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Suicides Among Canadian Farm Operators

William Pickett, Will D King, Taron Faelker, Ronald EM Lees, Howard I Morrison and Monica Bienefeld

Abstract

The objective of this epidemiologic study was to describe rates of suicide among male farm operators in Canada and to compare rates with those in the general male population. The data were obtained from the Canadian Farm Operator Cohort (CFOC) database. Outcome measures were age-specific and age-standardized rates of completed suicide (ICD-9-CM E-codes 950–959). A total of 1,457 cases of suicide were identified from the CFOC for the years 1971–1987. Age-standardized rates of suicide for those aged 30–69 were 29.2 (95% CI = 27.3–31.1) per 100,000 person-years (PYs) in the CFOC, 24.0 (95% CI = 22.1–25.8) per 100,000 PYs in the CFOC excluding Quebec (which had data linkage concerns) and 27.0 (95% CI = 26.6–27.3) per 100,000 PYs among Canadian males in general. Age-specific rates of suicide in the CFOC increased over time. After adjustment for age differences, provincial suicide rates among farm operators were generally lower than or equivalent to those observed in the comparison populations of Canadian males. The implications of these results are discussed. We speculate that high levels of social support traditionally available in Canadian farm communities may protect farm operators from abnormally high rates of suicide.

Key words: agriculture; Canada; farm; suicide; wounds and injuries

Introduction

It is widely believed that farm operators are at high risk for a number of stress-related disorders, including suicide.¹ Although some descriptive studies in the scientific literature support this belief,^{2–7} epidemiologic studies describing farm suicide rates and comparing them with rates in the general population are rare. Only one existing Canadian study⁷ was found in a review of the current biomedical literature. That study concluded that rates of suicide among Ontario farmers were lower than those in the general population. In contrast, studies from Kentucky^{2,4,6} and other states in the north-central and mid-western areas of the United States^{3,5} have reported higher rates of suicide among farmers than in the general population.

In the early 1990s, researchers at Health Canada and Statistics Canada assembled a cohort of Canadian male farm operators. This included 326,256 people who reported to the 1971 Canada Census of Agriculture. We had the opportunity of using this powerful and unique database to explore patterns of farm suicide in Canada from 1971 to 1987. Specific objectives were to describe rates of farm suicide and identify trends in these rates by time, age and province, and to compare age-standardized rates of suicide among farm operators with rates reported in the Canadian male population. It was our hope that this basic, epidemiologic analysis would contribute to the development and targeting of suicide prevention efforts in rural Canada.

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Methods

The Canadian Farm Operator Cohort (CFOC)

Statistics Canada assembled the cohort of 326,256 male Canadian farm operators by linking records from the 1971 Census of Agriculture,⁸ the 1971 Central Farm Register⁹ and the 1971 Census of Population.¹⁰ Information on all deaths in the cohort during the period 1971–1987 was then obtained through linkage to the Canadian Mortality Database.¹¹ The distribution of this cohort by province and age group is shown in Table 1 for 1971 (time of assembly), 1987 (end of follow-up) and the full study period (1971–1987). The table provides basic information about the size of the cohort and its subgroups as well as attrition within the cohort over time.

The database contains demographic, operational (farm) and mortality data on all Canadian farmers who owned and/or operated a farm in 1971 and responded to the 1971 Census of Agriculture. It has been used to investigate associations between specific agricultural exposures and various types of cancer, including possible environmental causes of non-Hodgkin's lymphoma,^{12,13} prostate cancer¹⁴ and leukemia,¹⁵ but has not been applied widely to the epidemiologic study of other outcomes, such as injury and suicide mortality.

Data Analysis

All members of the CFOC whose deaths were classified as completed suicides (ninth revision of the International Classification of Diseases, Clinical Modification [ICD-9-CM] E-codes 950–959¹⁶) were identified for study.

Age-specific rates of completed suicide within the cohort and associated 95% confidence intervals were calculated by 10-year age group for the full study period (1971–1987) and for three specific subperiods (1971–1975, 1976–1981 and 1982–1987), chosen to give roughly equivalent intervals. Numerators for the rates came from the CFOC; denominators were person-years (PYs) of life within strata during each of the time periods. The latter were also derived from the cohort. Confidence intervals were based on the normal approximation to the binomial.¹⁷

Age-specific rates of completed suicide for the general population of Canadian males (ages 20+) were also calculated. Published counts and rates of suicide were available for each year from a national Task Force document¹⁸ and were used to derive person-years at risk for each age

group by year as well as age-specific rates and associated confidence intervals for the 1971–1987 period.

For the individual provinces and the country as a whole, age-standardized rates of completed suicide were calculated for both the farm cohort and the general male population, using the direct method of standardization.¹⁹ (Although previous analyses with the CFOC^{12,15} have used indirect approaches to standardization, this method was not followed because of our desire to present and compare individual results for each of the 10 provinces.)

In addition, the CFOC was a closed cohort that aged over time, whereas the general population represented an open cohort with a relatively stable age distribution. Because of this, our analyses were restricted to persons aged 30–69 in order to make the two study populations more comparable. There were also a priori concerns about the quality of the data linkage with the province of Quebec.²⁰ National rates of suicide were therefore derived both with and without that province being included in the calculations. The 1971 Canadian population of males, 20–69 years,¹⁰ was used as the standard age structure in all of these calculations.

TABLE 1
Distribution of the Canadian Farm Operator Cohort and of suicides in the cohort, by province and age

Province	Person-years			Suicides	
	1971–1987 (n = 5,052,114)	1971 (n = 325,485)	1987 (n = 258,522)	1971–1987	
	%	%	%	n	(%)
CANADA (10 provinces)	100.0	100.0	100.0	1,457	(100.0)
Newfoundland/ Labrador	2.6	0.3	0.3	1	(0.1)
Nova Scotia	1.6	1.7	1.6	11	(0.8)
Prince Edward Island	1.3	1.3	1.3	11	(0.8)
New Brunswick	1.5	1.5	1.5	14	(1.0)
Quebec	16.3	16.8	15.3	382	(26.2)
Ontario	25.9	25.9	25.8	344	(23.6)
Manitoba	9.8	9.7	9.9	114	(23.6)
Saskatchewan	21.4	21.1	21.7	259	(7.8)
Alberta	17.4	17.1	17.7	259	(17.8)
British Columbia	4.9	4.9	5.0	62	(4.3)
Age group (years)					
20–29	2.1	7.3	0.0	18	(1.2)
30–39	10.4	18.1	1.4	156	(10.7)
40–49	21.5	27.6	13.5	310	(21.3)
50–59	28.1	26.9	25.2	473	(32.5)
60–69	23.7	15.5	30.7	316	(21.7)
70+	14.1	4.8	29.1	184	(12.6)

Calculation of the age-standardized rates for the CFOC was done in the following manner. Age-specific rates per 100,000 PYs (five-year age groups, ages 30–69) were calculated for the total study period (1971–1987) and the three subperiods. These age-specific rates were then applied to the demographic structure of the standard population. Age-standardized rates were calculated for Canada (with and without Quebec) and for each province individually. For the comparison population (Canadian males, ages 30–69), age-specific rates of suicide for 1971–1987 were derived from suicide counts and rates published in the Canadian Task Force document.¹⁸

Summary age-specific rates were then calculated for each five-year age group, and these age-specific rates were applied to the demographic structure of the standard population. Confidence intervals for both sets of standardized rates were calculated according to procedures outlined by Breslow and Day.¹⁹

Results

A total of 1,457 cases of suicide were identified from the CFOC for the years 1971 through 1987. The distribution of these suicides by province is outlined in Table 1.

Table 2 provides age-specific rates of suicide in the CFOC and the general male population in Canada. Within the farm operator cohort, modest increases in rates of suicide were observed in some of the 10-year age groups between 1971–1975 and 1976–1981. The largest increases in rates occurred in those aged 70 and over. This age group is unique within the cohort because it is open at the top end of the age distribution. This means that the group became progressively older over time and would include more farmers who were retired from operating their farm on an active basis. Between the second (1976–1981) and third (1982–1987) subperiods, the age-specific rates were equivalent in all age groups, with the exception of the 40–49 and 60–69 groups, which continued to show higher suicide rates.

Age-specific rates for the entire 1971–1987 period are also given for the CFOC and the general population (Table 2). Although there was some variation in these rates between the CFOC and the general population, they were generally consistent.

Table 3 presents directly standardized rates of suicide for the CFOC and the general Canadian male population aged 30–69 years; the rates are provided for each province and the country as a whole (with and without Quebec). Age-standardized rates are also provided for

TABLE 2
Age-specific rates of suicide (per 100,000 person-years) in the Canadian Farm Operator Cohort (CFOC) and the general Canadian male population

Age group (years)	CFOC: Rate (and confidence interval [CI])			1971–1987: Rate (and CI)	
	1971–1975	1976–1981	1982–1987	CFOC	CANADA
20–29	15.9 (7.3–24.6)	22.8 (2.8–42.7)	0.0 ^a	17.0 (9.1–24.8)	28.4 (27.8–28.9)
30–39	18.1 (12.9–23.3)	42.2 (33.1–51.3)	37.6 (23.1–52.0)	29.7 (25.0–34.3)	24.6 (24.0–25.2)
40–49	19.5 (15.3–23.7)	29.4 (24.0–34.7)	41.1 (33.5–48.7)	28.5 (25.3–31.7)	27.4 (26.7–28.1)
50–59	30.5 (25.4–35.7)	33.0 (28.1–37.9)	36.4 (30.8–42.0)	33.3 (30.3–36.3)	29.6 (28.9–30.4)
60–69	22.4 (17.0–27.9)	24.4 (19.8–29.0)	30.6 (25.6–35.6)	26.4 (23.5–29.3)	26.8 (25.9–27.6)
70+	9.5 (3.6–15.4)	27.3 (20.6–34.0)	29.4 (23.9–34.9)	25.8 (22.1–29.5)	24.3 (23.4–25.2)

^a No suicides and small numbers of person-years observed in this stratum

the CFOC within the three subperiods. With the exception of Quebec, provincial suicide rates in the farm operator cohort were lower than or equivalent to those in the general population of Canadian males. When Quebec was included in the calculation of the overall Canadian rate, the CFOC rate was slightly higher than that observed in the general population, and when Quebec was excluded, the rate was slightly lower. General rates of male suicide in Quebec were quite comparable with the remainder of the Canadian population. In contrast, Quebec rates of suicide from the CFOC were high in 1971–1975 relative to the rest of Canada, and this disparity increased over time (data not shown).

Discussion

This epidemiologic analysis presents rates of suicide in the Canadian population of male farmers. It also provides a comparison of directly standardized farm suicide rates with suicide rates in the general population of Canadian males.

Two important findings are indicated by our analysis. The first is that all age-specific rates of suicide within the farm operator cohort increased or remained steady between the first and last time periods studied. Similar increases were not observed in the comparison population of Canadian males.¹⁸ The second finding is that, after adjustment for age differences among groups, provincial rates of suicide among members of the CFOC were lower or equivalent to those observed in the general male population. This was true for 9 of the 10 provinces; the only exception was the province of Quebec, which showed high rates of suicide among farmers compared with the general population.

There is some concern among the researchers who assembled the CFOC about the quality of data for Quebec,²⁰ mainly because its data linkage was done separately from the rest of the provinces, and the number of Quebec suicides that were falsely identified from the Canada Mortality Database was expected to be higher than elsewhere. This is because the pool of surnames found in Quebec is smaller than in other provinces, and there is a higher probability of a false data linkage when the linkage procedures use surnames. This situation may very well have contributed to artificially high rates of suicide in Quebec, and we recognize this as an important caveat that must be considered when interpreting the results.

Temporal Trends

Trends suggesting increasing rates of farm suicide between the early and later years of the study, a pattern not observed in the general population,¹⁸ could be an artifact of changing practices in the classification of suicides. For example, there may be times when investigating coroners or medical examiners are reluctant to classify a suspicious death as a completed suicide. If this reluctance changes over time, then the trends might be explained by a temporal change in suicide classification. We consider this to be unlikely. Although suicides, in general, are perpetually under-reported, there is no evidence in the biomedical literature to suggest that under-reporting varied between urban and rural regions of Canada from 1971 to 1987. In a survey of attitudes of Ontario coroners toward suicide certification,²¹ 33% of 183 respondents were “reluctant to certify a death as a suicide,” primarily because of concerns about the emotional impact on the family. This self-reported reluctance did not vary between urban and rural areas.

