surveyed, adolescents were the most likely to be injured. Over one in five young Canadians aged 12 to 19 had had a serious injury in 2000/01.

Although both males and females were at highest risk during adolescence, the injury rate was particularly high for boys. At 27%, the proportion of boys injured was over four times that for 65- to 79-year-old men, and over three times that for men aged 80 or older.

Differences by sex

Up to the senior years, males were more likely than females to be injured. Then, from age 65 on, the risk of injury became higher for women.

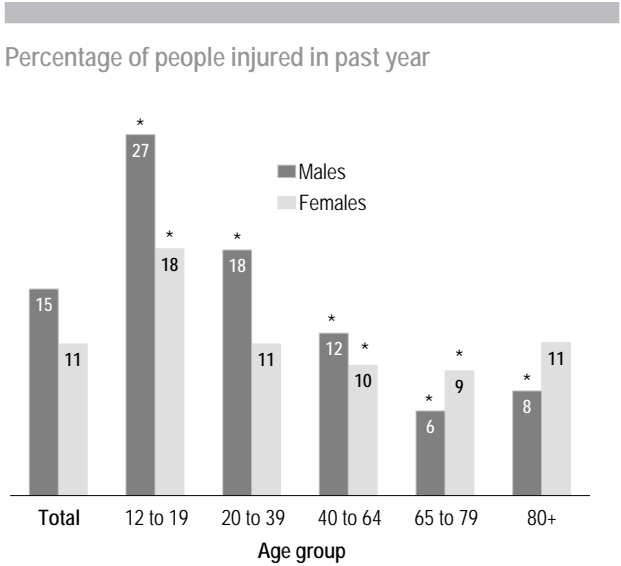
Among males, the injury rate decreased substantially with age until 80. By contrast, after their teens, the injury rate among women varied little. Women aged 20 to 39 were at the same risk of injury as elderly women (80 or older), and at only slightly higher risk than those in the 40 to 64 and 65 to 79 age groups.

Type and circumstances of injury

Sprains and strains were the leading type of injury for both sexes, followed by fractures (Table B). Males were most likely to injure either their wrist or hand; females, their ankle or foot.

Injuries to males were as likely to occur at an athletics facility (28%) as they were at home (26%). So it is not surprising that males were most often engaged in sports-related activities when they were injured.

For females, injuries at home were far more frequent (42%) than those sustained elsewhere. And injuries to females that happened while doing chores were more numerous than those that occurred during athletic pursuits. In fact, the rate of sports-related injury for males overall was more than double that for females: 5.4% compared with 2.6% (data not shown). This may reflect gender differences related to participation in sports, strenuous physical activity or risk-taking.



Data source: 2000/01 Canadian Community Health Survey
 * Significantly different from sex-specific value for total. Values between sexes differ significantly in all age groups ($p < 0.01$).

Risk varies with season

The risk of injury varies with the season, as activities and conditions change with the weather. Summer presented the highest risk of injury for both males and females aged 12 to 64, but seasonal variations were much more pronounced among males. Among seniors, however, the injury rate for women fluctuated more over the year than did the rate for men. Older women were most often injured during the winter months, while for older men, no significant seasonal differences emerged.

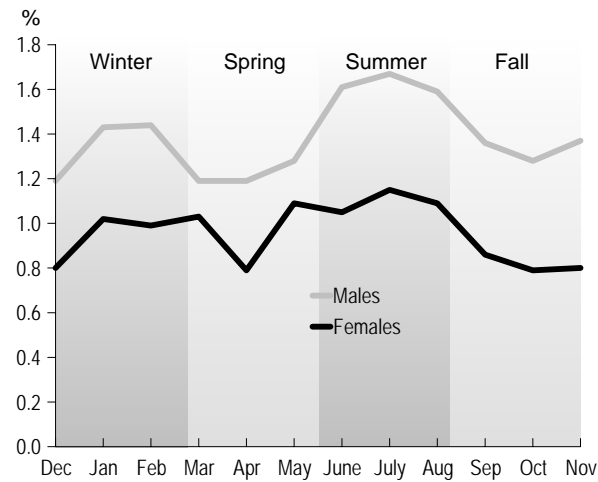
Falls cause most injuries

Falls were the leading cause of serious injury, accounting for 34% of injuries in males and 43% in females. For males, the risk of a fall-related injury was highest at ages 12 to 19. For females, the risk by age group was U-shaped; that is, women aged 80 or older and 12- to 19-year-old girls shared the same rate of fall-related injury.

