Patterns of health and disease are largely a consequence of how we learn, live and work

How Healthy Are Rural Canadians?

An Assessment of Their Health Status and Health Determinants

A Component of the Initiative "Canada's Rural Communities: Understanding Rural Health and Its Determinants"

September 2006

Canadian Population Health Initiative

Public Health Agency of Canada / Agence de santé publique du Canada

CRaMHR

Canadian Institute for Health Information / Institut canadien d'information sur la santé

The views expressed in this report do not necessarily represent the views of the Canadian Population Health Initiative, the Canadian Institute for Health Information, the Public Health Agency of Canada, the Centre for Rural and Northern Health Research or Laurentian University.

Canadian Institute for Health Information
495 Richmond Road
Suite 600
Ottawa, Ontario
K2A 4H6

Phone: 613-241-7860
Fax: 613-241-8120
www.cihi.ca

ISBN 13: 978-1-55392-881-2 (PDF)
ISBN 10: 1-55392-881-4 (PDF)

Cette publication est disponible en français sous le titre *Comment se portent les Canadiens vivant en milieu rural? Une évaluation de leur état de santé et des déterminants de la santé*
ISBN 13 : 978-1-55392-883-6 (PDF)
ISBN 10 : 1-55392-883-0 (PDF)

Acknowledgements

Editors

The core research team and editors of the report, *How Healthy Are Rural Canadians? An Assessment of Their Health Status and Health Determinants*, included the following:

Principal Investigators

Marie DesMeules

Raymond Pong

Co-Investigators

Claudia Lagacé

Denis Heng

Doug Manuel

Roger Pitblado

Ray Bollman

Judy Guernsey

Arminée Kazanjian

Irene Koren

How Healthy Are Rural Canadians? An Assessment of Their Health Status and Health Determinants is the result of the efforts of a great number of people and organizations, which contributed in a variety of ways. The core research team thanks all of those involved for the generous sharing of their thoughts, ideas and time and believes that the wide variety of input received has added to the richness of the final product. We would like to thank the following individuals for providing technical and analytical assistance: Lars Apland, Jenny Gold, Anita Li, Robert Semenciw and Feng Wang.

Mortality and cancer incidence data were provided to the Public Health Agency of Canada from the Canadian Vital Statistics databases and the Canadian Cancer Registry at Statistics Canada. The cooperation of the provincial and territorial vital statistics and cancer registries that supply the data to Statistics Canada is gratefully acknowledged.

Advisory Committee

The Advisory Committee helped to create the broad vision of the report and provided general input and feedback throughout the project. The Advisory Committee consisted of the following:

Jean Pruneau, Manager, Mental Health Promotion Section,
Centre for Healthy Human Development, Public Health Agency of Canada

Marc Hamel, Assistant Director, Population Health Surveys,
Health Statistics Division, Statistics Canada

Kira Leeb, Manager, Health Services Research
Canadian Institute for Health Information

Judith Dowler, Senior Advisor to the Deputy Minister
Departmental Secretariat, Deputy Minister's Office, Health Canada

Aurelie Mogan, Senior Economist
Rural Secretariat, Agriculture and Agri-food Canada

Reviewers

This document was kindly peer-reviewed in its entirety by:

Marc Hamel, Assistant Director, Population Health Surveys, Health Statistics Division, Statistics Canada

Dr. Renee Lyons, Canada Research Chair in Health Promotion, Dalhousie University

Dr. Mark Wheeler, Assistant Director, Policy Division, Policy Planning and Priorities Directorate, Health Policy Branch, Health Canada

Contents

List of Tables

List of Figures

List of Appendix Tables

Preface

Canada's Rural Communities: Understanding Rural Health and Its Determinants is a research program co-funded by the Canadian Population Health Initiative (CPHI) of the Canadian Institute for Health Information (CIHI), the Public Health Agency of Canada and the Centre for Rural and Northern Health Research. This is a multifaceted program consisting of five components:

- Component 1—**Conceptual and methodological considerations** (available data sources and relevant indicators for rural health were explored).
- Component 2—**How healthy are rural Canadians?** (national data sources were analyzed to provide a systematic and comprehensive assessment of the health status of rural Canadians).
- Component 3—**What are the determinants of rural health?** (secondary data sources and a variety of quantitative techniques were used and applied to identify key determinants of rural health).
- Component 4—**Focusing on health services as a determinant of health** (use of and access to health services were examined more comprehensively as a major determinant of health).
- Component 5—**Preparing for Phase II** (complementary methods, such as international comparisons and qualitative research, were explored and assessed for feasibility).

This report presents the results of our work from Component 2 and part of Component 3. It focuses on the analyses of several national data sources to examine whether there are differences in health between rural and urban Canadians. It explores many of the disadvantages and disparities facing rural communities of Canada. It is not our intent to diminish the advantages and attractions that many rural areas offer to their residents or visitors; rather, the aim is to create a wider understanding of rural health needs and to inform and support programs and policies that will attend to these needs.

The following material reflects the work of Canada's Rural Communities' research team that began in October 2002. Additional work that forms part of Canada's Rural Communities' research program will continue over the next year, and will be reported in a future report.

Executive Summary

How Healthy Are Rural Canadians? An Assessment of Their Health Status and Health Determinants is a pan-Canadian report that examines patterns of selected socio-demographic and economic characteristics, health status and health behaviours, focusing on the differences between rural and urban Canadians. The purpose of this report is to create a wider understanding of rural health needs and to inform and support programs and policies that will attend to these needs.

In the past few years, increasing attention has been given to the role of place in shaping people's health experiences. However, most of the theoretical work on place and health has been based on studies of urban environments. Less attention has been directed to characterizing the health of rural populations of Canada. This document is the first report ever produced at the pan-Canadian level that provides a broad picture of the health of rural populations. Its descriptive analysis provides a basis for considerations of rural health issues among health decision-makers and suggests future avenues of research in the area of rural health.

The report will be of interest to national, provincial, territorial and regional health authorities, practitioners, officials and decision-makers responsible for specific health promotion, as well as for disease prevention and clinical care programs. It will also be of interest to policy-makers in related non-health sectors, such as economic and social development in rural communities.