Another possible explanation for the temporal increases in farm suicide is a variation on what has been labelled the “healthy worker effect.”²² The healthy worker effect suggests that members of a working cohort are more likely to be healthy than are members of the general population, some of whom are not working. For example, rates of clinical depression, which could lead to suicide, might be less prevalent in groups of working people. By definition, all members of the farm operator cohort were employed at the initiation of follow-up in 1971. The low risks for suicide observed in the cohort during the earliest follow-up period are consistent with this effect. During the latter follow-up periods, CFOC

TABLE 3
Comparison of provincial, age-standardized rates^a of suicide in the Canadian Farm Operator Cohort (CFOC) with the general Canadian male population, ages 30–69, 1971–1987

Geographic region	CFOC: Rate (and confidence interval [CI])			1971–1987: Rate (and CI)	
	1971–1975	1976–1981	1982–1987	CFOC	CANADA
Newfoundland/ Labrador	0.0	0.0	0.0	0.0	12.4 (10.8–14.1)
Nova Scotia	7.9 (0.0–16.8)	5.9 (0.0–14.1)	16.4 (0.0–36.9)	8.7 (2.2–15.3)	25.6 (23.7–27.4)
Prince Edward Island	23.5 (0.0–50.4)	20.6 (1.6–39.6)	3.2 (0.0–9.5)	19.2 (3.4–34.9)	29.1 (23.8–34.4)
New Brunswick	8.6 (0.0–18.3)	30.5 (0.0–64.2)	3.5 (0.0–8.4)	15.7 (2.2–29.2)	26.2 (24.1–28.3)
Quebec	29.5 (22.1–36.9)	64.3 (51.7–76.8)	77.9 (61.0–94.8)	54.8 (48.1–61.5)	28.1 (27.4–28.8)
Ontario	23.6 (18.4–28.8)	27.6 (21.3–33.8)	28.2 (15.9–40.5)	26.2 (22.6–29.8)	25.4 (24.9–26.0)
Manitoba	20.1 (13.2–26.9)	22.9 (14.2–31.6)	31.0 (9.6–52.5)	21.8 (16.9–26.7)	27.2 (25.5–28.9)
Saskatchewan	16.6 (12.1–21.0)	23.9 (17.4–30.3)	25.4 (18.7–35.8)	21.8 (18.4–25.2)	28.0 (26.2–29.8)
Alberta	22.7 (16.4–28.9)	29.7 (22.6–36.8)	27.8 (19.8–35.8)	27.5 (23.3–31.8)	31.3 (30.0–32.5)
British Columbia	17.6 (8.7–26.5)	22.8 (12.3–33.2)	19.3 (7.9–30.6)	19.5 (13.9–25.1)	28.8 (27.7–29.8)
CANADA (10 provinces)	22.1 (19.6–24.7)	32.5 (29.1–36.0)	34.8 (29.7–39.8)	29.2 (27.3–31.1)	27.0 (26.6–27.3)
Canada, excluding Quebec	20.5 (17.9–23.1)	25.9 (22.6–29.2)	26.4 (21.4–31.4)	24.0 (22.1–25.8)	26.5 (26.1–26.9)

^a Per 100,000 person-years; age-standardized using the 1971 Canadian male population (aged 30–69) as the standard

members may have exited the work force because of retirement, illness or economic downturn. Thus, the healthy worker effect would not influence latter follow-up intervals to the same degree, and suicide rates in this cohort would be expected to increase with length of follow-up.

There is also some possibility that the study exposure (being a farm operator) could be classified incorrectly for members of the CFOC, and this could bias the results that were observed. Farmers who were initially included for 1971 may have left farming as an occupation in the years that followed. They could also have been working off the farm on a part-time basis during some time intervals. In our analysis, suicides in this subgroup would have been included in the farm operator deaths, which would inflate the calculated farm suicide rates. Conversely, suicides among male Canadians who became farm operators between 1971 and 1987 would not be included. In the absence of information about movement in and out of the Canadian agricultural work force, it is not possible to quantify the extent of any bias that arose from this situation.

Farm Operator Versus General Suicide Rates

It is clear from this study that, with the exception of Quebec, provincial rates of suicide in the CFOC were lower than or equivalent to those observed in the general population. Also, when Quebec data were excluded from the overall Canadian analysis, a slightly lower rate was observed in the CFOC.

There are legitimate reasons why farm suicide rates may be lower than those observed in the general population. Studies in the United States show that, with the exception of cases of death by firearms, suicide rates are greatest in the largest cities, lower in smaller cities and lowest in rural areas.²³ The vast majority of the Canadian population live in urban areas, and, if the US pattern holds for Canada, the overall Canadian rate may be weighted by high urban suicide statistics.

As well, existing social theories suggest that rates of suicide vary inversely with the stability and durability of social relationships within populations.²⁴ Absent or inadequate social support mechanisms are known risk factors for suicide.¹⁸ Farm populations in Canada have experienced economic uncertainty and crises during the past two decades, and the latter is a risk factor for suicide ideation and completion.¹⁸ We would argue that, when compared with their urban counterparts, farmers in most parts of rural Canada belong to communities that are exceptionally supportive in times of need. Social disintegration is thus minimized during times of crisis, and this is reflected in the lower suicide rates.

It is also possible that the slightly lower rates of farm suicide observed are reporting artifacts, explained by differential under-reporting of farm suicides by coroners and medical examiners when compared with their reporting practices for other groups of Canadians. Again, although this theory has arisen in past studies of suicide, there is no evidence in the published biomedical literature that this explanation is responsible for the observed differences.

Further Study

In this study we were able to document trends in farm suicides over only 17 years, which is a relatively short period in which to elucidate temporal trends. Additional surveillance is required to confirm these patterns of suicide in this and other farm populations (for example, among women, children, hired workers and others on farms). The CFOC was created as a male cohort because of the demographic structure of the farm operator population in 1971, and our results are necessarily limited by this restriction. Health risks to female farm operators and other women on Canadian farms are not well understood, and further study of farm suicide in this important population is warranted. Nor does the present study address societal conditions or personal and other etiologic factors that have been shown to lead to variations in suicide rates within other populations—for example, social or geographic isolation, poverty and economic crisis.¹⁸

Initial research with the CFOC shows that single marital status, lower levels of education and being the sole occupant of a household are important risk factors for farm suicide.²⁵ Findings from more definitive epidemiologic studies are required to form the basis of a better understanding of the root causes of suicide on Canadian farms.

Acknowledgements

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Mortality Attributable to Tobacco Use in Canada and its Regions, 1994 and 1996

Eva M Makomaski Illing and Murray J Kaiserman

Abstract

Using data from the National Population Health Survey and the Canadian Mortality Database, we applied the Smoking-Attributable Mortality, Morbidity and Economic Cost method to estimate national and regional smoking-attributable mortality for 1994 and 1996. The results indicate that 29,229 men and 15,986 women died in 1996 as a result of smoking, including 105 children under the age of 1. This total of approximately 45,200 deaths represents an increase of 3,807 deaths since 1991, of which 2,445 occurred in women. The increase in female mortality is almost entirely due to adult diseases, divided between cancers (1,026), cardiovascular diseases (743) and respiratory diseases (870).

Key words: Canada; mortality; smoking; tobacco

Introduction

In the past, Health Canada has calculated smoking-attributable mortality (SAM) for the survey years of 1985,¹ 1989^{2,3} and 1991⁴ using a modification of the Smoking-Attributable Mortality, Morbidity and Economic Cost (SAMMEC) method.⁵ The SAMMEC method, with its potential for estimating SAM for 26 categories known to be attributable to cigarette smoking, is considered to be one of the most reliable methods available. Since 1991, new smoking behaviour data for 1994⁶ and 1996⁷ have become available. The purpose of the present report is to update this earlier work and to determine whether SAM estimates have changed nationally and regionally.

Data Sources

For both 1994⁸ and 1996,⁹ mortality data on 22 adult smoking-related diseases and four pediatric diseases linked with maternal smoking were drawn from the Canadian Mortality Database, maintained at the Health Statistics Division, Statistics Canada. Deaths were categorized by diagnosis, region, sex and five-year age group for persons aged 35–64 and 65 or over, and infants aged less than 1 year. Diagnoses were designated by code from the ninth revision of the International Classification of Diseases.

Data on fire deaths caused by smokers' material, which includes cigarettes, cigars, pipes, matches and lighters, were obtained from the *1994 Annual Report of Fire Losses in Canada*,¹⁰ classified by region and sex (unpublished provincial tabulations were provided through the courtesy of Human Resources Development Canada). For 1996, information on fire deaths due to smoking was not available (at the time of writing this report) and was not included in our 1996 SAM calculations.

Calculation of SAM required smoking prevalence rates for adults 35 years of age or older and for women of childbearing age (15–44 years). Current, former and never smoker rates for 1994 and 1996 by region (province), sex and age group were obtained from the National Population Health Survey (NPHS) 1994/95⁶ and the NPHS 1996/97.⁷

The NPHS is a longitudinal household-based survey conducted every two years by Statistics Canada. The survey is designed to collect information about health status and health determinants, including health behaviour, use of health services and sociodemographic information. The target population of the NPHS is household residents in all provinces and territories, except persons living on Indian reserves, on Canadian

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Forces bases or in some remote areas of Ontario and Quebec.

Prevalence rates of current smokers aged 35 and older married to non-smokers were not available in either NPHS. Rates were obtained from the Survey on Smoking in Canada 1994/95, cycle 3,¹¹ and were used to calculate passive smoking deaths for both 1994 and 1996.

Diagnosis-specific relative risks for smoking-related diseases¹² were determined from the Cancer Prevention Study II (CPS-II) of the American Cancer Society and were previously presented in Collishaw and Leahy's 1989 report.² These relative risk estimates were based on a four-year follow-up study, from 1982 to 1986, of 1.2 million entrants in the CPS-II and were used to calculate regional SAM. The relative risks obtained were those for current and former smokers aged 35–64 and 65 or over by diagnosis and sex.

Methods

The Canadian mortality data^{8,9} and smoking prevalence rates^{6,7} for 1994 and 1996, combined with the CPS-II relative risks,¹² provide the basis for the smoking-related mortality estimates presented in this report. These estimates were calculated according to methods presented in Makomaski Illing and Kaiserman's 1991 report.⁴

Results

The 1996 results will be discussed in detail throughout this paper, but the 1994 estimates will be presented only in tables and figures. Total SAM estimates, by disease and region, are provided in Tables 1A (males) and 1B (females) for 1994 and in Tables 2A (males) and 2B (females) for 1996.

Overall, 29,229 males and 15,986 females died of smoking-attributable causes in 1996, including 63 boys and 42 girls under the age of 1. Cancers accounted for 17,703 of the total number of such deaths, cardiovascular diseases accounted for another 17,762 and respiratory diseases for the remaining 9,498 deaths.

Figure 1 shows the proportions of smoking-related deaths in 1996, by disease category, among 29,166 men, 15,944 women and 105 children (of both sexes). Of these deaths, lung cancer caused 8,973 (31%) male deaths and

TABLE 1A
Smoking-attributable mortality (SAM) estimates for current and former smokers, by disease category and region, MALES, Canada, 1994

Disease category	ICD-9 code	MALES: SAM BY REGION					
		Canada	Atlantic	Quebec	Ontario	Prairies	BC
ADULT DISEASES (35+ years)		29,657	3,024	8,467	10,251	4,528	3,386
<i>Cancers</i>		11,895	1,168	3,722	4,105	1,575	1,326
Lip, oral cavity, pharynx	140–149	646	54	204	231	76	81
Esophagus	150	673	63	138	271	105	96
Pancreas	157	405	33	130	139	57	45
Larynx	161	352	28	133	110	40	41
Trachea, lung, bronchus	162	9,004	912	2,891	3,064	1,177	960
Cervix uteri	180	N/A	N/A	N/A	N/A	N/A	N/A
Urinary bladder	188	450	38	123	173	62	53
Kidney, other urinary	189	365	40	102	116	57	50
<i>Cardiovascular diseases</i>		12,005	1,235	3,174	4,166	2,022	1,408
Rheumatic heart disease	390–398	44	3	14	13	8	7
Hypertension	401–405	148	13	31	58	28	16
Ischemic heart disease	410–414						
Ages 35–64		2,609	246	823	932	375	231
Ages 65+		4,300	434	1,093	1,565	691	517
Pulmonary heart disease	415–417	103	10	29	27	23	14
Other heart disease	420–429	1,423	180	378	381	291	193
<i>Cerebrovascular disease</i>	430–438						
Ages 35–64		417	48	115	134	66	54
Ages 65+		1,389	138	324	479	248	201
Atherosclerosis	440	432	34	89	179	89	39
Aortic aneurysm	441	810	86	194	283	148	99
Other arterial disease	442–448	331	44	84	114	54	35
<i>Respiratory diseases</i>		5,578	622	1,571	1,981	931	653
Respiratory tuberculosis	010–012	20	2	5	8	4	1
Pneumonia/influenza	480–487	1,193	123	220	443	221	185
Bronchitis/emphysema	491–492	799	70	292	220	129	88
Asthma	493	61	8	10	16	16	11
Chronic airways obstruction	496	3,685	418	1,043	1,294	562	367
PEDIATRIC DISEASES (<1 year)		90	6	21	34	21	8
Low birth weight	765	21	1	4	10	4	1
Respiratory distress syndrome	769	16	1	6	5	3	1
Respiratory conditions—newborn	770	16	2	3	8	3	1
Sudden infant death syndrome	798.0	35	2	8	10	11	4
FIRE DEATHS (all ages)		29	3	0	12	7	7
PASSIVE SMOKING DEATHS ^{a,b}		215	25	92	79	10	9
TOTAL		29,991	3,059	8,580	10,376	4,566	3,410

^a Deaths due to ETS (environmental tobacco smoke) were calculated using $rr_{ets} = 1.3$ and prevalence of current smokers, aged 35+, married to non-smokers, taken from SOSIC 1994/95, cycle 3 (Reference 11).

^b The estimates presented here include only lung cancer mortality from exposure to second-hand smoke. It is recognized that exposure to second-hand smoke is associated with other diseases, including heart disease and breast cancer. Until authoritative, consensus-based relative risks are made available, estimates of mortality remain unavailable.

4,519 (28%) female deaths, while ischemic heart disease caused 6,441 (22%) male deaths and 3,137 (22%) female deaths.

In 1996, 111,405 males and 101,476 females died of all causes in Canada; the top three leading causes of death in both men and women were cancer, heart disease and cerebrovascular disease.¹³ Overall, 21% of these deaths were attributable to smoking in 1996.