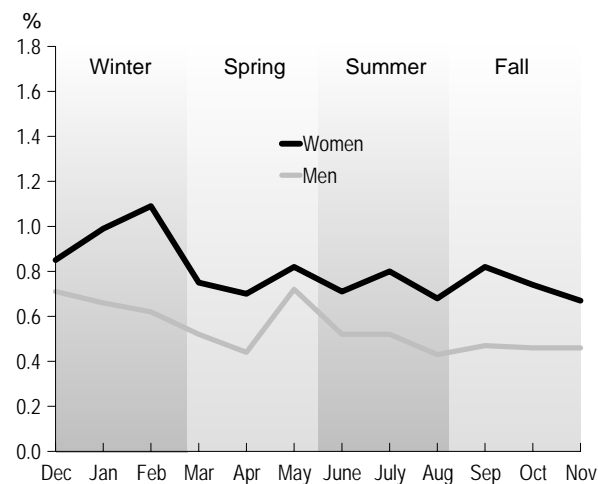
Slips on ice, snow perilous for seniors

For both seniors and younger people, slipping, tripping or stumbling (on a non-icy surface) was the leading cause of injurious falls. Reflecting the hazards of the Canadian winter, slipping on ice or snow also accounted for a substantial share of falls,

Percentage of people aged 12 to 64 injured in past year, by month of occurrence



Percentage of seniors (65+) injured in past year, by month of occurrence



Data source: 2000/01 Canadian Community Health Survey

and was especially perilous among seniors. In males younger than 65, over one-fifth of falls causing serious injury involved high-velocity sports: skating, skiing, snowboarding, in-line skating or skateboarding.

Risk lower in Québec, Nunavut

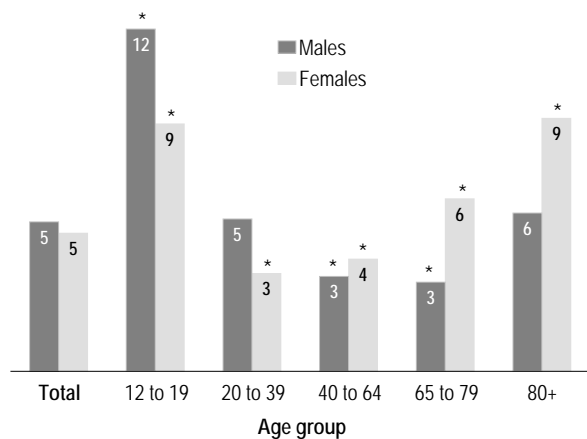
In 2000/01, the rates of serious injury in Nunavut (9%) and Québec (11%) were among the lowest in the country. Alberta recorded a high proportion of people reporting injury (18%).

Rates for adolescents—the most injury-prone age group among those surveyed—varied considerably by jurisdiction. Among the provinces, Québec had the lowest proportion of injuries among 12- to 19-year-olds; rates were higher in Saskatchewan and Alberta. The rate for Nunavut adolescents was strikingly lower than the rates for this age group in the rest of the country (data not shown).

Males — High income/high injury rate

Males who lived in the highest income households were more likely than Canadian males in general to sustain a serious injury in 2000/01. By contrast, males in the lower-middle category experienced a lower rate. This link between household income and injury among males may indicate a greater likelihood of participation in activities and sports that require fairly substantial expenses: lessons,

Percentage of people sustaining an injury caused by a fall



Data source: 2000/01 Canadian Community Health Survey
 * Significantly different from sex-specific value total.

Leading causes of falls . . .

. . . among people aged:	Percentage of falls		
	Total	Males	Females
12 to 64			
Slip or trip (not on ice)	42	40	46
Skating, skiing, snowboarding, inline skating	17*	22*	12*
From elevated position	13*	17*	8*
Slip or trip on ice or snow	13*	11*	16*
65 or older			
Slip or trip (not on ice)	53	43	57
Slip or trip on ice or snow	19*	22*	18*
Going up or down stairs	12*	15*	11*

Data source: 2000/01 Canadian Community Health Survey
 * Significantly different from total or sex-specific value for slip, trip (not on ice)

memberships in sports clubs, associations and fitness centres, for example, or skiing, snowboarding and hockey.