Findings in this report were obtained from several pan-Canadian data sources, including the Canadian Community Health Survey (CCHS), the Canadian annual mortality database and the Canadian Cancer Registry. The Metropolitan Influenced Zone (MIZ) classification developed by Statistics Canada was used to distinguish between urban and different types of rural communities. The MIZ definition is based on population density and distance, but also considers the commuting flow between rural and small towns and larger centres. Urban areas are defined as census metropolitan areas (CMAs) and census agglomerations (CAs). Metropolitan Influenced Zones (MIZ) are assigned on the basis of the share of the workforce that commutes to any CMA or CA (Strong MIZ: between 30% and <50%; Moderate MIZ: between 5% and <30%; Weak MIZ >0% and <5%; No MIZ: no commuters). This report explores such issues as socio-demographic characteristics, health behaviours, life expectancy and quality of life indicators, chronic conditions and injuries in Canadian rural and urban communities.

While some health measures did not show any pronounced rural–urban differences, and some adverse health measures were found to be higher in urban areas, rural areas generally showed a health disadvantage for many health-related measures examined in this study. Health disadvantages were reflected in measures that included higher mortality rates and standardized mortality ratios or relative risks greater than 1.0.

- Rural areas reported higher proportions of people with low income and less than secondary education level. On the other hand, a strong sense of community belonging was reported by rural residents in greater proportions than by their urban counterparts.
- Health-related factors, such as the prevalence of smoking and obesity, were elevated in rural Canada, while analyses of other health influences, such as dietary practices and leisure time physical activity, indicated lower practice levels in rural areas.
- For men, life expectancy at birth was significantly higher in urban areas compared to rural areas. Life expectancy in men ranged from 74.0 years in No MIZ areas to 76.8 in CMAs/CAs, but was higher in Strong MIZ areas (77.4 years) compared to CMAs/CAs. Among women, life expectancy was at its lowest in Weak MIZ areas, with 81.3 years, and at its highest in Strong MIZ areas, at 81.5 years.
- Higher overall mortality risks among rural communities seem to be driven by higher death rates from causes such as circulatory diseases, injuries and suicide. Residents of the most rural areas are often at highest risk. In contrast, residents of rural communities that have the most commuting flow between large centres were at lower risk of dying from certain conditions than those in urban areas or other rural areas.
- Circulatory disease mortality risk is significantly higher in all MIZ categories (with the exception of Strong MIZ areas) among men and women both aged 0 to 65 years and older than 65 (figures are for both sexes combined):
  - Strong MIZ areas: standardized mortality ratio = 1.00
  - Moderate MIZ: standardized mortality ratio = 1.07
  - Weak MIZ: standardized mortality ratio = 1.06
  - No MIZ: standardized mortality ratio = 1.10
- The incidence rates of most cause-specific cancers were lower in rural areas than in urban areas. Overall, cancer mortality rates were slightly lower in rural than urban areas (men—CMA/CA: 247.0 per 100,000; Weak MIZ: 238.7 per 100,000; women—CMA/CA: 155.1 per 100,000; Weak MIZ: 149.9 per 100,000).
- Respiratory disease mortality risks were, for the most part, significantly higher among rural residents (both sexes combined—Moderate MIZ: standardized mortality ratio = 1.08; Weak MIZ: standardized mortality ratio = 1.10; No MIZ: standardized mortality ratio = 1.10). Residents of Strong MIZ areas, however, had a reduced risk of dying from respiratory conditions, compared with those living in metropolitan cities (both sexes combined—standardized mortality ratio = 0.94). Women living in Weak MIZ areas reported a prevalence of asthma significantly lower than their urban counterparts.

- Only women living in Weak and No MIZ areas reported a higher prevalence of diabetes. When examining mortality risks, a reduced risk of dying from diabetes was observed for men living in Strong MIZ areas compared to their urban counterparts (Strong MIZ: standardized mortality ratio = 0.81). In contrast, women living in the most rural areas had higher risks of dying from diabetes compared to those living in urban areas (Moderate MIZ: standardized mortality ratio = 1.17; Weak MIZ: standardized mortality ratio = 1.16; No MIZ: standardized mortality ratio = 1.32).
- Canadians living in Strong, Weak and No MIZ areas reported a higher prevalence of arthritis/rheumatism than their urban counterparts (both sexes combined—CMA/CA: 15.4%; No MIZ: 17.5%).
- Multivariate analyses adjusting for various socio-economic and demographic factors showed that higher mortality risks in rural areas remained for all-cause mortality (relative risks, or RRs, ranging from 1.11 to 1.37 for men aged 0 to 44 years and from 1.08 to 1.31 for women in the same age group), motor vehicle accident deaths (RRs ranging from 1.61 to 1.90 for men aged 45 to 64 years and from 1.69 to 2.98 for women in the same age group) and suicides (RRs ranging from 1.28 to 1.67 for men aged 65 years and older and from 0.66 to 0.81 for women in the same age group).

This report shows that, generally, rural residents of Canada are more likely to be in poorer socio-economic conditions, to have lower educational attainment, to exhibit less healthy behaviours and to have higher overall mortality rates than urban residents. While some determinants of health are more difficult to modify than others, the authors identified possible avenues for addressing urban–rural health disparities, including, for example, the following:*

- Although many regional economic development programs or projects have yielded mixed results, some success stories may serve as models for community interventions. Innovative and multi-sectoral approaches could play an important role in assisting communities to adjust to and address micro- and macro-level changes such as boom-and-bust economic cycles (which tend to hit rural communities particularly hard) or a community's dependence on one industry for economic sustainability.
- Overall mortality due to injury and poisoning is considerably higher in rural areas than in urban areas. Certain rural-based industries, such as farming, fishing and logging, tend to have high levels of occupational hazards. One area of attention could be occupational health and safety issues in the rural setting, as rural workers may have special needs for which different solutions may be effective.

* Please note that the recommendations presented in the report do not necessarily reflect those of the Canadian Institute for Health Information, the Public Health Agency of Canada, the Centre for Rural and Northern Health Research or Laurentian University.