Cigarette smoking, the primary risk factor for the top three causes of death,⁴ was estimated to be responsible for 26% of all male deaths and 16% of all female deaths

TABLE 1B
Smoking-attributable mortality (SAM) estimates for current and former smokers,
by disease category and region, FEMALES, Canada, 1994

Disease category	ICD-9 code	FEMALES: SAM BY REGION						TOTAL SAM
		Canada	Atlantic	Quebec	Ontario	Prairies	BC	M+F
ADULT DISEASES (35+ years)		15,287	1,455	3,966	5,484	2,311	2,071	44,945
<i>Cancers</i>		5,523	476	1,472	2,002	808	766	17,418
Lip, oral cavity, pharynx	140-149	175	15	43	61	26	31	820
Esophagus	150	230	15	55	91	31	38	902
Pancreas	157	522	54	134	185	81	68	927
Larynx	161	80	6	31	24	9	10	432
Trachea, lung, bronchus	162	4,148	349	1,107	1,508	603	580	13,151
Cervix uteri	180	144	11	33	52	32	17	144
Urinary bladder	188	167	20	51	62	17	16	617
Kidney, other urinary	189	58	6	17	18	10	6	423
<i>Cardiovascular diseases</i>		6,228	644	1,634	2,183	963	803	18,233
Rheumatic heart disease	390-398	69	5	24	21	10	9	113
Hypertension	401-405	145	17	41	50	25	13	293
Ischemic heart disease	410-414							
Ages 35-64		615	65	183	245	78	45	3,223
Ages 65+		2,588	242	719	882	387	358	6,889
Pulmonary heart disease	415-417	87	7	23	27	17	12	189
Other heart disease	420-429	1,012	137	265	278	176	156	2,435
Cerebrovascular disease	430-438							
Ages 35-64		338	28	97	120	61	34	755
Ages 65+		465	58	106	138	77	86	1,854
Atherosclerosis	440	443	31	73	253	55	31	875
Aortic aneurysm	441	270	30	55	97	45	42	1,081
Other arterial disease	442-448	196	25	49	72	32	17	527
<i>Respiratory diseases</i>		3,536	335	861	1,299	540	502	9,294
Respiratory tuberculosis	010-012	8	2	2	3	1	1	28
Pneumonia/influenza	480-487	1,093	116	203	437	179	158	2,286
Bronchitis/emphysema	491-492	410	30	130	119	68	63	1,209
Asthma	493	72	7	16	27	9	13	133
Chronic airways obstruction	496	1,954	180	511	714	282	267	5,639
PEDIATRIC DISEASES (<1 year)		60	5	13	23	14	6	150
Low birth weight	765	18	1	3	8	5	1	39
Respiratory distress syndrome	769	12	2	3	3	2	2	28
Respiratory conditions—newborn	770	12	1	2	5	3	2	30
Sudden infant death syndrome	798.0	18	1	4	6	5	2	53
FIRE DEATHS (all ages)		12	0	0	9	3	0	41
PASSIVE SMOKING DEATHS ^{a,b}		121	11	32	40	16	22	336
TOTAL		15,481	1,471	4,011	5,555	2,344	2,100	45,472

^a Deaths due to ETS (environmental tobacco smoke) were calculated using $rr_{ets} = 1.3$ and prevalence of current smokers, aged 35+, married to non-smokers, taken from SOSIC 1994/95, cycle 3 (Reference 11).

^b The estimates presented here include only lung cancer mortality from exposure to second-hand smoke. It is recognized that exposure to second-hand smoke is associated with other diseases, including heart disease and breast cancer. Until authoritative, consensus-based relative risks are made available, estimates of mortality remain unavailable.

in 1996. It is interesting to note that, among men, smoking accounted for 10% of all deaths from cardiovascular disease (CVD), 11% of all deaths from smoking-related cancers and 5% of all deaths from respiratory diseases; among women, these proportions were 6%, 6% and 4% respectively.

Of the total 45,215 smoking-attributable deaths in Canada in 1996, 15,642 occurred in Ontario; 12,328 in Quebec; 7,080 in the Prairies; 5,860 in British Columbia; and 4,305 in the Atlantic region (Tables 2A and 2B).

Figure 2 shows the changes in SAM for both sexes from 1985 to 1996. The number of smoking-attributable deaths among women rose from 9,009 in 1985 to 15,986 in 1996, an increase of 77%. The number of deaths

among men remained relatively constant throughout this period (from 28,321 in 1985 to 29,229 in 1996), representing a drop in the male-to-female SAM ratio, from 3.1 to 1.8.

The SAM trends by disease category for both sexes are presented in Figure 3. From 1989 to 1996, female SAM increased by 48% (5,166 deaths), whereas male SAM increased only slightly, by 6% (1,692 deaths). The large increase in female SAM is mainly due to large jumps in cancers (19%; 2,016 deaths), cardiovascular diseases (15%; 1,670 deaths) and respiratory diseases (16%; 1,691 deaths). Among men aged 35 and over, smoking-related deaths from both cancers and respiratory diseases rose by 3% and, from cardiovascular

TABLE 2A
Smoking-attributable mortality (SAM) estimates for current and former smokers,
by disease category and region, MALES, Canada, 1996

		MALES: SAM BY REGION					
Disease category	ICD-9 code	Canada	Atlantic	Quebec	Ontario	Prairies	BC
ADULT DISEASES (35+ years)		28,952	2,838	8,144	9,841	4,535	3,594
<i>Cancers</i>		11,844	1,087	3,772	3,981	1,615	1,389
Lip, oral cavity, pharynx	140-149	614	37	201	226	82	69
Esophagus	150	702	63	141	278	118	103
Pancreas	157	410	35	121	140	63	51
Larynx	161	329	22	136	110	32	29
Trachea, lung, bronchus	162	8,973	844	2,935	2,974	1,184	1,036
Cervix uteri	180	N/A	N/A	N/A	N/A	N/A	N/A
Urinary bladder	188	435	39	131	144	67	53
Kidney, other urinary	189	381	47	107	110	68	49
<i>Cardiovascular diseases</i>		11,429	1,182	2,877	3,964	1,959	1,448
Rheumatic heart disease	390-398	38	1	13	13	5	6
Hypertension	401-405	148	16	30	52	27	22
Ischemic heart disease	410-414						
Ages 35-64		2,392	237	682	867	359	248
Ages 65+		4,049	407	1,020	1,443	677	503
Pulmonary heart disease	415-417	111	10	29	33	23	17
Other heart disease	420-429	1,473	184	346	423	302	218
Cerebrovascular disease	430-438						
Ages 35-64		378	34	110	137	55	41
Ages 65+		1,389	140	307	460	288	194
Atherosclerosis	440	326	17	76	138	57	39
Aortic aneurysm	441	778	96	176	275	110	121
Other arterial disease	442-448	346	42	87	122	57	39
<i>Respiratory diseases</i>		5,679	569	1,495	1,897	961	757
Respiratory tuberculosis	010-012	15	1	5	5	1	2
Pneumonia/influenza	480-487	1,183	114	213	429	238	187
Bronchitis/emphysema	491-492	710	55	242	195	122	95
Asthma	493	63	5	9	22	14	14
Chronic airways obstruction	496	3,708	393	1,025	1,245	586	63
PEDIATRIC DISEASES (<1 year)		63	4	16	24	15	4
Low birth weight	765	18	1	5	8	3	1
Respiratory distress syndrome	769	15	1	5	4	3	1
Respiratory conditions—newborn	770	13	1	2	6	2	1
Sudden infant death syndrome	798.0	17	2	3	5	7	1
FIRE DEATHS (all ages)		N/A	N/A	N/A	N/A	N/A	N/A
PASSIVE SMOKING DEATHS ^{a,b}		214	23	94	77	10	10
TOTAL		29,229	2,865	8,254	9,942	4,560	3,608
SAM as percentage of all deaths		26	3	7	9	4	3
Male-to-female SAM ratio		1.8	2.0	2.0	1.7	1.8	1.6

NOTE: Estimates in bold should be interpreted with caution.

^a Deaths due to ETS (environmental tobacco smoke) were calculated using $rr_{ets} = 1.3$ and prevalence of current smokers, aged 35+, married to non-smokers, taken from SOSIC 1994/95, cycle 3 (Reference 11).

^b The estimates presented here include only lung cancer mortality from exposure to second-hand smoke. It is recognized that exposure to second-hand smoke is associated with other diseases, including heart disease and breast cancer. Until authoritative, consensus-based relative risks are made available, estimates of mortality remain unavailable.

diseases, rose minimally by 0.2%. Figure 4 compares increases in smoking-related deaths from lung cancer, ischemic heart disease and chronic airways obstruction between 1989 and 1996 among men and women.

Discussion

In 1996, smoking remained the number one preventable cause of death and disease in Canada. Accounting for over 45,200 deaths that year, smoking far exceeded the second most important preventable cause of death—accidents (8,603 deaths).¹³ Since 1991, the number of smoking-attributable deaths in Canada has

increased by an estimated 8% (3,807 deaths); of these, almost two thirds (64%; 2,445 deaths) occurred in females. On a regional basis, there were 1,188 more smoking-related deaths (+20%) in the Prairies over the same five years, followed by an increase of 1,149 deaths (+8%) in Ontario.

The number of smoking-related deaths among females is rising faster than among males. In 1985, the ratio of male-to-female deaths attributable to smoking was approximately 3.1; in 1989, this ratio had fallen to 2.5; in 1991, to 2.1; and in 1996, it had declined further to 1.8.

TABLE 2B
Smoking-attributable mortality (SAM) estimates for current and former smokers,
by disease category and region, FEMALES, Canada, 1996

Disease category	ICD-9 code	FEMALES: SAM BY REGION						TOTAL SAM
		Canada	Atlantic	Quebec	Ontario	Prairies	BC	M+F
ADULT DISEASES (35+ years)		15,811	1,423	4,027	5,645	2,492	2,224	44,763
<i>Cancers</i>		5,859	508	1,577	2,047	905	822	17,703
Lip, oral cavity, pharynx	140-149	160	10	31	65	31	24	775
Esophagus	150	235	20	44	101	35	36	937
Pancreas	157	527	53	145	168	88	73	936
Larynx	161	66	1	23	27	11	5	395
Trachea, lung, bronchus	162	4,519	391	1,250	1,555	687	636	13,492
Cervix uteri	180	146	17	30	62	20	16	146
Urinary bladder	188	142	10	37	51	21	23	577
Kidney, other urinary	189	63	8	17	19	12	7	444
<i>Cardiovascular diseases</i>		6,133	557	1,538	2,257	982	798	17,562
Rheumatic heart disease	390-398	65	5	25	18	9	8	104
Hypertension	401-405	150	15	36	54	26	19	298
Ischemic heart disease	410-414							
Ages 35-64		568	68	163	208	78	50	2,960
Ages 65+		2,569	192	644	1,003	372	359	6,618
Pulmonary heart disease	415-417	85	6	20	28	20	12	197
Other heart disease	420-429	1,007	138	271	319	204	145	2,550
Cerebrovascular disease	430-438							
Ages 35-64		307	25	85	111	51	34	685
Ages 65+		511	44	113	192	79	83	1,900
Atherosclerosis	440	315	17	61	144	63	29	641
Aortic aneurysm	441	270	29	66	93	49	32	1,048
Other arterial disease	442-448	216	19	53	87	31	27	562
<i>Respiratory diseases</i>		3,819	358	912	1,341	605	604	9,498
Respiratory tuberculosis	010-012	11	2	2	3	2	3	26
Pneumonia/influenza	480-487	1,074	105	189	399	200	180	2,257
Bronchitis/emphysema	491-492	414	31	132	120	68	63	1,124
Asthma	493	66	5	12	29	10	11	130
Chronic airways obstruction	496	2,254	216	577	790	325	347	5,962
PEDIATRIC DISEASES (<1 year)		42	4	11	13	10	4	105
Low birth weight	765	14	0	4	5	4	2	32
Respiratory distress syndrome	769	8	2	3	1	1	1	23
Respiratory conditions—newborn	770	7	1	2	3	2	0	20
Sudden infant death syndrome	798.0	13	1	3	4	4	1	30
FIRE DEATHS (all ages)		N/A	N/A	N/A	N/A	N/A	N/A	N/A
PASSIVE SMOKING DEATHS ^{a,b}		133	13	36	42	18	24	347
TOTAL		15,986	1,440	4,075	5,700	2,520	2,251	45,215
SAM as percentage of all deaths		16	1	4	6	3	2	21

NOTE: Estimates in bold should be interpreted with caution.

^a Deaths due to ETS (environmental tobacco smoke) were calculated using $rr_{ets} = 1.3$ and prevalence of current smokers, aged 35+, married to non-smokers, taken from SOSIC 1994/95, cycle 3 (Reference 11).

^b The estimates presented here include only lung cancer mortality from exposure to second-hand smoke. It is recognized that exposure to second-hand smoke is associated with other diseases, including heart disease and breast cancer. Until authoritative, consensus-based relative risks are made available, estimates of mortality remain unavailable.

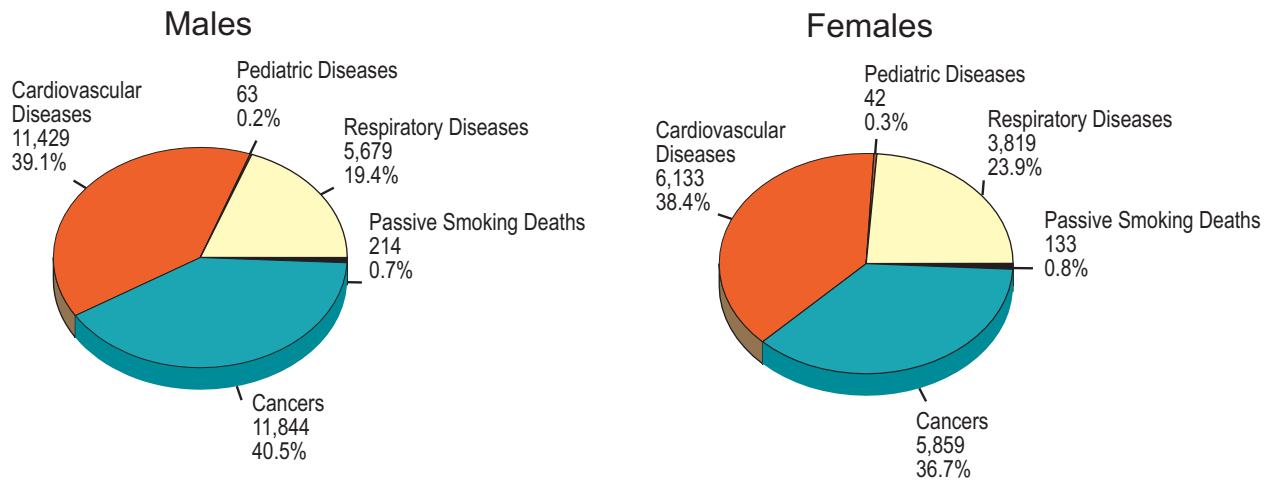
The World Health Organization predicted that 16,000 Canadian women and 30,000 Canadian men would die in 1995 from smoking-related causes.^{14,15} As can be seen from our results (Figure 2), this forecast was reasonable.