For females, injury rates did not differ significantly by household income.

Most treated, few hospitalized

About two-thirds (64%) of people who had a serious injury in 2000/01 sought treatment within 48 hours. More than half of those seeking treatment went to hospital emergency rooms, and about 1 in 5 to a doctor's office; only about 8% were admitted to and stayed overnight in a hospital (data not shown).

Deaths

Although most injuries are not fatal, according to the Canadian Mortality Database, 13,082 Canadians died from injury- and poisoning-related causes in 2000. This amounted to 6% of all deaths that year. The number of injury and poisoning fatalities for males (8,730) was twice that for females (4,352). Over one-quarter (28%) of these deaths were suicides; just under one-fifth (19%) were due to motor vehicle traffic crashes. Falls accounted for 13% of injury deaths.

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The Questions

The estimates of *serious*, or *activity-limiting*, injuries among Canadians aged 12 or older in 2000/01 are based on responses to questions in the Canadian Community Health Survey. Respondents were asked about injuries that occurred in the past year and that were serious enough to limit their normal activities. Several examples were given: "a broken bone, a bad cut or burn, a sprain, or a poisoning." Respondents were asked:

- Not counting repetitive strain injuries, in the past 12 months were you injured?
- Thinking about the most serious injury, in which month did it happen? Was that last year or this year?
- What type of injury did you have? (For example, a broken bone or burn.)
- What part of the body was injured?
- Where did the injury happen?
- What type of activity were you doing when you were injured?
- Was the injury the result of a fall?
- How did you fall?
- What caused the injury?
- Did you receive medical attention for this injury within 48 hours from a health professional?
- Where did you receive treatment?
- Were you admitted to a hospital overnight?

Data sources

Canadian Community Health Survey

Estimates of *activity-limiting injuries* were obtained from the first cycle of the Canadian Community Health Survey (CCHS), which was conducted between September 2000 and October 2001.¹ The CCHS is a general health survey that covers the population aged 12 or older who were living in private households. It does not include residents of Indian reserves, Canadian Forces bases, and some remote areas. The overall response rate for cycle 1 was 85%; total sample size was 131,535.

Estimates were weighted to represent the 2000 Canadian population aged 12 or older. Variance on estimates, and on differences between estimates, was calculated using the bootstrap technique, which accounts for the complex sampling design of the survey.^{2,3}

Canadian Mortality Data Base

Information on *deaths related to injury* was obtained from the 2001 Canadian Mortality Data Base. This data source, compiled from information provided by the vital statistics registrar in each province and territory, is maintained by Statistics Canada.

Table A

Percentage of people who sustained at least one activity-limiting injury in past year, by sex, household population aged 12 or older, Canada

	Total		Males		Females	
	'000	%	'000	%	'000	%
Total	3,441	13.3	1,966	15.5	1,475	11.3 [†]
Age group						
12-19	738	22.8*	448	26.9*	291	18.4*
20-39	1,320	14.8*	819	18.3*	501	11.3
40-64	1,077	10.8*	594	11.9*	483	9.6*
65-79	229	7.9*	82	6.3*	147	9.3*
80+	76	10.1*	22	7.8*	53	11.5
Season						
Spring (March, April, May)	802	3.1*	434	3.4*	368	2.8*
Summer (June, July, August) [‡]	973	3.8	565	4.5	408	3.1
Fall (September, October, November)	783	3.0*	468	3.7*	315	2.4*
Winter (December, January, February)	852	3.3*	483	3.8*	370	2.8*
Province/Territory						
Newfoundland	53	11.5*	33	14.7	20	8.4*
Prince Edward Island	15	12.7	8	13.7	7	11.8
Nova Scotia	107	13.6	58	15.2	50	12.2
New Brunswick	78	12.2*	43	13.8	35	10.7
Québec	689	11.1*	399	13.0*	290	9.2*
Ontario	1,297	13.1	733	15.1	564	11.2
Manitoba	122	13.5	70	15.8	52	11.3
Saskatchewan	127	15.8*	70	17.5	57	14.1*
Alberta	434	17.5*	254	20.4*	180	14.6*
British Columbia	509	14.9*	292	17.3*	218	12.6*
Yukon	4	14.8	2	15.2	2	14.4
Northwest Territories	4	13.7	3	18.8	1	8.2
Nunavut	2	8.5*	1	9.4*	1	7.5*
Household income						
Low	346	12.9	152	14.2	194	12.1
Lower-middle	631	12.3*	335	14.0*	296	10.7
Upper-middle	1,088	13.3	625	15.1	464	11.5
High	1,034	14.6*	666	17.2*	368	11.5