- People living in rural communities generally need to travel longer distances, and often on more dangerous roads, for work, shopping and other reasons. Not surprisingly, injuries and death due to traffic accidents are much more common in rural areas. Improving rural road conditions and raising road safety awareness could be an avenue to explore.
- The importance of disease prevention and health promotion is well recognized in public health and clinical settings. What is less clear is whether conventional strategies, mostly developed by urban program planners for urban residents, are equally effective in rural settings. Findings reported in this study concerning health-related factors, such as higher proportions of smokers, lower consumption of fruit and vegetables and higher proportion of individuals who are overweight among rural residents, suggest that there may be potential in rural-friendly approaches in disease prevention and health promotion.

Chapter 1 Introduction and Background

In comparison with other countries of the world, Canadians as a whole enjoy a very high standard of living. According to most summary measures of social well-being, Canada compares well against other developed countries such as the United States, Australia, Japan and the United Kingdom. Canadians are healthy: in 2000, the life expectancy at birth stood at 79.4 years, one of the highest among OECD (Organisation for Economic Co-operation and Development) countries—only Japan, Switzerland, Sweden and Iceland have higher life expectancies. The infant mortality rate in Canada has fallen greatly over the past few decades (it stood at 5.3 deaths per 1,000 live births in 2000, lower than in the U.S. and around the median among OECD countries). The unemployment rate is lower than that in Italy, Greece and Germany, and labour force participation is similar to that of most OECD countries.[1, 2] Measures of the health of a population are linked and reflect other aspects of social well-being, including socio-economic status.

Summary measures of an entire population, however, rarely tell the whole story. This report and the work of other researchers show that characterizing the rural populations of Canada and their health status is complex. Inevitably, there will be certain groups within the population that will fare relatively better or worse than the average when specific measures of health and well-being are examined. Health deficits are not irreversible realities, but they exist.[3] For example, Canada's Aboriginal population lags behind the rest of the population in several important areas, such as health and socio-economic status.[4] People living in remote regions are also disadvantaged with regard to education and employment opportunities, income and access to goods and services (and in some areas, access to basic necessities, such as water and fresh food).[5–7] These disadvantages are reflected in their overall less favourable indicators of social well-being, including health indicators.

Several key documents, such as *Toward a Healthy Future: Second Report on the Health of Canadians*,[8] have stressed the need to enhance understanding of the broader determinants of health affecting the well-being of Canadians. However, the information available to date is unfortunately incomplete and unsystematic. Criticisms of existing Canadian studies typically are that they are not national in scope, are dated, are not comparable because of the use of different definitions of "rural" and are limited in nature because a very restricted set of indicators is used. Somewhat limited evidence suggests that rural populations may have specific health vulnerabilities, poorer health status, lower life expectancy, higher accident and injury rates and higher levels of disability.[9–13] There is also evidence indicating that rural communities have unique characteristics with respect to health determinants, including demographic, economic and social factors, as well as physical environment factors.[14, 15] To date, much of rural health research in Canada has focused on accessibility to health services, and less attention has been given to the other determinants of health. This greater attention given to health care services issues experienced by rural residents can be justified by the fact that "rural" is characterized by long distances and low population density, and the challenge of providing health services is a compound feature of the following issues:

1. The economic base of many rural communities is shifting because machinery is being substituted for labour in communities based on farming, fishing, mining and lumbering. The challenge facing these communities is to find new ventures in order to maintain their employment base, and, typically, this has proven to be a difficult endeavour.[242]
2. The technology of many health services requires more equipment per health professional, which can be justified only in larger hospitals serving larger communities.[243–245]
3. Many communities face a double setback: because their population base is declining, it no longer meets the conditions to justify highly specialized health care facilities.[246]

However, there may be more fundamental reasons behind the disparities identified in the literature than simply access to services. An adequate understanding of rural health requires the adoption of a much broader perspective.

1.1 Objectives and Framework

"Place" embodies a lot of things. It is a shorthand way of describing a host of factors that may have health consequences for communities, populations, families and individuals. Before the early 1990s, research on the effect of place on health was scarce, partially as a result of concerns about the ecological fallacy† and a lack of methodological and computing techniques. Another reason was the unavailability of data or suppression/ release of numbers for small places. Place was often treated as a residual category: "an unspecified black box of somewhat mystical influences on health that remains after investigators have controlled for a range of factors."[16] Since the early 1990s, a resurgence of interest in the role of place in shaping people's health experiences has occurred. It is now argued that place should have a special status in the population health debate as an important explanatory variable.[17–23]

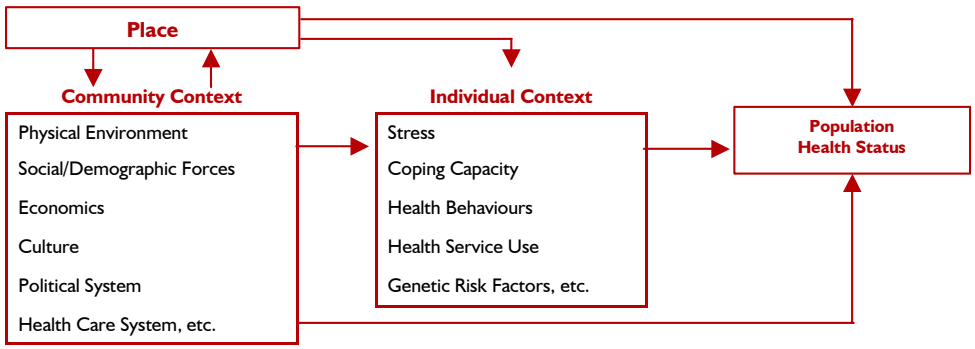
Given this enhanced interest in place and its role in population health research, the conceptualization and measurement of place has received more attention. Three types of explanations for geographic variations in health have been suggested: compositional, contextual and collective.[16] Compositional explanations draw our attention to the characteristics of individuals concentrated in particular places; contextual explanations are related to opportunity structures in the local physical and social environment; and collective (social capital) explanations emphasize the socio-cultural and historical features of communities, such as shared norms, traditions, values and interests. These explanations are viewed as being interrelated and embedded in relationships that tie the individuals to organizations, neighbourhoods and families in their communities, and should be included in studies of place and its effects on health.[16, 17, 24]

† The ecological fallacy is an error in the interpretation of statistical data in which inferences about the nature of individuals are based upon aggregate statistics collected for the group to which those individuals belong (that is, an assumption that all members of a group exhibit characteristics of the group at large).