The smoking behaviour of the population two decades earlier is reflected in the present trends in smoking-attributable mortality. Among women, smoking rates peaked in the late 1970s, and lung cancer death rates are now more than four times as high as rates in 1969.¹⁶ Among men, however, smoking rates peaked in the mid 1960s; after decades of continuous increases, lung cancer death rates reached a peak in the late 1980s and have fallen slightly since then.²

The number of smoking-related deaths is also influenced by the growth and aging of the population.¹⁷ As “baby boomers” age, it can be expected that large numbers of Canadians will continue to die from smoking-related causes, in particular from lung cancer, heart disease and cerebrovascular disease.¹⁴

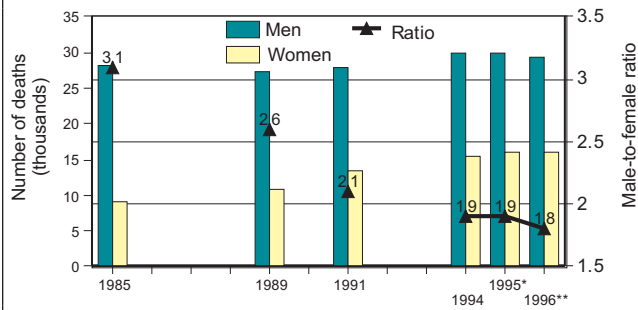
Given the levelling off of male SAM over the past few years coupled with the decrease in smoking prevalence among males, there is little reason to change earlier predictions that male SAM may start to decline by the new millennium and eventually level off, while female SAM will continue to rise and may eventually reach, or even exceed, male levels.

FIGURE 1
Proportion and number of deaths due to smoking in Canada, 1996



Note: Fire deaths due to smoking are excluded because of the unavailability of 1996 data.

FIGURE 2
Changes in SAM by sex, Canada, selected years



* 1995 estimates were forecasted by the World Health Organization.
** 1996 estimates exclude fire deaths due to smoking.

FIGURE 3
Changes in SAM by sex and disease category between 1989 and 1996, Canada

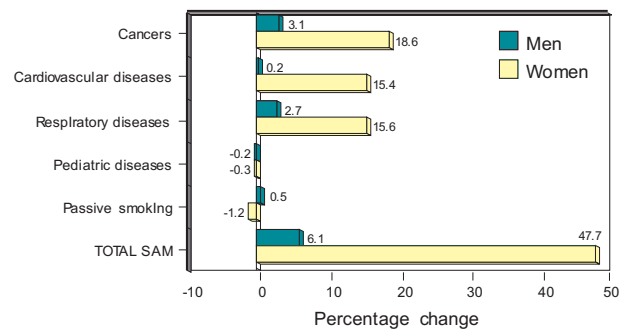
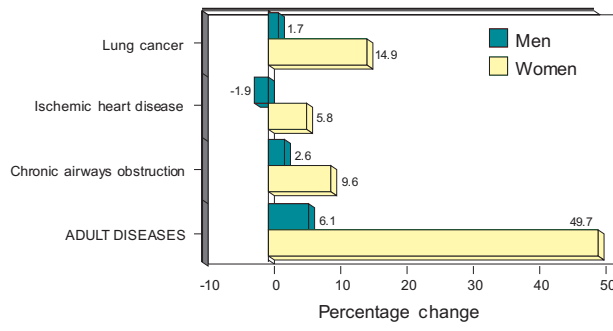


FIGURE 4
Changes in SAM for leading diseases, by sex, between 1989 and 1996, Canada



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Mental Health of the Canadian Population: A Comprehensive Analysis

Thomas Stephens, Corinne Dulberg and Natacha Joubert

Abstract

This study examines eight measures of mental health and looks for associations with nine potential demographic and psychosocial determinants. Data from the National Population Health Survey (NPHS), analyzed by logistic regression, reveal consistently strong, graded, independent associations of current stress, social support, life events, education and childhood traumas with both positive and negative indicators of mental health status. Sex differences exist for four of eight measures. For most indicators, mental health is relatively poor among youth and improves with age. Physical and mental health problems are associated. There is no independent relation between mental health and income adequacy or province of residence. Two measures used in several previous Canadian surveys are recommended for inclusion in the NPHS to better monitor population mental health.

Key words: *Canada; cognitive impairment; depression; distress; mastery; mental health; population; self-esteem; sense of coherence*

Introduction

Recent reports on the mental health of the Canadian population have focused on specific measures and traits, notably depression,¹⁻³ a general measure of psychological well-being called “sense of coherence,”^{4,5} cognitive status⁶ and work stress.⁷ To date, there have been no comprehensive studies covering a range of positive and negative indicators of mental health, nor has there been a systematic examination of factors associated with positive and negative mental health. However, Statistics Canada’s National Population Health Survey allows this type of examination.

Such an analysis is the purpose of this article. We seek to answer two interrelated questions: “What is the current state of mental health in the Canadian population?” and “Which psychosocial and physical health factors are most closely associated with mental health status?” Answers to these questions will have obvious implications for planning mental health services and mental health promotion.

Our approach to the description of population mental health and the analysis of its determinants has both conceptual and practical rationales.

Conceptually, mental health is treated here as a set of affective/relational and cognitive attributes that permit the individual to carry out valued functions with *reserve capacity* or *resilience* and thus to cope effectively with challenges to both mental and physical functioning. Happiness and work satisfaction are examples of such desirable states, as are self-esteem, mastery and a sense of coherence. Although some consider these latter attributes as *determinants* of mental health, they are considered here as (positive) indicators of mental health status since they contribute to reserve capacity and coping ability.

The population health framework identifies a wide range of conditions or determinants that influence health status.⁸ Many of these determinants—health services, the physical environment, personal health practices—initially gained prominence on the policy scene with the publication of *A New Perspective on the Health of Canadians*.⁹ The social and economic environment is the most notable addition from the population health framework, and it is the focus of the determinants examined here for their contribution to mental health status.

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From a practical point of view, this analysis is limited by the data available to describe the mental health of the Canadian population. Fortunately, the initial cycle of the ongoing National Population Health Survey in 1994/95 included a wide range of mental health indicators as well as a full complement of plausible determinants. These are described further under Methods.

Methods

Source of Data

This study involved secondary analysis of the public use data file of the 1994/95 National Population Health Survey (NPHS).^{10,11} As a result of its sample design and the high response rate, the NPHS provides an authoritative picture of the Canadian population living in the 10 provinces. Data were collected by computer-assisted personal interview with both a household representative and selected individuals. For all of the indicators reported here on mental health status and determinants, except for physical health and some of the demographic information, data were obtained directly from the selected household member; proxy responses were not accepted. The maximum sample available for analysis was 17,626 persons aged 12 and older; the actual sample for most analyses was usually closer to 14,500 as a result of missing cases on any given variable.

Because stress was a major topic for the initial NPHS, the survey included a variety of indicators relevant to mental health, which was unprecedented for a major national study. Although two of these—depression and distress—have since been promoted to “core” survey content and were thus repeated in 1996/97, we have chosen to focus exclusively on the 1994/95 data in order to compare associations across a large number of indicators of status, most of which were *not* repeated in the second cycle of the NPHS. Most of the social determinants in this analysis were not repeated either.

In 1994/95, the NPHS covered several self-reported indicators of mental health on the positive dimension, including sense of coherence, self-esteem, mastery and happiness/interest in life, and on the negative side, depression, level of distress, impact of distress and cognitive impairment. Thus mental health status is measured here with four positive and four negative indicators, which are only modestly interrelated.^a This provides an unusual opportunity to compare associations with determinants across many indicators.

Indicators of Mental Health and of Determinants

Sense of coherence (SOC), or psychological well-being, refers to an outlook or enduring attitude whereby life is seen as comprehensible, manageable and meaningful. It has been shown in a number of international studies to predict longevity and to relate to

physical health,¹² a conclusion that appears to hold for the Canadian population as well.⁴ The NPHS was the second population survey in the world, after Finland's,¹³ to measure SOC at the national level. SOC was measured by means of 13 questions that were summarized into a scale with potential scores ranging from 0 to 78. On the basis of the distribution, a high SOC was arbitrarily defined as a score of 67 or greater. This measure was completed only by persons aged 18 and older.

Self-esteem refers to a positive sense of self and was assessed by six questions taken from the classic Rosenberg scale used to measure this attribute.¹⁴ No previous national survey in Canada has assessed self-esteem. Since there is no accepted definition of *adequate* self-esteem, the 25-point scale was arbitrarily divided according to the distribution of scores. High self-esteem refers to a score of 20 or greater.

Sense of mastery is the extent to which individuals believe their life chances are under their control. It was measured by means of seven questions,¹⁵ yielding scores ranging from 0 to 28. A high sense of mastery was arbitrarily defined as a score of 23 or greater, based on the distribution.

Happiness and interest in life is a single item from the multi-item Health Utility Index.¹⁶ Respondents were asked “Would you describe yourself as usually ... happy and interested in life,” through “somewhat happy” and ending with “... so unhappy that life is not worthwhile.” This variable was dichotomized as happy/other.

Depression is a mood disorder characterized by pervasive feelings of sadness, sometimes accompanied by a sense of helplessness, hopelessness, irritability and physical symptoms such as fatigue. It was measured in the 1994/95 NPHS by a set of 27 questions about such symptoms, taken from the Composite International Diagnostic Interview.¹⁷ The total score was an estimate of the probability that the individual had a major depressive episode in the previous 12 months, stated in six levels with 90% as the definition of “probable” depression. For the purposes of analyzing the relation with the determinants, but not for descriptive analysis, the small and ambiguous category of “possible depression” (>0% and <90% probability of a depressive episode) was omitted.

Distress, as measured in the 1994/95 NPHS, is a state characterized by symptoms of anxiety and depression. *Amount of distress* was assessed by a six-item symptom checklist yielding a score of 0–24. On the basis of the distribution, high distress was arbitrarily defined as a score of 5 or greater. The *impact* of distress on life and activities was measured with a single question: “How much do these experiences usually interfere with your

^a Phi coefficients for paired measures, as dichotomized for the later analyses, ranged from 0.07 to 0.37 (data not shown).

life or activities?” and a response of either “a lot” or “some” was used to define a life affected by distress.

Cognitive impairment was measured by two questions, one each about difficulties with thinking and remembering, which were part of the Health Utility Index.¹⁶ Impairment was defined as “unable to remember anything at all,” “unable to think or solve problems” or “some difficulty thinking.”

The NPHS gathered information on a wide range of demographic attributes, and on psychosocial and physical health factors that are plausibly related to mental health. The demographic factors analyzed here were age, sex, province of residence, education, income adequacy and household type. The psychosocial factors and their method of measurement were childhood traumas (number checked on a list of 7); life events (number checked on a list of 10); current stressors, involving time pressures, others’ expectations and quality of social relationships (number checked on a list of 18); a social involvement index (based on three questions about regularity of participation in voluntary groups and church attendance); a frequency of social involvement index (based on reported frequency of contact with persons considered part of the respondent’s social network); and a social support index (number of informal social resources checked as available in the event of need). The physical health questions were broad, and were analyzed to ensure that they were limited to physical health: chronic physical conditions (number checked on a list of 18) and activity restriction (long-term limitation attributed to a physical cause). Further details on these measures have been published by Statistics Canada.¹⁰

Analysis Methods

For the descriptive analysis of mental health status reported in Table 1, population estimates were produced from the weighted frequencies, in the usual manner. These were reviewed for reliability using Statistics Canada’s suggested criteria.¹⁰

For the analysis of associations among determinants, multiple logistic regression was employed, using weighted data for which the weights had been adjusted to an average value of 1. For this purpose, all mental health status variables (the dependent measures) were dichotomized so that the target conditions became high sense of coherence, high self-esteem, high sense of mastery, happy and interested in life, depressed, high level of distress, life affected by distress and cognitively impaired. Independent variables were maintained as ordinal wherever applicable, although some collapsing of categories was necessary for reasons of sample size.

The independent variables (psychosocial factors and physical health) described earlier were selected for the multivariate analysis on the basis of consistently strong bivariate associations. Variables of potential interest omitted from the present analysis because of their

generally weak relation to mental health were leisure-time physical activity and regular heavy drinking.¹⁸

Initial analyses included all of the eight independent variables reported later, plus four others—province of residence, income adequacy, social involvement and frequency of social contacts. When these four variables were dropped from the analyses because of their weak associations with the indicators of mental health, it had little impact on the associations between mental health and the remaining independent variables or “determinants.”

One final control was effected in the analyses. In addition to controlling for the eight determinants in all logistic regressions, level of distress was controlled for in the analyses of impact of distress. This answers the question of whether, regardless of the amount of distress, some persons are more affected by distress than others.

Results

Table 1 summarizes the results on eight measures of mental health status, by sex, age, education and province of residence. As already noted, four of these indicators were measured with continuous scales that had been categorized for the present analysis according to their respective distributions. As a result, these total scores are not absolutely meaningful; however, intergroup comparisons are valid. By these arbitrarily defined indicators, almost one third (31%) of Canadian adults had a high SOC, slightly more than half (52%) had high self-esteem, close to one quarter (23%) had a high sense of mastery and more than one quarter (29%) reported some distress.

The non-arbitrary measures paint a moderately positive picture overall: three quarters (74%) of Canadians described themselves as happy and interested in life, 6% were depressed, one in six (16%) reported that stress affects their lives and 9% had some cognitive impairment.

Although the results in Table 1 are unadjusted for relations to other variables, it is instructive to note some consistencies across mental health indicators. For example, there were similar sex differences on six of eight indicators, suggesting modestly better mental health for males than females. There were also consistent associations between these self-reported measures of mental health and age: on most indicators, youth aged 12–19 or 12–29 had the lowest prevalence of positive mental health and the highest prevalence of mental health problems.