Data source: 2000/01 Canadian Community Health Survey

[†] Significantly different from estimate for men ($p < 0.05$)

[‡] Reference group

* Significantly different from value for total, or total in same sex where appropriate, or reference group ($p < 0.05$)

Table B

Characteristics and circumstances of injury, by sex, household population aged 12 or older who sustained at least one activity-limiting injury in past year, Canada

	Total		Males		Females	
	'000	%	'000	%	'000	%
Total	3,441	100.0	1,966	57.1	1,475	42.8 [†]
Type of injury						
Sprain/Strain [†]	1,467	42.7	802	40.9	665	45.1
Fracture	639	18.6*	351	17.9*	287	19.5*
Cut	453	13.2*	318	16.2*	135	9.2*
Body part						
Ankle/Foot	737	22.2*	367	19.3*	370	26.0*
Wrist/Hand [†]	671	20.2	419	22.1	251	17.6
Back	467	14.1*	270	14.2*	197	13.8*
Knee/Lower leg	419	12.6*	235	12.3*	185	12.9*
Mechanism						
Fall [†]	1,278	37.4	654	33.5	623	42.7
Exertion	696	20.4*	409	21.0*	286	19.6*
Sharp object	330	9.7*	237	12.2*	92	6.3*
Struck	292	8.5*	191	9.8*	101	6.9*
Transport-related	229	6.7*	110	5.6*	119	8.2*
Place						
Home	1,136	33.1*	515	26.3	621	42.3*
Athletics area [†]	796	23.2	556	28.4	241	16.4
Street	426	12.4*	191	9.8*	234	16.0
Construction/Industrial area	297	8.7*	274	14.0*	23	1.6*
Activity						
Sports [†]	1,025	29.9	689	35.2	336	22.9
Work	817	23.9*	585	29.9*	232	15.8*
Chores	603	17.6*	245	12.5*	358	24.4
Leisure	476	13.9*	237	12.1*	239	16.3*

Data source: 2000/01 Canadian Community Health Survey

[†] Reference group

* Significantly different from estimate for reference group in same sex ($p < 0.05$)

FOLIC ACID SUPPLEMENTATION by Wayne J. Millar

In 1999, the rate of open neural tube defects, the two most common of which are spina bifida and anencephaly, was 5.6 for every 10,000 births.¹ These defects occur in the first four weeks of pregnancy, usually before most women know they are pregnant.² The prevalence of open neural tube defects tends to be lower among children of women who have taken folic acid supplements around the time of conception.³⁻⁵

Folic acid is a B-vitamin that facilitates nucleic acid synthesis, which is necessary for normal cell replication. Naturally occurring folates are found in broccoli, spinach, Brussels sprouts, corn, legumes, and oranges.

If women relied only on dietary intake, a substantial proportion of the childbearing population would receive a lower level of folic acid than is recommended for preventing neural tube defects.⁶ A diet that conforms to Canada's Food Guide for Healthy Eating would provide about 0.2 milligrams of folic acid a day. The Society of Obstetricians and Gynaecologists of Canada recommends that women who could become pregnant should take a multivitamin containing 0.4 to 1.0 milligrams of folic acid every day, in addition to the amount that would be found in a healthy diet.⁷ Health Canada advises that daily folic acid supplementation be started at least two to three months before conception and continued throughout the first trimester.⁸