One important aspect of place is community size and rurality, which is the focus of this study. Most of the theoretical work on place and health and how to measure its effects, while relevant to the study of rural health, has been based on studies of urban environments.[24] This has contributed to the difficulties encountered in our work and the work of others in trying to characterize the rural populations of Canada and their health status. A simplified framework that incorporates the concept of "place" and its "rural" dimension by portraying the hypothesized relations between major categories of determinants and the health status of rural populations has been developed as part of this research (Figure 1). This framework recognizes the compositional, contextual and collective features of place and shows that the relations can be direct, indirect or reciprocal.

Figure 1

A Population Health Framework for Rural Health



Building on this framework, the overall research question driving this report is the following: Are the people living in rural areas and small towns less healthy than those living in urban areas? The report presents the results of both a descriptive analysis of selected health and socio-economic indicators and several multivariate regression analyses. The main objective was to describe the health status and identify key determinants of health that would permit us to explain why some rural communities are healthy and others are not. Specifically, this report addresses the following objectives:

- Identify the key variables (health determinants and/or health status indicators) that lead to health similarities or differences among urban, suburban, rural and remote populations;
- Describe whether residence in a rural or remote location is a determinant of health above and beyond other known determinants of health;
- Assess whether there are disparities between rural and urban populations on individual and community determinants of health; and
- Contribute to addressing some of the knowledge gaps that have been identified in the past, as well as stimulate more research and interest in rural health.

1.2 Structure of the Report

This report has five chapters and a number of appendices. Chapter 1 provides the introduction, background, objectives and framework for the report. Chapter 2 provides a brief overview of the literature on population health, with an emphasis on the health of rural populations living in developed countries, focusing on Australia, the U.S. and the UK. It is divided into three main sections: issues pertaining to the socio-demographic and economic context of Canada's rural communities; issues pertaining to health status and determinants of health of rural areas, including mortality, socio-economic status, race and ethnicity, environmental factors, health-related behaviours, physical and cultural access to services and psychosocial factors; and a brief overview of Canada's policy activities in the area of rural health.

Chapter 3 describes the data sources and the methodologies that were used in the production of this report. Strengths and limitations of the approach that we used are articulated in further depth in this chapter. Chapter 4 presents the results of this study. The results are presented and discussed according to five themes: socio-demographic characteristics; health behaviours; overall measures of health status; chronic diseases; and injuries and poisonings. The final chapter draws together the major findings and discusses the broad policy implications of our findings and the lessons learned.

Appendix A provides examples of Census subdivisions classified to degrees of rurality (Metropolitan Influence Zone [MIZ]). Appendix B provides further details on the Canadian Community Health Survey (CCHS) and provides definitions of CCHS variables that were examined as part of this study. Appendix C contains all of the supplementary age-standardized mortality rate tables. These tables provide the national mortality rates of selected ICD-9 chapters by age group, sex and place of residence for the 10-year period between 1986 and 1996. Appendix D contains all of the supplementary age-standardized tables created from data obtained from the CCHS, Cycle 1.1 (2000–2001). These tables detail selected socio-demographic characteristics, health status and quality of life indicators, health behaviours and chronic conditions by sex and place of residence. Appendix E provides the supplementary regression analyses.

Limitations

This document is the first report ever produced at the pan-Canadian level that provides a broad picture of the health situation of rural populations. It is a descriptive analysis, and its intention is to provide material for the discussion of rural health issues—and perhaps even to suggest future avenues of research in the area of rural health. It does not provide information on causal relationships between place of residence and particular health problems. As well, it does not examine the heterogeneity of urban health or compare different types of urban communities to rural areas. "Urban areas," defined in this study as all CMA/CA areas,‡ was used as the referent group in all of our analyses, despite the apparent heterogeneity of urban areas that have been demonstrated by other

‡ **Census metropolitan areas** (CMAs) have 100,000 or more people in the urban core (including all neighbouring towns and municipalities where 50% or more of the workforce commutes to the urban core). **Census agglomerations** (CAs) have 10,000 to 99,999 in the urban core (including all neighbouring towns and municipalities where 50% or more of the workforce commutes to the urban core).

researchers.[25] The intent of our project has not been to dismiss the importance of the differing levels of health status in urban areas by treating them as one homogeneous unit. Rather, the authors fully acknowledge that these issues are important to better understand geographic disparities. Our goal was to focus on rural areas, given that the body of knowledge of the health of rural communities in Canada is quite limited and that a better understanding of rural health issues is needed.

Chapter 2 Literature Review

2.1 Socio-Demographic and Economic Context of Canada's Rural Communities

Most people have an intuitive notion of what "rural" means, but a precise and universally accepted definition has thus far eluded researchers and public administrators. "Rural," to most people, is "non-urban," "urban" is "non-rural"—a largely tautological definition that is not particularly helpful for research purposes. Depending on the specific definition of "rural" that is used, very different results can be obtained. For example, rural Canada can be shown to have made up as little as 22% and as much as 38% of Canada's population in 1996, depending on which definition is chosen.[26] In a large portion of research publications, though, this problem is side-stepped by authors who do not explicitly define "rural," typically using the term as if the readers already know what it means. The lack of a precise definition means that comparisons of the results are problematic.

Definitions of rurality based on distance and density have been employed with some success in quantitative research using secondary data sources; du Plessis et al.[26] and Pong and Pitblado[27] have identified some definitions of "rural" commonly used in Canada and have noted their strengths and limitations. In general, these definitions introduce some sort of gradation of "rural" (that is, categories of rurality), primarily based on distance and density. A key strength of these types of definition is that they allow for comparisons. A common limitation of each of these definitions is that they do not deal in any depth with a social representation of "rural" and may not be appropriate for use in other types of research.

Using a definition of "rural" that is based on distance and density (such as the metropolitan influenced zone, or MIZ, which is based on the commuting flow between rural and small towns and larger centres),§ Canada's rural communities can be characterized, among other things, by their widely scattered population. Though well over 95% of Canada's land mass is rural according to 1996 Census data, that mass is populated by only 22.1% of Canadians.[28, 29] Between 1996 and 2001, the total rural population (all MIZ categories combined) declined relative to urban areas in both absolute numbers and proportion of the Canadian population (Table 1). When examining the different categories of rurality in the MIZ classification scheme, Strong MIZ areas and, to a lesser extent, No MIZ areas, actually reported an increase in population, whereas Moderate and Weak MIZ areas reported a decrease in population.**

§ Refer to Section 3.1 for a detailed definition of "metropolitan influenced zone."