Among the few consistent provincial differences was the good mental health in Newfoundland and Prince Edward Island, where respondents reported among the highest SOC, most happiness and least amount of depression and distress. No province consistently ranked low in mental health, but Quebec was noteworthy for the number of measures on which it was at the extreme of

TABLE 1
Indicators of population mental health status, by sex, age, education completed
and province, Canada, ages 12+, 1994/95

	Population estimate (thousands)	Positive mental health				Mental health problems			
		High sense of coherence (%)	High self-esteem (%)	High mastery (%)	Happy, interested in life (%)	Depressed (%)	High distress level (%)	Distress affects life (%)	Some cognitive impairment (%)
TOTAL	23,949	31 ^a	52	23	74	6	29	16	9
Males	11,780	32 ^a	53	25	74	4	26	14	9
Females	12,168	30 ^a	51	21	74	7	32	18	9
Ages 12-19	3,372	12 ^a	44	18	72	7	40	17	13
Ages 20-29	3,879	21	51	25	72	7	38	17	9
Ages 30-39	5,210	27	54	24	76	6	29	15	7
Ages 40-49	4,235	30	56	26	72	6	25	16	9
Ages 50-59	2,825	35	57	21	77	5	23	14	6
Ages 60-69	2,282	43	51	19	76	2	21	15	8
Ages 70+	2,145	47	48	18	73	3	22	17	14
Less than high school	7,986	33	45	16	70	6	33	17	13
High school	9,007	28	53	23	74	6	30	16	8
College	3,806	30	55	25	76	5	26	14	7
University	3,109	34	63	34	81	5	23	14	5
Newfoundland	483	39	37	14	76	#	25	14*	11
Prince Edward Island	110	35*	42	19	82	#	23*	#	6
Nova Scotia	764	30	39	21	73	8*	27	19	11
New Brunswick	626	29	44	15	75	4*	28	17	11
Quebec	6,030	27	66	24	72	5	35	13	6
Ontario	9,050	32	51	24	74	6	28	17	10
Manitoba	891	34	36	14	74	8*	30	15	11
Saskatchewan	792	37	36	17	75	5*	23	14	10
Alberta	2,166	30	47	24	78	5	26	15	9
British Columbia	3,037	30	49	23	73	6	26	18	11

^a Limited to ages 18+, thus the population estimates for the first four rows are, in thousands:

Total — 19,818, Males — 9,477, Females — 10,341, Ages 18-19 — 754. The provincial populations are also lower by approximately 17% than the figures reported.

* Moderate sampling variability — to be interpreted with caution

High sampling variability — not sufficiently reliable for publication

the distribution. Quebeckers reported among the highest levels of self-esteem and mastery but the least happiness, lowest sense of coherence and most distress.

Although these descriptive data may be useful for identifying population groups at risk, they raise questions about the underlying reasons. To begin to answer this question, we conducted a series of multiple logistic regressions. The essence of this statistical technique is that it reveals the unique contribution of a potential determinant of health status while simultaneously controlling for the influence of all other determinants. Results are expressed as odds ratios.

Table 2 shows the relations of three demographic variables (age, sex, education), four psychosocial variables (childhood traumas, current stress, life events and social support) and two physical health variables (chronic problems and activity restriction) to the four measures of positive mental health. Table 3 provides similar information for the four measures of mental health problems. Province has been omitted from the analyses because the associations with mental health were consistent across provinces once all the other

factors had been taken into account. Similarly, income adequacy, social involvement and frequency of social contacts are not reported here, as they did not have any independent association with mental health in other models that were examined.

With eight dependent variables and nine independent variables, what can be concluded from these results? Are there demographic, psychosocial or physical health indicators that have consistent relations with these indicators of mental health? Is the relation with mental health problems simply the inverse of any relation with positive mental health?

Table 4 provides an overview of the findings to answer these questions. Because of the large and complex sample of the NPHS and the number of relations used for the analysis, a strict standard for statistical significance was adopted ($p < 0.001$) for this overview. Further, the order of the categories for each variable in Tables 2 and 3 was taken into account in Table 4 (but not tested for trends).

The significant and graded relations between these determinants and the measures of mental health status may be summarized as follows.

Independent of all other variables, age was clearly related to psychological well-being (SOC), which increased impressively with age. The odds of seniors reporting a high sense of psychological well-being were as much as five times those of teens. Level of distress also tended to decline with age, but not as regularly as psychological well-being increased. Interestingly, cognitive impairment among teens was second only to the level among seniors aged 70 and older. Compared with the data in Table 1, the associations between age and mental health were fewer but led to the same conclusion—that poorer mental health is more common among youth than older age groups, at least on these indicators.

Education was strongly related to six measures of mental health and had a consistent, graded association with four. Self-esteem, mastery and happiness/interest in life all increased with amount of formal education. The odds of a high sense of mastery among university graduates were 2.2 times the odds among high-school dropouts, even after other factors had been accounted for. Interestingly, with more education the impact of distress became increasingly *more* likely to affect one's life.

Number of childhood traumas was strongly associated with SOC, depression and distress, and, to a lesser extent, with mastery and happiness. Such traumas appear not to be related to self-esteem, however.

Amount of current stress was one of the strongest correlates of mental health status, being strongly and consistently related to all positive and negative measures. The odds ratios were quite high. For example,

compared with persons reporting low stress, the odds of those with a lot of stress being depressed were about three times as high, and of being distressed, four times as high.

Number of life events was also important for its apparent impact on mental health: it was negatively

TABLE 2
Adjusted odds ratios^a (OR) and standard errors (SE) for four measures of positive mental health, by demographic, psychosocial and physical health determinants, Canada, ages 12+, 1994/95

Determinant	Sense of coherence (high vs lower)		Self-esteem (high vs lower)		Mastery (high vs lower)		Happiness (high vs lower)	
	OR (n = 14,477 ^b)	SE	OR (n = 14,665 ^b)	SE	OR (n = 14,590 ^b)	SE	OR (n = 14,703 ^b)	SE
Age	<0.001 ^c		<0.001 ^c		<0.001 ^c		<0.001 ^c	
12-19	1.000	-	1.000	-	1.000	-	1.000	-
20-29	1.987*	0.144	1.224	0.096	1.052	0.115	1.356	0.106
30-39	2.850*	0.141	1.360	0.094	0.953	0.113	1.642*	0.104
40-49	3.503*	0.142	1.527*	0.096	1.123	0.115	1.396	0.106
50-59	4.121*	0.144	1.694*	0.099	.894	0.120	1.895*	0.112
60-69	5.143*	0.146	1.368	0.103	.812	0.126	1.577*	0.116
70+	5.335*	0.149	1.258	0.106	.764	0.131	1.356	0.120
Sex	0.031		0.035		<0.001		0.154	
Male	1.000	-	1.000	-	1.000	-	1.000	-
Female	0.918	0.040	0.931	0.034	0.849*	0.041	1.060	0.041
Education	0.710		<0.001		<0.001		<0.001	
Less than high school	1.000	-	1.000	-	1.000	-	1.000	-
High school	1.012	0.052	1.363*	0.044	1.498*	0.057	1.286*	0.051
College	1.040	0.063	1.429*	0.054	1.598*	0.067	1.399*	0.064
University	0.963	0.065	1.854*	0.058	2.218*	0.068	1.421*	0.071
Childhood traumas (number)	<0.001		0.140		<0.001		<0.001	
0	1.000	-	1.000	-	1.000	-	1.000	-
1	0.670*	0.047	0.942	0.041	0.929	0.049	0.753*	0.048
2	0.737*	0.067	1.050	0.055	1.368*	0.063	0.756*	0.062
3	0.592*	0.104	1.040	0.076	0.910	0.099	0.702*	0.084
4-7	0.467*	0.158	0.866	0.094	0.769	0.136	0.544*	0.099
Current stress	<0.001		<0.001		<0.001		<0.001	
Low	1.000	-	1.000	-	1.000	-	1.000	-
Moderate	0.534*	0.043	0.952	0.040	0.728*	0.046	0.590*	0.052
High	0.207*	0.065	0.747*	0.049	0.441*	0.062	0.337*	0.057
Life events (number)	<0.001		0.170		<0.001		<0.001	
0	1.000	-	1.000	-	1.000	-	1.000	-
1	0.762*	0.050	1.007	0.042	0.859	0.051	0.889	0.050
2+	0.527*	0.076	0.911	0.053	0.768*	0.069	0.660*	0.058
Social support	<0.001		<0.001		<0.001		<0.001	
Little	1.000	-	1.000	-	1.000	-	1.000	-
Low	0.984	0.190	1.398	0.134	1.365	0.215	1.765*	0.137
Moderate	1.218	0.162	1.644*	0.116	1.878	0.186	2.065*	0.118
High	1.878*	0.151	1.841*	0.106	2.320*	0.176	3.219*	0.107
Physical health problems (number)	<0.001		0.076		0.005		0.087	
0	1.000	-	1.000	-	1.000	-	1.000	-
1	0.879	0.048	0.916	0.041	0.967	0.049	1.010	0.050
2	0.733*	0.066	1.004	0.055	0.909	0.067	0.877	0.064
3+	0.806	0.071	0.900	0.059	0.762*	0.077	0.902	0.068
Restricted activity	0.002		0.005		0.009		<0.001	
No	1.000	-	1.000	-	1.000	-	1.000	-
Yes	0.831	0.060	0.872	0.049	0.846	0.064	0.735*	0.055

^a Adjusted for all other independent variables shown

^b Ns are weighted to reflect the sample design (numbers vary because of missing values).

^c Italicized *p* values describe the overall association of the variables.

* *p* < 0.001 for individual coefficient

associated with three measures of positive health and positively with three indicators of problems. Persons reporting two or more significant life events in the previous year had more than twice the odds of being depressed as those reporting no events.

Social support was second only to current stress in its importance for mental health: it was strongly and positively associated with SOC, self-esteem, mastery and happiness, and negatively related to depression, level of distress and impact of distress. Persons with high levels of social support had only half the odds of being affected by distress, even when the amount of distress was held constant.

In contrast to most of these demographic and psychosocial determinants, the association between physical and mental health was limited to only some of the indicators in this study. The number of chronic physical health problems was closely associated with depression and cognitive impairment, and physical restriction was associated with all four mental health problems but none of the indicators of positive mental health.

After all the other variables had been controlled for, sex differences remained on four of the eight indicators of mental health: the odds were twice as high that women were depressed, and they were somewhat more prone to and affected by distress, whereas the odds of men reporting high mastery were higher.

Discussion

These results from the NPHS provide an unusually comprehensive look at the mental health of a population and the factors that may influence it. They provide evidence of consistently strong, graded, independent relations linking current stress, social support, life

TABLE 3
Adjusted odds ratios^a (OR) and standard errors (SE) for four measures of mental health problems, by demographic, psychosocial and physical health determinants, Canada, ages 12+, 1994/95

Determinant	Depression (probable vs none)		Distress level (high vs lower)		Distress affects life ^d (some vs none)		Cognitive Impairment (some vs none)	
	OR	SE	OR	SE	OR	SE	OR	SE
	<i>(n = 14,288^b)</i>		<i>(n = 14,674^b)</i>		<i>(n = 11,156^b)</i>		<i>(n = 14,708^b)</i>	
Age	<0.001 ^c		<0.001 ^c		0.347 ^c		<0.001 ^c	
12-19	1.000	-	1.000	-	1.000	-	1.000	-
20-29	0.443*	0.168	0.820	0.106	0.975	0.146	0.788	0.149
30-39	0.430*	0.164	0.535*	0.104	0.967	0.145	0.570*	0.149
40-49	0.437*	0.169	0.423*	0.107	1.096	0.149	0.731	0.150
50-59	0.337*	0.185	0.368*	0.113	0.974	0.159	0.414*	0.167
60-69	0.186*	0.230	0.375*	0.119	1.027	0.170	0.658	0.167
70+	0.231*	0.239	0.408*	0.124	1.277	0.176	1.215	0.164
Sex	<0.001		<0.001		<0.001		0.126	
Male	1.000	-	1.000	-	1.000	-	1.000	-
Female	2.039*	0.084	1.299*	0.041	1.256*	0.060	0.909	0.062
Education	0.130		<0.001		<0.020		<0.001	
Less than high school	1.000	-	1.000	-	1.000	-	1.000	-
High school	1.066	0.100	0.821*	0.053	1.154	0.076	0.716*	0.074
College	0.960	0.125	0.727*	0.065	1.069	0.095	0.604*	0.098
University	1.317	0.138	0.859	0.071	1.356	0.102	0.551*	0.116
Childhood traumas (number)	<0.001		<0.001		<0.001		<0.001	
0	1.000	-	1.000	-	1.000	-	1.000	-
1	1.325	0.104	1.251*	0.049	0.865	0.073	1.017	0.077
2	1.731*	0.115	1.254*	0.063	1.083	0.088	1.401*	0.091
3	2.095*	0.135	1.359*	0.085	1.214	0.110	1.379	0.120
4-7	2.618*	0.143	1.917*	0.102	1.543*	0.120	1.426	0.135
Current stress	<0.001		<0.001		<0.001		<0.001	
Low	1.000	-	1.000	-	1.000	-	1.000	-
Moderate	1.506	0.124	1.973*	0.053	1.224	0.085	1.503*	0.083
High	2.894*	0.124	4.388*	0.058	1.864*	0.089	2.099*	0.090
Life events (number)	<0.001		<0.001		0.007		<0.001	
0	1.000	-	1.000	-	1.000	-	1.000	-
1	1.499*	0.099	1.294*	0.049	1.042	0.072	1.321*	0.077
2+	2.527*	0.100	1.738*	0.058	1.272	0.078	1.646*	0.086
Social support	<0.001		<0.001		<0.001		0.001	
Little	1.000	-	1.000	-	1.000	-	1.000	-
Low	0.440*	0.215	0.988	0.143	0.599	0.176	0.710	0.186
Moderate	0.429*	0.175	0.677	0.123	0.530*	0.152	0.691	0.157
High	0.307*	0.150	0.491*	0.112	0.518*	0.134	0.596*	0.138
Physical health problems (number)	<0.001		<0.001		0.013		<0.001	
0	1.000	-	1.000	-	1.000	-	1.000	-
1	1.193	0.099	1.100	0.050	1.105	0.074	1.103	0.080
2	1.334	0.122	1.219	0.066	1.244	0.092	1.425*	0.096
3+	1.693*	0.119	1.722*	0.068	1.320	0.092	1.673*	0.096
Restricted activity	0.001		<0.001		<0.001		<0.001	
No	1.000	-	1.000	-	1.000	-	1.000	-
Yes	1.654*	0.096	1.589*	0.056	1.599*	0.073	1.489*	0.076

^a Adjusted for all other independent variables shown

^b Ns are weighted to reflect the sample design (numbers vary because of missing values).