Less than half

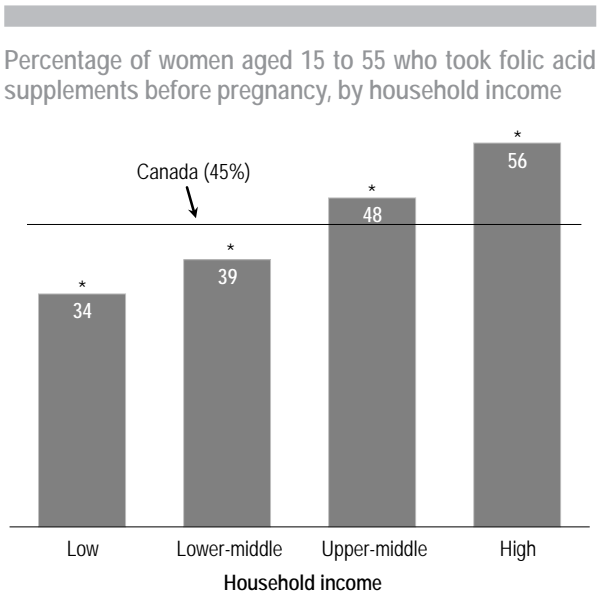
In 2000/01, as part of the Canadian Community Health Survey, women aged 15 to 55 who had given birth in the previous five years were asked questions about their pregnancy, including, "Did you take a vitamin supplement containing folic acid before your (last) pregnancy, that is, before you found out that you were pregnant?" Of the estimated 1.5 million women in this age range who had given birth, 45% reported that they had used vitamin supplements containing folic acid before their last pregnancy.

The older the mother, the more likely she was to have used folic acid supplements. The figure ranged from 33% among women aged 15 to 24 to 48% at age 30 or older.

Although unplanned pregnancies occur in all marital status groups, pregnancies among married women are more likely to be planned, and therefore, may be more likely to involve the use of folic acid supplements before conception.⁹ Close to half (48%) of women who were married had taken folic acid supplements, compared

with 31% who were not married.

Folic acid supplementation was associated with several socio-economic factors. Use tended to be higher among urban than rural mothers, and among those in higher-income households. Level of education was also associated with use, which was lowest among women with less than high school



Data source: 2000/01 Canadian Community Health Survey
 * Significantly different from rate for Canada (p < 0.05)

Use of folic acid supplements before pregnancy among women who gave birth in previous five years, 2000/01

	Estimated population	Took folic acid	
	'000	'000	%
Total	1,525	690	45
Age			
15-24	191	63	33*
25-29	375	163	43
30-55	960	465	48*
Marital status			
Married	1,296	620	48*
Not married	229	70	31*
Missing	F	F	F
Province/Territory			
Newfoundland	25	11	44
Prince Edward Island	7	3	43
Nova Scotia	43	22	50
New Brunswick	35	16	45
Québec	346	105	30*
Ontario	607	311	51*
Manitoba	55	25	46
Saskatchewan	51	22	43
Alberta	163	81	49*
British Columbia	184	91	49*
Yukon Territory	2	1	42
Northwest Territories	3	1	31*
Nunavut	3	1	41
Rural/Urban			
Rural	271	110	41*
Urban	1,254	580	46*
Household Income			
Low	229	78	34*
Lower-middle	367	145	39*
Upper-middle	505	242	48*
High	337	187	56*
Missing	88	38	43
Education			
Less than high school graduation	202	67	33*
High school graduation	313	132	42*
Some postsecondary	138	49	35*
College/University graduation	860	439	51*
Missing	F	F	F
Immigrant status			
Immigrant	357	150	42
Non-immigrant	1,162	539	46*
Missing	F	F	F

Data source: 2000/01 Canadian Community Health Survey

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

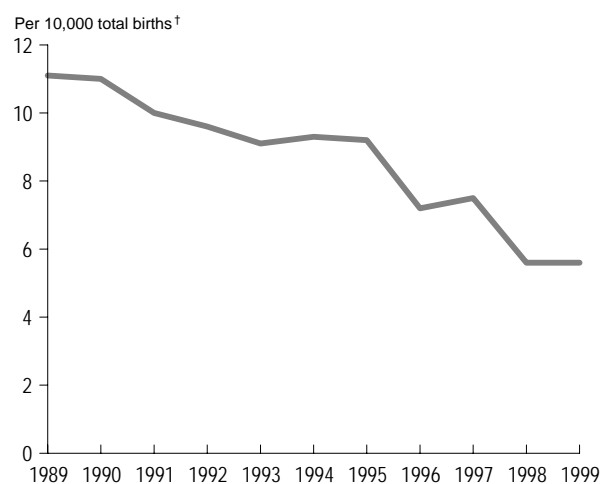
F Coefficient of variation greater than 33.3%

graduation, and highest among postsecondary graduates. The percentage of immigrant mothers who had used folic acid supplements was lower than the figure for those who were Canadian-born: 42% versus 46%.