** Examples of how some of Canada's communities are classified to each degree of rurality using the metropolitan influenced zone (MIZ) classification can be found in Appendix A at the end of this report.

Table 1

Population by Degree of Rurality (Metropolitan Influenced Zone, or MIZ), Canada, 1996 and 2001

	Population and Percent Distribution (Within 2001 Boundaries)				Percent Change Within MIZ Groups Between 1996 and 2001
	1996	%	2001	%	
Urban (CMA/CA)	22,654,692	78.5	23,839,086	79.4	5.2
All rural and small town areas	6,192,069	21.5	6,168,008	20.6	-0.4
Strong MIZ	1,470,493	5.1	1,524,579	5.1	3.7
Moderate MIZ	2,307,387	8.0	2,285,538	7.6	-0.9
Weak MIZ	2,027,488	7.0	1,969,211	6.6	-2.9
No MIZ	330,616	1.2	333,847	1.1	1.0
Rural and small town territories	56,085	0.2	54,833	0.2	-2.2
Total	28,846,761		30,007,094		4.0

Source: Adapted from the Statistics Canada Census of Population, 1996 and 2001.
This analysis is based on the Statistics Canada Census of Population, 1996 and 2001.
All computations, use and interpretation of these data are entirely that of the authors.

The percent changes within MIZ groups at the national level mask some important variations at the provincial/territorial level (Table 2). For example, though there was a general increase in percent of the population living in census metropolitan areas/census agglomerations (CMA/CAs) at the national level, those urban areas in Newfoundland and Labrador, the Yukon and the Northwest Territories experienced decreases in their populations. For the different rural areas, at one end of the spectrum, Newfoundland and Labrador experienced strong decreases in population for all MIZ areas, whereas Alberta experienced increases in population in all MIZ areas, especially in Strong and No MIZ areas. The other provinces fell somewhere between these two extremes, with provinces such as Nova Scotia, New Brunswick and Saskatchewan tending towards rural population decline and provinces such as Manitoba and Ontario tending towards rural population increase during this five-year period.

Rural communities face a number of socio-demographic and economic challenges. In general, rural communities have different socio-economic and demographic profiles than urban communities. The aging of the population, economic difficulties and geographic isolation are among the factors that could contribute to specific health vulnerabilities in rural areas and small towns in developed countries.

Table 2

Population Change by Degree of Rurality (Metropolitan Influenced Zone, or MIZ) Between 1996 and 2001

	Percent Change Within MIZ Groups Between 1996 and 2001						
	Urban	Rural and Small Town (RST) Areas					Total
	CMA/CA	All RST Areas (Subtotal)	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ	
Newfoundland and Labrador	-2.6	-10.6	-10.7	-10.9	-10.0	-11.2	-7.0
Prince Edward Island	1.8	-1.0	0.1	-1.2	-2.0	-5.8	0.5
Nova Scotia	1.2	-2.3	4.9	-2.1	-3.2	-1.3	-0.1
New Brunswick	0.3	-2.7	-1.6	-3.5	-2.9	3.0	-1.2
Quebec	2.0	-0.8	2.3	-1.3	-4.4	-0.4	1.4
Ontario	6.8	1.5	4.1	-0.1	-2.9	11.6	6.1
Manitoba	0.5	0.5	3.1	1.8	-1.3	1.4	0.5
Saskatchewan	0.6	-3.5	0.8	-2.6	-4.4	-3.5	-1.1
Alberta	12.0	5.5	12.7	5.9	1.8	17.9	10.3
British Columbia	6.0	-1.1	2.5	0.7	-3.9	1.1	4.9
Yukon Territory	-1.8	-18.9	n/a	n/a	n/a	n/a	-6.8
Northwest Territories and Nunavut	-4.2	0.9	n/a	n/a	n/a	n/a	-0.5

n/a = not applicable
Census metropolitan areas (CMAs) have 100,000 or more residents in the urban core and include all neighbouring towns and municipalities where 50% or more of the workforce commutes to the urban core.
Census agglomerations (CAs) have 10,000 to 99,999 people in the urban core and include all neighbouring towns and municipalities where 50% or more of the workforce commutes to the urban core.
Metropolitan influenced zones (MIZ) are assigned on the basis of the share of the workforce that commutes to any CMA or CA (Strong MIZ: 30 to <50%; Moderate MIZ: 5 to <30%; Weak MIZ: >0 to <5%; No MIZ: no commuters).
Note: Using the 2001 boundaries, the MIZ classification groups all three territories into a unique category that is not further broken down into MIZ categories.
Source: Adapted from the Statistics Canada Census of Population, 1996 and 2001.
This analysis is based on the Statistics Canada Census of Population, 1996 and 2001.
All computations, use and interpretation of these data are entirely that of the authors.

Most rural communities have a high dependency ratio—that is, large populations of children and youth (0 to 19 years of age) and seniors (older than 60 years of age), and a relatively small population of working-age individuals (20 to 59 years of age). Rural populations are generally older than their urban counterparts. Many factors contribute to an older age distribution, including the aging of the rural population, the tendency of retirees to move to rural areas and the migration of rural youth to urban centres for further education and employment opportunities.[29]

Employment and education opportunities are critical to the well-being of small communities. Unfortunately, there is a prevailing view that rural areas are lacking in these opportunities, as well as in the social, cultural and recreational facilities that attract skilled labour. In general, rural populations are less highly educated, have higher unemployment rates and have lower incomes than urban populations. In 2001, the proportion of people aged 20 to 34 with less than a high school graduation certificate was higher in rural (23%) than in urban (14%) communities.[30] Finally, income disparities between rural and urban populations are still apparent, families in rural communities having a median income of $49,449 compared with $56,817 for their urban counterparts.[30]