^c Italicized *p* values describe the overall association of the variables.

^d Model also includes level of distress (dichotomized).

* *p* < 0.001 for individual coefficient

events, education and childhood traumas to several indicators of both positive mental health and mental health problems. They also provide evidence of differences related to sex, age and physical health status, although these are concentrated among the indicators of

TABLE 4
Summary of relations among eight measures of mental health status and
nine demographic, psychosocial and physical health determinants,
Canada, ages 12+, 1994/95

Determinant	Sense of coherence	Self-esteem	Mastery	Happy	Depressed	Distress level	Distress affects life	Some cognitive impairment
Age	***	*	*	*	*	*		*
Education		***	***	***		*	*+	*_ _
Childhood traumas	*_		*_	*_	***	***	***	*+
Current stress	*_ _	*_ _	*_ _	*_ _	***	***	***	***
Life events	*_ _		*_ _	*_ _	***	***		***
Social support	*+	***	***	***	*_ _	*_ _	*_ _	
Physical health problems (number)	*_				***	***		***
Sex			*		*	*	*	
Restricted activity				*	*	*	*	*

Key

* $p < 0.001$ for the association of the variable with the measure of mental health status
In addition to $p < 0.001$ for the association,
** a consistent, ordered positive association of all levels of the determinant
+ a consistent, ordered positive association of all but one level
-- a consistent, ordered negative association of all levels of the determinant
- a consistent, ordered negative association of all but one level

mental health problems, and there are few differences in positive mental health associated with sex and physical health. Relations between age and mental health are the most complex but can be summarized by noting that it is usually youth who are most likely to have mental health problems and least likely to report positive mental health.

It is important to note that terms such as “influence” and “determinants” are not strictly correct in this context, since these results are based on cross-sectional data. Only childhood traumas and life events imply a temporal order that is logically necessary for inferring causation, and even then longitudinal analysis would be needed to confirm this. Indeed, in other analyses of NPHS data, SOC has been described as a determinant of physical health⁴ rather than an outcome of it, and depression has been described as affecting social life¹⁹ rather than being affected by it, as is implied here. In reality, there is probably a negative and self-reinforcing spiral between mental health and many of the factors reported here. For example, longitudinal analysis of US population data reveals that distress leads to negative assessment of self-reported health status, which in turn elevates subsequent distress.²⁰ Similarly, Icelandic data show that chronic physical conditions affect depression, in part by undermining personal resources such as mastery and self-esteem.²¹

Leaving aside the question of direction of the associations, many of the relations reported here echo findings from other population studies, which have typically been limited to a single outcome variable.

Many of these psychosocial factors have previously been reported as important for depression and other outcomes. For example, stressors and life events affect both sexes in the Canadian population, whereas childhood traumas are additionally important for women.¹ A British cohort study links parental divorce in childhood (an item on the childhood trauma scale) with psychological distress at ages 23 and 33,²² and Norwegian data reveal how economic hardship and family dissension (other scale items) in childhood lead to poorer mental health in adulthood.²³ Longitudinal data from the Whitehall II study in Britain show that emotional support predicts good mental health in men and negative social support predicts poor mental health in both sexes.²⁴ Among Canadian workers, psychological distress is greater for women when support from co-workers is low, and for men, when job-related stressors are high.²⁵

The distribution of mental health problems among demographic groups reported here is consistent with other recent studies. The higher prevalence of depression among Canadian women replicates the results of a study across 10 countries, including Canada, using a different

measure.²⁶ Sex differences in depression have been reported to start as early as 15 years of age in Canada.³ However, it is noteworthy that, although this study considered eight distinct measures of mental health, sex differences were found for only four of them. Previous studies limited to one or two measures of mental health problems may have left the impression that sex differences are more widespread than they appear to be here.

The association we found between age and mental health is important because it runs counter to both intuition and much previous evidence. On several indicators, mental health is shown to improve with age at least until the middle years and, on SOC, well into the senior years. With respect to depression and distress in Canada, this has been reported before, based on NPHS data, and the contrast with the *inverse* association between age and depression in the United States has been hypothesized to result from the different racial make-up of the two populations.² However, there may be another explanation: in 1978/79, distress and age were inversely related in Canada as well, according to the Canada Health Survey.²⁶ Since that time, however, the social and economic lot of seniors has improved markedly in Canada while that of youth has declined, relatively speaking.²⁷ The strong link between socio-economic status and mental health is well established, as illustrated by the results in this report and population studies in Britain and the United States.^{28,29}

The *lack* of an independent relationship between income adequacy and mental health status in the NPHS data is especially interesting in this light, but consistent with the view that education improves psychological well-being because it provides access to non-alienating work²⁹ and that, independent of income, a sense of mastery is related to greater life satisfaction and less depression.³⁰

Conclusions

This study has implications for the strategy of mental health promotion, further analysis of the NPHS and other data, and future monitoring of mental health in Canada.

A unique feature of this study is the mix of positive and negative outcome measures, an approach made possible by the number and variety of relevant indicators in the first cycle of the NPHS. Our analysis of associations of demographic and psychosocial factors with all of these outcome measures leads to an important conclusion: the psychosocial and demographic factors associated with mental health problems were also found to be (inversely) associated with the indicators of positive mental health. *This implies that strategies that promote resilience and other psychological resources will also contribute to problem reduction or even prevention.* More generally, health promotion and disease prevention can be seen as two sides of the same coin and entirely compatible, even mutually reinforcing.

Mental health promotion consists of establishing those conditions that will foster resilience and support, and lead to positive states such as satisfaction and happiness.³¹ It is clear from this analysis that such conditions include, broadly stated, a reduction in current stressors and childhood traumas and a fostering of social support. More detailed analysis of longitudinal data from the NPHS and other sources is required to be more specific about the desired conditions, although some of this analysis has been started with respect to job factors⁷ and types of social support.²⁴

Notwithstanding the comparative richness of the measures in the NPHS and the fact that the measures of depression and distress will be repeated in every cycle, improvements are possible. In particular, it would be highly desirable to repeat the mental health status measures of the 1978/79 Canada Health Survey, including the Affect Balance Scale³² and the Health Opinion Survey.³³ This would permit more systematic comparisons with earlier times. The Affect Balance Scale was also used in the 1981 and 1988 Canada Fitness Surveys and the General Social Surveys of 1985 and 1990; it remains in use internationally³⁴ and is conceptually compatible with the NPHS. The Health Opinion Survey is a long-standing measure of anxiety and depression that is conceptually similar to the current NPHS distress scale. The possibility of direct and unambiguous comparisons of mental health status in the Canadian population over approximately 25 years argues strongly for its inclusion in the NPHS or comparable national surveys of population health.

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Commentary

Ethical Issues in the Use of Computerized Databases for Epidemiologic and Other Health Research

Wilfreda E Thurston, Michael M Burgess and Carol E Adair

Abstract

Computerization of databases has increased apprehension about loss of privacy. The intent of this paper is to facilitate health research that gives proper respect to ethical principles, thereby increasing public comfort and reducing demands for restrictive legislation concerning access to databases. We review how computerization has increased the saliency of concerns and discuss examples of the application of ethical analysis in published database research. Extreme positions notwithstanding, there is general agreement among researchers that research curiosity and the convenience of database research cannot justify the suspension of moral concerns about privacy and confidentiality. Public and professional concerns may affect policy development; therefore, the methods of ensuring privacy and protecting confidentiality must be routinely described in research proposals and published reports along with the benefits of the research. An important issue requiring further attention is that the moral responsibility to respect privacy increases with the sensitivity of information.

Key words: computers; databases; epidemiology; ethics; guidelines; health care research; linkage; public policy

Introduction

In this paper we address the principles of ethical research as they can be applied to research using computerized databases. A database, computerized or not, is a collection of information on individuals. Our belief is that restrictive legislation concerning access to databases¹ should be avoided by respecting the public's apprehension that an individual's privacy has been diminished by technology.² Neither personal knowledge of misuse of data, demographic variables nor exposure to media accounts explains the public's concerns.³ Computerization merely increases the salience of some historic concerns.⁴ However, the nature of the response of health researchers to these concerns may have a major impact on policy development around database research.

Principles of Ethical Research and Computerization

The first principle to be assessed in any research with human subjects is that of non-maleficence: avoiding harm to the subjects caused by the research process, the

intervention or procedures being evaluated or used in the study, or by the uses made of the data. Health information that is not secured and is put to another use can affect employment status and benefits.⁵ Computerization has raised new security issues, including the ability to transport large quantities of data without being physically close to it and to alter records invisibly.⁶ The speed and storage capacity of computers have resulted in policies to protect privacy.⁷

A duty to maintain confidentiality and to respect privacy, another ethical principle, exists as a result of the nature of the relationship within which information is disclosed. That duty may be stronger when the nature of the information itself—for instance, sensitive diagnoses—establishes some reasonable expectation of confidentiality. A “gradual erosion of the concept of confidentiality of medical records” has been attributed to technological advances.⁸

Fidelity to the therapeutic or other relationships within which information is disclosed is an implicit

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commitment that the nature of that relationship will be respected. Patients share information in the belief that it is related to their health care, for direct clinical and billing purposes. Clinicians can be encouraged to add information to a file in the interest of future research, regardless of its clinical significance. It is relatively easy to add variables to a longitudinal database; storage room is not an issue, and a few fields will not substantially increase data entry time. Patient privacy and trust, however, may be compromised if patients are not aware that the relationship in which information is gathered has varied.

The possibility of linking databases when a common identifier does not exist is another reason to add fields. Improving linkage capability may mean including “complete name, maiden name, address, complete date, place of birth, and sex.”⁹ Some health researchers want access to the following types of records: medical, school, social agency, federal agency, credit, employment, census, social security and internal revenue “when the appropriate provisions for confidentiality are met.”¹⁰ Concern about ethical principles increases because a range of information not originally intended to be associated with an individual becomes available, and the individuals involved may not have known that others would have access to this aggregate of information.

Finally, when control of the use of personal information is lost, there is a loss of autonomy or rational self-direction, such that personal values may be compromised. Diagnostic information, for example, is sensitive, and its disclosure might be limited to clinicians or a select group of acquaintances. The principle of autonomy must also be respected with regard to choice of a social community or a social identity,¹¹ such as a risk group.

Other Moral Concerns

Three other moral concerns—informed consent, public good and the least harm principle—arise with respect to balancing the principles already mentioned. Informed consent is a directive that balances autonomy with risk of harm to achieve some good. In research, the good may be non-personal, whereas the risks are borne personally. If valid informed consent is given to inclusion in a research database, then there is no infringement of autonomy. Individual consent for use of data is not always required by policy¹² if protection of individual confidentiality is ensured. Kluge,¹³ however, took the extreme position that using patient data in a study without informed consent is electronic assault. A more moderate position balances issues of anonymity and consent with notions of probability and magnitude of harms. Recent proposals for a code of ethics for health information professionals¹⁴ and Canadian research guidelines provide caution without much guidance for database research.¹⁵

The accomplishment of a very important public good (e.g. control of an epidemic) may justify some

infringement of confidentiality, autonomy or fidelity. However, when some moral harm must be done to achieve a greater moral good, the least harm principle specifies that only the least harm necessary to accomplish the good is justified. Of two possible methods to accomplish a research goal, the one that causes least moral harm must be selected. Balancing the protection of individuals’ autonomy with the benefits of research to the community may be difficult.^{10,14,15} Historically, however, the automatic setting aside of social interests in favour of the individual has been infrequent and usually prescribed by legislation.⁸

Cost and convenience become morally relevant when it is prohibitively expensive to achieve a moral good while offering full protection of confidentiality, autonomy or fidelity. The principle of least harm requires that, if the justification for moral harm is a greater moral good, the moral harm must be the least necessary to achieve the moral good. For example, there is less loss of confidentiality if the people who abstract the data from the health record for research would see that information anyway.

Application of Ethical Analysis in Published Studies

We selected several examples of published studies of database research to illustrate the application of principles of ethical research. The analysis and discussion rely entirely on the information contained in the published articles.

Example 1: Linkage of Government Health Records and a Disease Registry

Our first example involves five papers from the *Journal of Acquired Immune Deficiency Syndromes*. The first¹⁶ describes the creation of a longitudinal database of AIDS patients in New York and California using Medicaid records, an AIDS registry and death certificates. The new database covered several years and contained the following: one record for each case, demographic and Medicaid data, health care utilization and expenditure data, and ICD-CM (International Classification of Diseases, Clinical Modification) codes.

Because people could use more than one Medicaid number, cases were linked using Medicaid number, social security number, birth date and name. Different diagnostic algorithms for AIDS were created for California and New York. The percentage of people identified by the algorithms and in the registry ranged from 25% to 80%, depending on sex and age. As well, proxy measures were used to create risk group designations: drug users, hemophiliacs, recipients of blood products, children, other females (not previously included) and other males. The last category was assumed to “loosely approximate the homosexual male risk group.”¹⁶ The database was then used to study Medicaid eligibility patterns, some features of the epidemic in Medicaid users, lifetime Medicaid utilization and expenditures, and a survival-based severity

index.¹⁷⁻²⁰ Ethics and security were not mentioned in the papers, but several ethical concerns arose in our minds upon reading.