Declining rates of neural tube defects

The 1999 level of open neural tube defects in Canada—5.6 per 10,000 births—was substantially lower than the rate of 11.1 per 10,000 in 1989.¹ Factors other than taking folic acid supplements probably contributed to this decline. Food fortification with folic acid is not likely involved, as it was not mandated in Canada until 1998. However, prenatal screening to detect congenital anomalies may have resulted in some women opting for therapeutic abortion.¹⁰ For instance, in England and Wales, the incidence of neural tube defects fell from 3.2 per 1,000 births in the early 1970s to 0.1 per 1,000 births in 1997. About 40% of this decline was attributed to prenatal screening and termination of pregnancy, with the remainder accounted for by a decline in incidence, that coincided with an increase in dietary folate.¹¹

Rate of neural tube defects, Canada, 1989 to 1999

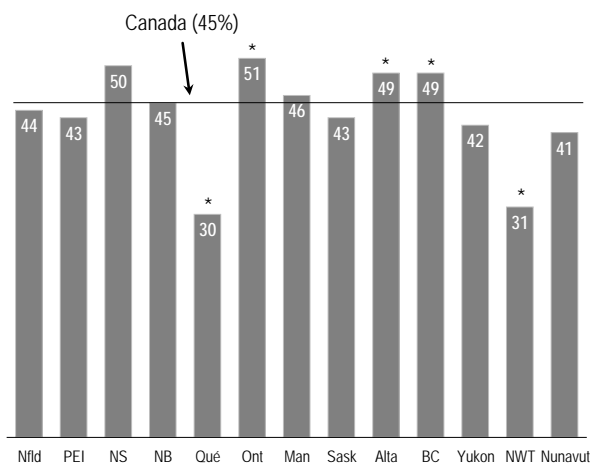


Data source: Health Canada, Canadian Congenital Anomalies Surveillance System

Note: Excludes Nova Scotia

† Live births and stillbirths

Percentage of women aged 15 to 55 who took folic acid before pregnancy, by province/territory



Data source: 2000/01 Canadian Community Health Survey
* Significantly different from rate for Canada ($p < 0.05$)

Provincial and territorial rates of folic acid supplementation varied from 30% in Québec and 31% in the Northwest Territories to 51% in Ontario. Rates in Alberta and British Columbia were also above the national level.

In Québec, where the reported use of folic acid supplementation is low, the rate of neural tube defects is relatively high.⁷ However, in Newfoundland, where the level of folic acid supplementation matches the national figure, the rate of neural tube defects is the same as in Québec.⁷

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Data source

Use of vitamin supplements containing folic acid before pregnancy was estimated using data from the first cycle of the Canadian Community Health Survey (CCHS), which was conducted from September 2000 to October 2001.¹² The survey covers the population aged 12 or older who were living in private households at the time. It does not include residents of Indian reserves, Canadian Forces Bases, or some remote areas. The response rate for the first cycle was 85%; the total sample size was 131,535.

All differences were tested to ensure statistical significance; that is, they did not occur simply by chance. To account for survey design effects, standard errors and coefficients of variation were estimated using the bootstrap method.¹³⁻¹⁵ A significance level of $p < 0.05$ was applied in all cases.

The information about the use of folic acid supplements is based on a sample of 7,875 women aged 15 to 55 who had given birth in the previous five years, representing a population of 1.5 million women. The survey did not ask the women if they had planned their pregnancy or about their knowledge of folic acid. No information is available about the dosage of folic acid or the frequency of use. The percentage of women taking folic acid may be underestimated, because some women may not know that multivitamins contain it.

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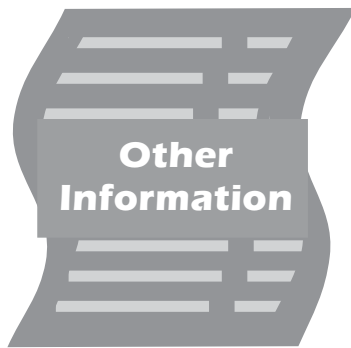
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