Labour force participation and employment and unemployment rates provide an indication of the general economic performance of a community or region. The labour force participation and employment rates increased in both rural and urban areas between 1996 and 2000 (6% and 8%, respectively). While both the labour force and employment rates in rural areas remained lower than in urban areas, growth was similar in rural and urban regions, at just over 5%. During the same period, the unemployment rates in rural and urban areas declined, but the rate of reduction was slightly less in rural areas.[31]

It has been shown that young people living in rural communities tend to migrate to more urban centres for different reasons, including better employment opportunities, and this situation is reflected by lower employment rates of rural youth.[29] Young people aged 15 to 24 years old living in rural areas had lower labour force participation rates than those in both urban areas and the general rural population. Although the unemployment rates have decreased over time, they were higher for youth living in rural areas compared to urban youth in 2000 (15% and 12%, respectively); the unemployment rates were particularly high among male youth (over 15%) living in rural areas.[31]

The ethnic composition of rural areas also differs from that of urban areas. In 1996, rural Canada had the lowest proportion of immigrants, including recent immigrants and visible minorities; 88% lived in urban regions.[32] Immigrants who settled in rural regions preferred the higher-income provinces (British Columbia, Ontario and Alberta) and the Yukon. In rural regions of Saskatchewan, Quebec and the Atlantic provinces, immigrants represented less than 4% of the population.[32]

Another important characteristic of rural communities is their relatively high proportion of Aboriginal People compared with urban centres. Canada has the second-highest Aboriginal Peoples' share of the total population, at 3.3%. New Zealand ranked first, with Aboriginal Peoples making up 14% of its total population. Aboriginal Peoples accounted for 2.2% of Australia's population and 1.5% of the population of the U.S.[33] In Canada in 2001, a little over half (51%) of the population who identified themselves as Aboriginal—First Nations, Inuit and Métis—lived in rural areas;[33] 31% of the total rural Aboriginal population lived on Indian reserves and settlements and 19.5% lived in rural non-reserve areas.[33] These proportions have declined slightly since 1996, as the Aboriginal population is experiencing the same issues of youth migration to urban areas.

In addition to the challenges of rural life, many Aboriginal communities have the added challenges that come from living in remote communities. Health Canada (2003)[4] has developed a four-level classification system of remoteness for First Nations and Inuit communities: type I—remote isolated—no scheduled flights or road access and minimal telephone or radio service; type II—isolated—scheduled flights, good telephone services, no road access; type III—semi-isolated—road access, physician services at greater than 90 kilometres; and type IV—non-isolated—road access and less than 90 kilometres away from physician services. The majority of Aboriginal communities, 64%, are non-isolated; 14% are semi-isolated; and 22% are isolated or remote isolated.[4]

2.2 Health Status and Determinants of Health in Rural Areas and Small Towns

Despite the general consensus in the literature that people in rural and remote communities have poorer health status than those who live in larger centres, it is prudent to not take this as a blanket statement for all rural and remote communities. Studies of differences in rural and urban health status, sometimes even published within the same country, have produced conflicting conclusions of whether certain characteristics confer an advantage or disadvantage on rural areas, depending on the level of geographic detail and the chosen outcomes of a particular study.

Mortality

Studies of overall mortality offer an example of the range of conclusions that can be drawn when data are analyzed by place of residence. Several studies published in the U.S. and in Australia have shown higher overall mortality rates among people living in rural areas and small towns.[34, 35] In the UK, as early as the mid-19th century, it had been shown that urban areas had higher mortality rates, a difference that has continued in more recent reviews.[36, 37] This, however, may mask more subtle variations at smaller geographic areas within countries. For example, in the UK, some rural northern districts had higher mortality rates than urban districts in the south, and remoter rural districts had higher and more rapidly increasing mortality rates than less remote rural areas.[36]

Not only do countries differ about whether rural areas are disadvantaged, but this research question is also further complicated when age, sex and other important possible confounders are taken into account. Eberhardt et al.[35] reported higher mortality rates among persons 65 years of age and over living in the U.S.'s rural areas. Conversely, a study looking at the effect of rural residence on the mortality hazards of people aged 55 years and older found an urban mortality gradient—mortality risk decreasing as population density declines—even after the effect of age, sex, marital status, ethnicity and socio-economic status had been controlled for.[38] It also concluded that the introduction of major confounders did not explain away the association between level of urbanization and all-cause mortality.

Studies of cause-specific mortality patterns provide more examples of how rural areas and decreased health status are not always synonymous. In the U.S., mortality rates from ischemic heart disease were higher among men living in rural communities, but lower among rural women compared with their urban counterparts.[35] In Australia, rates of death from heart disease were higher in rural and remote areas among both sexes.[34, 39] In Canada, a study done in the province of Quebec reported lower mortality rates in rural areas from ischemic heart disease.[40]

Similar to cardiovascular mortality, cancer mortality varies when analyzed by place of residence: geographic differences seem to vary according to sex and cancer site. In Australia, all-cancer mortality was higher among males living in rural and remote areas, but among females the rates were similar across all rural–urban categories.[34] Breast cancer mortality in rural areas is either lower than or similar to the rates in urban areas, whereas death rates for cervical and lung cancer appear higher in rural and remote areas.[34, 40, 41] Ethnicity could also play an important role in the risk of dying from cervical cancer, particularly among women living in the most remote areas. An Australian study has shown that, compared with non-Aboriginal women living in either urban or rural areas, Aboriginal women living in rural areas were at greater risk of dying from cancer of the cervix.[42]

Mixed results are also found in the literature on chronic diseases. A provincial study done in Canada did not find any evidence of an urban–rural gradient for several chronic conditions, including arthritis, food allergies, asthma, heart disease, diabetes and back pain.[40] This was corroborated by two studies (Canadian and Australian), which found that people living in rural areas were less likely to report a chronic condition, and that the health problems experienced by women in rural and remote areas were very similar to those reported by urban women.[43, 44] However, remote area women were more likely to report skin cancer and diabetes.[43] Studies on cancer incidence indicate that, overall, it is similar in rural and urban areas. However, the data do indicate that the incidence of cancer in the buccal cavity, lips and pharynx is substantially higher in rural areas and affects more men than women.[45, 46]