When AIDS diagnosis, types of treatments and secondary infections of specified individuals are disclosed for research purposes without the consent of the individuals, their autonomy is limited. The principle of non-maleficence may have been breached since there is some risk of prejudicial treatment with the creation of a list of identifiable, living persons with AIDS. Some individuals were not registered on the AIDS registry, perhaps because they or their physicians decided that this would be unwise. The database identified many of these cases as instances of AIDS as well as some cases with a false positive diagnosis. Furthermore, since patients disclosed information that they believed was necessary to receive medical treatment through Medicaid, the fidelity of that clinical relationship may have been breached. These issues would not have arisen if all individuals in the database had given informed consent to be involved. There is no evidence in the article that this was the case, and, given the size and nature of the population, we assume that this was not possible.

Alternatively, the study might still reasonably have been approved by a human subjects review committee under two conditions: (1) all individuals in the new database freely consented to being in the source databases for research purposes and (2) security measures minimized the risk due to inadvertent or malicious disclosure. If access by researchers had been achieved without names or contact numbers, then there would have been considerable reduction of risk of harm and violation of privacy and autonomy. It is clear, however, that this study used names as part of the unique identifiers. It might also be established that the benefits of doing the study were moral benefits that could not be achieved without suspension of the duty of confidentiality.

We propose four possible moral benefits of the study. The most direct moral benefit would be decreased suffering if resources for persons with AIDS who were receiving Medicaid became more readily available. Less directly and more controversially, if AIDS therapies are disproportionately expensive and thus fewer resources are made available for them, then reallocation of resources to persons with other diseases may lead to decreased suffering for those persons, with possible detrimental effects on the subjects whose privacy was compromised. Other much less direct benefits are reduced prejudice toward persons with AIDS and decreased suffering through the prevention of AIDS.

The first benefit provides the strongest justification for the study. Nevertheless, the benefit of ensuring the future adequacy of resources for treatment of AIDS justifies the violation of the usual duties of confidentiality only if there is no other less ethically offensive method to achieve the moral good. In this case, the study design was not essential to ensuring the

adequacy of future resources. Cost and convenience cannot stand alone as justification for suspension of moral concerns; thus, if no argument can be made for the moral importance of the specific information obtained, then the study design cannot be justified on the grounds that other designs may have been more expensive and less convenient.

Example 2: Linkage of Government Health Records

The second example also involved linkage of two government health records, in a Canadian pilot study to establish the feasibility of the process for studying other diseases.²¹ Manitoba's hospital separation files and files of claims made by physicians were linked using the unique personal identification number (PIN) assigned to each resident of the province. All cases of acute myocardial infarction (AMI) were identified, and AMI-related conditions and medical procedures were separated and analyzed.

It is unlikely that patients knew about the research or consented to be in the study, so the fidelity of the clinical relationship and patients' autonomy may have been jeopardized. Furthermore, since the PIN was used, information was traceable back to individuals. However, if the names and addresses were removed from the database after linkage, tracing would require some effort or expertise, or access to the master list. In other words, confidentiality may have been protected and the potential for inadvertent harm to subjects reduced to an acceptable level.

The information gathered in this study was of a less sensitive nature than in the previous example, and therefore the potential for harm to subjects was less. A large sample was needed, and a design involving consent would have been very costly and would have resulted in a loss of precision, since some potential subjects or their relatives could not have been traced. Therefore, the public good was served by examining the equity and value of treatments; for instance, the findings that women received fewer tests, were less likely to be hospitalized and more likely to die in hospital suggested that changes in health care delivery were desirable and would benefit some of the research population.

Example 3: Program Evaluation

More comprehensive information on subjects may enhance the evaluation of community-based health promotion interventions. The demand that programs be tested for effectiveness has increased, but it is very costly to enrol enough individuals in community studies to ensure sufficient follow-up and power to detect clinically significant differences between groups. An alternative design is to assess changes at the group or community level.

Researchers linked live birth certificates for 1988 and 1989 with Medicaid newborn hospital claims to identify Medicaid births and evaluate the impact of maternity care co-ordination on birth outcomes.²² The baby's

Medicaid identification number was used to extract all health care claims beginning within 60 days of birth. The mother's name and date of birth were matched with claims paid for maternity care co-ordination, with the public health department client information system and with records of the Special Supplementary Food Program for Women and Children. The resulting sample was 15,526 women who received maternity care co-ordination and 34,463 controls.

A significant impact was found on improving birth outcomes for women on Medicaid and lowering the number of babies with very low birth weight. Prenatal care from public health departments was better than that from other services. The moral good of this study lies in its potential impact on policies regarding delivery of prenatal care to poor women. A large sample was needed to detect the small but clinically significant differences in low birth weight outcomes that were achieved. A prospective randomized trial would have allowed for informed consent and autonomy of mothers, but it would have cost much more. The research design avoided conflicts in fidelity since neither participants nor health care providers knew of the study. The record departments compromised the privacy of patients, but the study seemed the best way to achieve the moral value of justice and beneficence to the population. Some of the subjects who continued on Medicaid may have benefited.

Example 4: Use of Records on Deceased Subjects

Studies using record linkage may be the best way to achieve the moral good when contact is not possible. A study linked all death records for women aged 10–49 with live birth records, to identify women who had died within one year of giving birth.²⁵ The mother's social security number and name, and the baby's name and date of birth were used, all of which (save the social security number) are available to the public. Since the mother was dead, the privacy of the social security number is not as important. Medical records for mother and baby and autopsy reports on mothers were reviewed to identify maternal deaths. Identification of maternal deaths was increased by 100%, which has major implications for policies on perinatal care and provides a more accurate assessment of success in reaching goals for reduced maternal mortality.

The moral benefit of this study, although indirect, is the accumulation of important evidence supporting changes in health care policy and funding. The group studied could not benefit from the research. It would have been costly and very inconvenient for the researchers to contact the families of the deceased women in order to seek permission to review their medical records; furthermore, each family may have been unnecessarily upset by the reminder of the woman's (and possibly child's) death. An alternative design, a large prospective study, would also have been much more costly and intrusive and would have taken several years.

Example 5: Reporting of Sensitive Information

Ethical research ought to maintain confidentiality, particularly when breaches are in no way important to the research findings or to achieving social good. It is unusual to see this practice overlooked, but a report on a study that linked death certificates with AIDS as the cause of death to a cancer registry in order to study the impact of AIDS on "cancer registration"²⁴ contains one table in which all 20 cases of AIDS identified in the study are listed with their sex, age of death, risk group, year of cancer diagnosis, type of cancer, and whether cancer was on the death certificate and AIDS was on the medical record.

This appears to us to be a potential breach of confidentiality. We see no need to present these details to support the study's findings. Furthermore, with so few cases, the families could have been contacted for consent or the same results could have been achieved by contacting a group of living patients, obtaining their consent and getting data on cancer diagnosis, retrospectively and prospectively. This seems to be an example of violating the principle of confidentiality even if there is no evidence that any other harm befell an individual. Such extreme and unusual cases tend to receive undue attention when detected and cause alarm in the general public.

Public Concerns and Policy Development

The public's role in policy development is significant because of the dependence on voluntary provision of information by individuals.²⁵ In Britain, the United States and West Germany, policy development around technology has been characterized as conflictual. Fears of loss of privacy, the potential for increased power of the state, misuse of personal information and reduced human dignity have been raised as issues. By contrast, the Swedish response was described as "consensual, anticipatory, and open."²⁷

Canadian studies indicate that the potential for a conflictual discourse on database research exists but is avoidable. The largest group of people in one survey² was knowledgeable about computers and well educated, with a higher proportion of women, Quebec residents and white collar workers. They were extremely fearful of intrusions into privacy and tended to believe that current controls were inadequate and that informed consent and regulation needed to be increased. Another study³ found that most people tended to weigh the benefits of data collection and the presence of mechanisms for data control in deciding whether a threat to privacy was acceptable. These pragmatists became unconcerned when they believed fair practices were followed and would not seek government regulation. Thus, if health researchers follow ethical practices and are seen by the public to be doing so, demands for legislative restriction may be fewer²⁶ and the role of health data in serving the public good²⁷ may be emphasized.

Conclusions

We have discussed the ethics of database research and how computerization has increased public concern about some issues. Although there are some extreme positions taken on the subject of individual rights versus public benefit, we find general agreement that research curiosity and the convenience of database research cannot justify the suspension of moral concerns about privacy and confidentiality that affect us all as patients and citizens. Our literature review, however, suggested that more attention must be given to all of the ethical issues raised by database research since we feel that the extent to which ethically relevant details are discussed may be interpreted as a reflection of the level of concern about these issues among authors and/or editors.

In order to avoid public demands for restrictive regulation of databases and research, we believe that epidemiologists and health researchers must maintain the public's trust by providing a description of the ethical component of the research design (e.g. how confidentiality was protected or access to data without consent was justified) in proposals and published reports. The benefits of research must be highlighted, and methods of protecting confidentiality and ensuring privacy must be routinely described in research proposals and published reports. An important issue that has received little attention to date is that the moral responsibility to respect privacy increases with the sensitivity of the information.

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Status Report

Conceptual Framework for Child Maltreatment Surveillance

Lil Tonmyr and Gordon Phaneuf

The Child Maltreatment Division of the Bureau of Reproductive and Child Health, in partnership with many stakeholders, is developing a capacity for national surveillance of child abuse and neglect that consists of data collection, analysis and response. Response activities include information dissemination, knowledge development, policy analysis and targeted epidemiologic risk assessment studies to support prevention and intervention programs directed toward children and youth who are at risk.

The Canadian Incidence Study of Reported Child Abuse and Neglect

The Child Maltreatment Division is undertaking the Canadian Incidence Study of Reported Child Abuse and Neglect (CIS) as a cornerstone of a national surveillance system. The CIS collects data from participating child welfare agencies in each of the provinces and territories in Canada in order to advance the national knowledge base on the extent and dynamics of child abuse and neglect. A description of the study appeared previously in *Chronic Diseases in Canada* [1998;19(2):71–2]. The first cycle of data collection and analysis is near completion, and the data collection cycle will be repeated at set intervals. The co-operation of provincial and territorial governments is crucial to the study's success and it is hoped that each of the provinces and territories will participate on an ongoing basis.

Development of a Conceptual Framework for Child Maltreatment Surveillance

A conceptual framework is being designed to help guide the development of a national surveillance system for child maltreatment. The framework builds on the strengths and lessons learned through the implementation of the initial cycle of the CIS. It is intended to identify and suggest future paths for action by identifying priority areas for future monitoring

activities; specifying appropriate avenues for research and analysis; providing direction for partnership development and role definition; and examining competing theories on child maltreatment.

Objectives

The objectives of the conceptual framework are to examine the following items.

- the relation between child maltreatment theory and public health surveillance
- the conceptual context in which maltreatment surveillance activities should be developed
- the interplay between the conceptual and functional aspects of child maltreatment surveillance
- the “fit” between child maltreatment surveillance and population health
- the different approaches to child maltreatment surveillance with an assessment of their respective merits and limitations
- the prospects for strengthening surveillance of reported and unreported abuse
- the gaps in child maltreatment data collection and research

Approach

The project will include a literature review of child maltreatment theories, consultations with key informants domestically and internationally (World Health Organization [WHO], United Nations International Children's Emergency Fund [UNICEF], Pan American Health Organization [PAHO], Centers for Disease Prevention and Control), an expert review and the integration of a population health approach to child maltreatment surveillance.

Author References

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Expert Review

An international expert advisory committee has been established to assist in the review of the framework. The committee has representation from the WHO, PAHO, The Founders Network, the Kempe Children's Center, the American Humane Association, Westat, Ryerson University, Cornell University, University of British Columbia, University of New Hampshire and the Laboratory Centre for Disease Control.

Contractor

David Wolfe, at the Department of Psychology, University of Western Ontario, has been awarded the contract to help develop the conceptual framework. Dr Wolfe is the author of several books on child abuse, and he is the chair of the Committee on Child Abuse in Peacetime for the International Working Group on Trauma, organized by the United Nations. He has undertaken a range of research activities for Health Canada, including writing a paper for the National Forum on Health. ■

Book Review

Epidemiologic Methods for Health Policy

By Robert A Spasoff

New York: Oxford University Press, 1999;
x + 228 pp; ISBN 0-19-511499-X; \$63.95 (CAN)

When the editor contacted me to review a book whose title had both “epidemiology” and “health policy” in it, I groaned. Not because I am not interested in this area but because, to date, offerings in this area have not really delivered on the topic. They are either simply volumes of case studies or do not really describe the unique features of epidemiology when applied to health policy. This volume by Robert Spasoff actually delivers on the topic at hand, with the key word in the title being “methods.” While the book is not a rigorous methodological work (the author deliberately goes lightly on the equations), it does give an excellent overview of the diverse range of methods that can be applied in the policy cycle.

The book is split into two main sections: “Concepts, Methods, and Data” and “The Policy Cycle.” The first section covers the health policy process, basic epidemiologic methods that support policy and population health data. The opening chapter on policy may cause political scientists to cringe—this entire field is covered in a matter of pages. Imagine what all of epidemiology in the same space would look like! Also imagine how hard it would be to cover such a difficult topic in such a short space. Spasoff manages to cover the very difficult field of policy very neatly and clearly in a single chapter. His treatment should be an excellent introduction for those who are new to this field.

The chapters on epidemiologic tools and health data should be largely review for most readers with epidemiology training. Many diverse topics are brought together including several that are not covered in most introductory epidemiology textbooks. These topics are often very important to those in applied health settings like health departments or regional health authorities. Examples are record linkage, complex survey analysis and calculation of health expectancy. It is my experience that those who come to positions in such settings often have trouble getting on top of such topics. This volume should serve as a resource for these individuals. While the methodological coverage in each area is brief, there are many references provided for each topic.