Injuries, motor vehicle accidents and suicide are increasingly recognized as being greater problems in rural areas. All studies examined showed that mortality from unintentional injury, motor vehicle accidents and suicide increased strongly with increasing rurality.[34, 35, 37, 40, 47, 48] The farming environment and the diversity of production processes that are carried out on a daily basis on farms can contribute to the high rate of injury.[49] Moreover, injury is the leading cause of mortality among children living in rural areas of Manitoba, particularly among those living in the north.[50]

Suicide is also a major health and social problem in rural areas. There is a clear urban–rural increase in suicide rates among males, but not among females.[35, 40, 47, 48] Moreover, marital status (being divorced) and ethnic composition (being of Caucasian or Aboriginal origins) reinforce the relation between an increasing degree of rurality and increasing suicide rates among both sexes.[48]

Greater proportions of rural and northern people have reported poor or fair health, activity limitations and a Health Utility Index (HUI) indicative of disability.[14, 35, 40] In contrast, an Australian study found that there was very little difference between mid-age women from rural and urban areas on the physical and mental health component summary scores of the Medical Outcomes Study Short-Form Health Survey (SF-36). Moreover, ratings of self-reported health were also similar across the rural–urban continuum.[43]

Considerable consensus exists in the research community on the reasons for the health disparities between rural and urban populations in industrialized countries. In particular, lifestyle risk factors, physical environment factors and health service access and utilization are repeatedly cited. There are also other social determinants of health that contribute to the disparities, namely, gender, socio-economic status, race and ethnicity and socio-cultural and psychosocial factors.

Socio-Economic Status (SES)

Personal or family income, education and occupation are strongly related to most indicators of health status, health care access and use and health-related behaviours. Thus, a community's economic well-being and the share of its people living below the poverty line, in particular, greatly influence the health and health needs of its residents.[35, 51]

In the U.S., the highest concentration of poverty was among people living in large metropolitan areas and in rural and small town areas; the lowest was among those living in fringe counties of large metropolitan areas.[35] In Canada, it was found that people who were living in northern Ontario (compared to the rest of the province) had the highest percentage of single-parent families and the highest percentage of people whose main daily activity was caring for family. Northern Ontario also had the lowest percentage of people working for pay, the highest percentage of people who had not completed high school and the highest unemployment rate as compared with the province as a whole.[14] Results from an Australian longitudinal study on women's health indicated that, compared with urban women, a higher proportion of rural and remote women had fewer than 10 years of formal education.[43] Moreover, a lower proportion of rural and remote women worked for pay outside the home, and a higher proportion worked in a family business, as compared with urban women.[43]

A person's SES, combined with his or her place of residence, is related to disease occurrence. An Australian study concluded that the higher risk of coronary heart disease in rural populations compared with urban populations was due, in part, to a lower SES and the ethnic composition (that is, fewer immigrants).[51] Senior et al.[52] also found that when SES characteristics were controlled for, the tendency for lower mortality in the most rural areas of the UK was substantially reduced. However, the association between SES and mortality seems to be weaker among rural older men and stronger among their urban counterparts, leading to a health advantage for rural men.[53]

Race and Ethnicity

Very few studies have looked at the health of rural people from different racial/ethnic backgrounds. This can be explained partly by the small proportion of immigrants living in rural areas and the associated difficulties of undersampling and data suppression, and concerns of statistical reliability, privacy and confidentiality. A report published in the U.S. in 2000 revealed that rural minorities are disadvantaged compared with their urban counterparts in certain areas of health, such as cancer screening and management, cardiovascular disease and diabetes.[54] Those differences were mainly driven by the black and American Indian/Alaska population.

An important ethnic subpopulation in Canada's rural and remote areas is Aboriginal Peoples (which refers to First Nations, Inuit and Métis). It is recognized that they face additional challenges in terms of health. Health conditions such as diabetes, heart disease, hypertension, cancer and arthritis are more prevalent in this population.[55–57] While there is a paucity of data on Métis and Inuit health, the available literature on First Nations shows that they experience poorer overall health, higher smoking rates and higher mortality rates due to cancer, motor vehicle accidents, circulatory diseases, diabetes, alcoholism and suicide than their non-Aboriginal counterparts.[4, 58–61]

Physical Environment

There has been an increasing research emphasis on the physical environment as a major determinant of health,[62, 63] though it still lags behind compared to research on other health determinants. Environmental health scientists relate the external environment and environmental factors, including manufactured and natural substances and radiation, to individual human health and the health of communities.[63, 228, 229, 230] Although there is much overlap of this complex issue, some environmental issues, such as air and water quality, directly affect very specific human health issues (for example, respiratory health and intestinal disease). Other environmental issues, such as climate change, acidic precipitation and soil contamination, have an indirect health impact. Even relatively mundane environmental changes like inclement climate and weather may indirectly affect health by becoming significant barriers to accessing health services in rural and remote communities.[64]

Much of the research examining the association between the environment and health has focused on problems of air, water and soil pollution[62] and has taken place in almost exclusively urban study settings.[65] A lack of rural environmental health indicators, which could allow us to assess the state of the environment and its potential impact on health in rural areas, has been identified as one of the major gaps in the limited research on the physical environment as a determinant of health. Although the feasibility of developing environmental rural health indicators has been examined,[64] there is still much work to do in this area.

Health-Related Behaviours

There are also conflicting results in the health-related behaviour literature, likely due to methodological issues. Generally, it does not show clear disparities between rural and urban communities. Smoking and physical activity are the two indicators for which there seem to be clear urban–rural differences. The proportion of smokers was found to be higher in rural areas, and greater proportions of individuals living in rural communities were physically inactive.[14, 40, 46, 66] The same gradient for smoking rates was found in both adolescents aged 12 to 17 and adults.[35, 67] On the other hand, fewer rural women reported low levels of work-related and leisure time physical activity.[43] There were no differences in alcohol consumption, breastfeeding or food insecurity.[14, 35, 40] Obesity rates were found to be higher in rural areas in three studies; rural men overall and rural women living in poverty or mid-age rural women were more likely to be obese than urban men and women.[14, 35, 40, 43, 68] In contrast to these results, a Canadian study found that the overall body mass index (BMI) values in rural men and women were not significantly different from those of their urban counterparts.[69]

Physical and Cultural Access to Services††

The reality of living in rural and remote areas is that there are fewer health care services.[70] Geographic isolation and problems with access to and shortage of providers and services are multidimensional problems. For instance, poor road quality combined with greater periods spent on the road not only contribute directly to higher incidence of injury, but also compromise access to health services.[49, 70] Moreover, difficult economic circumstances, travelling time to the city and the lack of car ownership can affect access to and demand for health services.[71]

One's definition of health also affects use of health care services. An Australian study found that people in rural areas commonly describe health in the negative, as an absence of disease.[72] Therefore, if health is understood to be an absence of disease, the main concern will be the cure of illness as opposed to the maintenance of good health. Consequently, curative treatment becomes the focus of a health care system, and demand is made for acute care as opposed to primary care and health promotion and prevention.[70] Whether this is the case in Canada needs to be investigated.