The second section of the book steps through the policy cycle, starting with assessment of population health and assessment of potential interventions, and

then considering policy choices, policy implementation and, finally, policy evaluation. In each section the role of epidemiologic methods or, more appropriately, the role that epidemiologists are often called upon to play, is reviewed. Again, many topics not readily found in other epidemiologic textbooks are covered here. A realistic appraisal of the role of epidemiology in the health policy process is provided. Spasoff acknowledges that policies will be based on a range of considerations, with epidemiologic data and research being just one of them.

One topic that I thought was missing from the book as I read through it was surveillance, with related issues such as time series analysis and mapping. However, these are tucked into the final chapter on policy evaluation, although the author does note they could have also been covered in the earlier chapter on measuring health status. Again these are methods whose application by epidemiologists is relatively new and often not easily found in introductory textbooks. Hopefully, potential readers who think the policy chapters are not relevant to them won’t miss these excellent sections.

A major advantage for Canadian readers is that many of the examples are from this country. At the same time, there are also examples from the United States and Europe, particularly for the Netherlands, where epidemiologists have been able to play a major supporting role in health policy development. These examples are provided in separate boxes that are liberally dispersed through the entire book. The examples help to emphasize the applied nature of the book’s content.

The major weakness is that the book does have very brief discussions of many of the methodologies. Those who actually want to apply the methods will likely have to proceed to the references. However, this should serve as an excellent overview for epidemiologists who find themselves working in settings where they are linked to the policy process or those who would like to learn more about it. The author developed the book from a course in Epidemiology and Health Policy, and the book should serve as an excellent textbook for those planning to offer such a course.

Overall rating:	Excellent
Strengths:	Provides summary of policy development and implementation cycle for epidemiologists Reviews a range of methods not generally found in general epidemiology textbooks
Weaknesses:	Some topics are covered very briefly
Audience:	Epidemiologists and health planners at all levels of government and in community agencies Researchers and academics wishing to apply their results Graduate students in epidemiology and health services research disciplines

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New Resources

New from the Data Liberation Initiative

Health PCCF+ (Geocodes/PCCF Version 3C)

PCCF+ is an automated system that uses postal codes to assign census geography to health records. It is based on the latest Postal Code Conversion File and the Postal Code Population Weight File produced by the Geography Division of Statistics Canada. PCCF+ uses weights to allocate postal codes linked to multiple enumeration areas according to the distribution of population using a given postal code. For postal codes that do not match exactly to PCCF, the first two or three characters of the postal code are used to assign partial geographic identifiers to the extent possible. PCCF+ also generates full diagnostic and reference information for the records coded.

This is the system used for small-area coding by the Health Statistics Division of Statistics Canada, the Canadian Cancer Registries and selected Canadian Vital Statistics registries.

For authorized university research and teaching purposes, Health PCCF+ is now available under the Data Liberation Initiative (DLI). On the DLI FTP site, the filenames are shown in the directory `~/health/pccf-fccp`. For general information on the DLI, including contact persons at each participating university, see the Statistics Canada Web site: www.statcan.ca (Education resources / Data Liberation Initiative).

Vital Statistics Data from Statistics Canada

Revival of printed catalogues for 1996 and 1997 data years

Seven former catalogued publications on vital statistics were cancelled last year due to low sales (as opposed to use in depository libraries). However, for the 1996 and 1997 data years only, they will be available as “shelf tables” from the Health Statistics Division (\$20 each; telephone: (613) 951-1746; fax: (613) 951-0792; e-mail: macdgar@statcan.ca). These products carry identifying numbers like those of the former catalogues, except for using “F0” in the place of the hyphen and the addition of an “XPB” extension at the end (for bilingual format on paper). For example, catalogue 84-209 becomes catalogue 84F0209-XPB. The following items are currently available, or will be available when indicated.

Causes of Death, 1996 (catalogue no 84F0208-XPB)

Causes of Death, 1997 (catalogue no 84F0208-XPB)

Mortality—Summary List of Causes, 1996
(catalogue no 84F0209-XPB)

Mortality—Summary List of Causes, 1997
(catalogue no 84F0209-XPB)

Leading Causes of Death at Different Ages, Canada, 1996
(catalogue no 84F0503-XPB)

Leading Causes of Death at Different Ages, Canada, 1997
(catalogue no 84F0503-XPB)

General Summary of Vital Statistics by Local Area, 1996
(catalogue no 84F0001-XPB)

General Summary of Vital Statistics by Local Area, 1997
(catalogue no 84F0001-XPB, planned for November 1999 release)

Births and Deaths, 1996 (catalogue no 84F0210-XPB)

Births and Deaths, 1997 (catalogue no 84F0210-XPB)

Divorces, 1996 and 1997 (catalogue no 84F0213-XPB)

Marriages, 1996 (catalogue no 84F0212-XPB)

Marriages, 1997 (catalogue no 84F0212-XPB, planned for November 1999 release)

There are currently no plans to issue corresponding paper products for the 1998 data year.

Health Indicators CD-ROM

Health Indicators has become a CD-ROM product (catalogue no 82-221-XCB; \$100) and has expanded considerably in scope. The most recent issue contains the following vital statistics data.

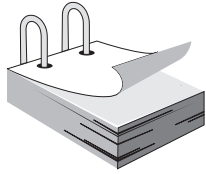
- 1996 birth, death and stillbirth data in multidimensional tables (B20/20 format, downloadable)

- 1996 and 1997 tables on causes of death (detailed causes and summary list) with content equivalent to the former causes of death publications (catalogue nos 84-208 and 84-209, but in B20/20 format, downloadable)

This product also contains lots of other health data that are not from vital statistics.

Other

The new *Compendium of Vital Statistics* (catalogue no 84-214-XPE/XPF; \$45), with data to 1996, is planned for late October release. There are no plans to publish this for the 1997 data year.



Calendar of Events

November 30–Dec 2 1999 Dallas, Texas USA	"Prevention Successes 2000: Better Health for All" 14th National Conference on Chronic Disease Prevention and Control Sponsors: Centers for Disease Control and Prevention, Association of State and Territorial Chronic Disease Program Directors and American Heart Association	Estella Lazenby The KEVRIC Company, Inc. 610 – 8401 Colesville Road Silver Spring, MD USA 20910 Tel: (301) 588-6000 Fax: (301) 588-2106 E-mail: elazenby@kevrinc.com < www.cdc.gov/nccdphp >
January 28–29, 2000 Toronto, Ontario	"Better Breathing 2000" The Ontario Thoracic Society's Annual Scientific Conference on Respiratory Health	The Ontario Thoracic Society 201 – 573 King Street East Toronto, Ontario M5A 4L3 Tel: (416) 864-9911 Fax: (416) 864-9916 E-mail: ots@titan.tcn.net < http://www.on.lung.ca >
March 13–16, 2000 Quebec City, Quebec	"Health and the Quality of Life: Our Municipalities in an Era of Globalization" 3rd Conference of Local Health Authorities of the Americas Organized by <i>l'Institut national de santé publique du Québec</i> and the WHO Collaborating Centre for the Development of Healthy Cities and Villages	Secrétariat du 3e Congrès des responsables locaux de santé des Amériques 938, rue Saint-Maurice Montréal (Québec) H3C 1L7 Tel: (514) 395-1808 Fax: (514) 395-1801 E-mail: 3econgres@opus3.com < http://www.msss.gouv.qc.ca/congres_quebec >
April 17–20, 2000 New Orleans, Louisiana USA	CDC — Diabetes Translation Conference 2000 Centers for Disease Control and Prevention	Norma Loner CDC/DDT 4770 Buford Highway NE, MS: K10 Atlanta, Georgia USA 30341-3717 Tel: (770) 488-5376
May 7–10, 2000 Victoria, British Columbia	"Science and Policy in Action" First International Conference on Women, Heart Disease and Stroke Heart and Stroke Foundation, American Heart Association, Health Canada and Centers for Disease Control and Prevention are providing early leadership	Taylor & Associates 18 – 5370 Canotek Road Gloucester, Ontario K1J 9E8 Tel: (613) 747-0262 Fax: (613) 745-1846 E-mail: gtaylor@netrover.com
May 28–30, 2000 Ottawa, Ontario	"Charting the Course for Literacy and Health in the New Millennium" First Canadian Conference on Literacy and Health Organized by the Canadian Public Health Association's (CPHA) National Literacy and Health Program	CPHA Conference Department 400 – 1565 Carling Avenue Ottawa, Ontario K1Z 8R1 Tel: (613) 725-3769 Fax: (613) 725-9826 E-mail: conferences@cpha.ca < www.nald.ca/nlhp.htm >

<p>June 11–13, 2000 Edmonton, Alberta</p>	<p>"Statistics and Health 2000" International conference organized by the Biostatistics Research Group (BRG), Statistics Centre, University of Alberta</p>	<p>KC Carrière (Program Committee Chair) Tel: (780) 492-4230 Fax: (780) 492-6826 E-mail: BRG@stat.ualberta.ca <http://www.stat.ualberta.ca/~brg></p>
<p>August 23–27, 2000 Victoria, British Columbia</p>	<p>ITCH 2000: "From Potential to Practice" International Conference on Information Technology in Community Health Call for abstracts and student poster contest deadline: December 15, 1999</p>	<p>ITCH 2000 c/o School of Health Information Science University of Victoria PO Box 3050, STN CSC Victoria, BC V8W 3P5 Tel: (250) 721-8576 Fax: (250) 472-4751 E-mail: itch@hsd.uvic.ca <http://itch.uvic.ca></p>

CDIC: Information for Authors

Chronic Diseases in Canada (CDIC) is a peer-reviewed scientific journal published four times a year. Contributions are welcomed from outside of Health Canada as well as from within this federal department. The journal's focus is the prevention and control of non-communicable diseases and injuries in Canada. This may include research from such fields as epidemiology, public/community health, biostatistics, behavioural sciences and health services. CDIC endeavours to foster communication among public health practitioners, chronic disease epidemiologists and researchers, health policy planners and health educators. Submissions are selected based on scientific quality, public health relevance, clarity, conciseness and technical accuracy. Although CDIC is a Health Canada publication, authors retain responsibility for the contents of their papers, and opinions expressed are not necessarily those of the CDIC Editorial Committee or of Health Canada.

Feature Articles

Most feature articles are limited to 4000 words of text (excluding abstract, tables, figures and reference list) in the form of original research, surveillance reports, meta-analyses, methodological papers, literature reviews or commentaries. The maximum text length for Short Reports is 1200 words.

Under normal circumstances, two other types of feature articles (both 3000 words maximum) will be considered as submissions only from authors within Health Canada: Status Reports describing ongoing national programs, studies or information systems of interest to chronic disease researchers and public health practitioners; and Workshop/Conference Reports of relevant workshops, etc. organized or sponsored by Health Canada.

Authors outside of Health Canada may submit reports for our Cross-country Forum (3000 words maximum) to exchange information and insights about the prevention and control of chronic diseases and injuries from research or surveillance findings, programs under development or program evaluations.

Additional Article Types

Letters to the Editor (500 words maximum) commenting on articles recently published in CDIC will be considered for publication. Book/Software Reviews (500–1300 words maximum) are usually solicited by the editors. In addition, the editors occasionally solicit Guest Editorials on specific topics.

Submitting Manuscripts

Submit manuscripts to the Editor-in-Chief, *Chronic Diseases in Canada*, Laboratory Centre for Disease Control, Health Canada, Tunney's Pasture, CDIC Address Locator: 0602C3, Ottawa, Ontario K1A 0L2.

Since *Chronic Diseases in Canada* adheres in general (section on illustrations not applicable) to the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" as approved by the International Committee of Medical Journal Editors, authors should refer to the *Canadian Medical Association Journal* 1997 Jan 15; 156(2): 270–7 for complete details (or at <www.cma.ca/publications/mwc/uniform.htm>).

Each submission must have a covering letter signed by all authors that identifies the corresponding author (including fax number) and states that all authors have seen and approved the final manuscript and have met the authorship criteria of the Uniform Requirements.

The covering letter should also include a full statement regarding any prior or duplicate publication or submission for publication. Written permission from anyone mentioned by name in the acknowledgements should appear at this time. Suggestions for appropriate peer reviewers are appreciated as well.

Manuscripts may be submitted in either English or French and will be published in both languages, if accepted. Submit four complete printed copies of a manuscript, double-spaced, on standard-sized paper with one-inch margins. Each section (i.e. title page, abstract and key words, text, acknowledgements, references, tables and figures) should begin on a separate, numbered page.

If a manuscript is accepted for publication, send the final hardcopy version with the accompanying text file in WordPerfect or ASCII, in IBM-compatible format, specifying the software version.

Abstract and Key Words

An *unstructured* abstract (one paragraph, no headings) not exceeding 150 words (100 words maximum for Short Reports) must accompany each manuscript with three to eight key words noted below, preferably from the Medical Subject Headings (MeSH) of *Index Medicus*.

Tables and Figures

Tables and figures should be as self-explanatory and succinct as possible. They should not simply duplicate the text, but should illuminate and supplement it, and they should not be too numerous. Place them on separate pages after the references, numbered in the order that they are mentioned in the text.

Provide explanatory material for tables in footnotes, identifying the table footnotes by lower-case superscript letters in alphabetical order.

Figures must be limited to graphs or flow charts/templates; we are unable to publish photographic illustrations at this time. Specify the software used (preferably Harvard Graphics) and supply raw data (in hardcopy form) for all graphs. **Do not import figures into the text of the manuscript.**

Authors must obtain written permission from the copyright holder to reproduce or adapt any tables or figures that have been published previously.

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References should follow the Vancouver style, numbered consecutively in the order that they first appear in the text (identified by numbers in superscript or within parentheses) and arranged numerically in the reference list. References cited only in tables or figures should be numbered as above according to the first mention of the particular table/figure in the text. **Remove any endnote/footnote word-processing feature used to generate a reference list.**

Authors are responsible for verifying the accuracy of references. The use of references to unpublished observations/data or personal communications is discouraged; if used, do not include with numbered references but in the text in parentheses and obtain permission for these citations.

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