Psychosocial Factors

It is generally accepted that a healthy social climate that results in residents having a sense of belonging and pride in their community contributes to the health of communities and populations.[73–82] Indeed, some authors have suggested that community characteristics have a greater impact on health status than the availability of medical care.[11, 83] There is a need to study the mechanisms of how concepts like social capital and community capacity contribute directly and indirectly to the health of a community.[84] Social capital has been defined in many ways[85] and generally refers to links between an individual and his or her immediate social environment; it includes concepts such as social networks, mutual trust, civic participation, community engagement and other institutional relations that can affect the health of individuals. Social capital is not a substitute for socio-economic factors such as having warm, secure and safe housing; enough to eat and drink; a good sanitation and water supply; appropriate and safe transport; and adequate income—but it does play an important role in building healthy communities once the "bare necessities" have been met, and therefore it is one of the influential aspects to consider when studying rural health issues.[74, 82]

Data from an Australian longitudinal study showed that rural and remote women had lower stress scores than urban women, even though the number of stressful life events experienced in the previous 12 months was similar for the two populations.[43] In the same study, scores on life satisfaction (measured by satisfaction with achievements in areas such as work, relationships and social activities) were also similar for rural and urban women. However, rural and remote women are exposed to more violence in personal relationships than urban women.[86, 87] Rural women who are victims of domestic violence are often isolated and are faced with a lack of services that address domestic violence.[87]

---

†† A more detailed literature review of health care services utilization and access will be published in a future report on health services utilization.

A growing body of literature points to an association between positive social support and better recovery from illness and lower mortality.[78, 88] Conversely, it appears that relative poverty, negative life experiences and a lack of control over work and life in general are factors that could compromise mental health in rural places.[87] Concurrently, the high rural suicide rate, particularly among males, has drawn attention to the psychological and emotional well-being of people living in rural and remote areas and has highlighted the possible hazards that rural life could represent to mental health, such as isolation, growing unemployment and poverty.[86]

The available literature demonstrates the heterogeneity of rural and urban communities of the industrialized world.[35, 39, 89] The tendencies for health deficits to be associated with rural areas do exist, though it is far from absolute that rural communities systematically have a negative impact on the health of the population. The diversity of results found in the literature also highlights the complexity of doing rural health research and the variety of the measures used. However, the differences between rural and urban populations seem to lie in the nature of the health problems experienced, as well as in the distribution of the determinants of health.

2.3 Policy-Related Activities in the Area of Rural Health

In recent years, the health status and the determinants of health of small territorial units (for example, health regions or public health units) have increasingly been scrutinized.[90] There is greater recognition that communities have widely different opportunities and constraints that shape their potential development and their health, and that the policy process should not overlook this diversity of conditions. At the provincial/territorial and federal levels, attention to small territorial units is required in order to understand how universal policies might affect different areas, as well as to assess the potential for local policies. Decentralization of services and increased responsibilities allocated to local and regional administrative bodies have stimulated analysis of health performance on a smaller geographic scale.

Within the context of health care being a direct responsibility of the provinces (except for the First Nations and Inuit and Canadian Forces populations), several federal initiatives to improve rural health have been put in place in response to the concerns of rural Canadians: Innovations in Rural and Community Health initiative, a National Strategy on Rural Health, the Canadian Rural Partnership, the establishment of a National Rural Health Council and the Canadian Institutes of Health Research (CIHR) Strategic Initiative in Rural and Northern Health Research. However, gaps remain in research, interventions and policies and have been identified.[91]

Chapter 3 Methodology

This chapter describes the definition of rurality, the data sources and the particular analytical approach that was used for each of them. The first section addresses the definition of rurality and highlights some of its strengths and weaknesses. Then Section 3.2 presents each data source and its respective analytical approach. Finally, Section 3.3 discusses general statistical issues as well as some of the methodological limitations of the data and approaches used for this report.

3.1 Definition of Rural

Critical to any type of rural research is how "rural" is defined or operationalized (that is, how it is defined in such a way that it can be measured). As stated in Section 2.2, the size and characteristics of rural populations depend on how "rural" is defined. Based on a comprehensive review of the literature and database availability, as well as discussions between research team members and Advisory Committee members, the Metropolitan Area and Census Agglomeration Influenced Zones (MIZ) definition was used for this and all components of the research program.

Metropolitan Area and Census Agglomeration Influenced Zones (MIZ)

The Rural and Small Town (RST/MIZ) definition refers to the population living outside the commuting zones of larger urban centres—specifically outside census metropolitan areas (CMAs) and census agglomerations (CAs). CMAs and CAs contain large urban areas, or urban cores, that, together with neighbouring census subdivisions (CSDs) or municipalities, have a high degree of social and economic integration with the urban core.

The MIZ definition is a refinement or extension of the CMA/CA/RST‡‡ concept, developed by Statistics Canada's Geography Division "to better show the effects of metropolitan accessibility on non-metropolitan areas."[26, 92] Census subdivisions (CSDs)§§ that lie outside a CMA or CA are classified into one of four zones of influence ranging from "strong" to "no" influence, according to the degree of influence that CMA/CAs have on them.

- **Strong MIZ:** 30% or more of the employed labour force living in the CSD works in *any* CMA/CA urban core.
- **Moderate MIZ:** at least 5%, but less than 30%, of the employed labour force living in the CSD works in *any* CMA/CA urban core.
- **Weak MIZ:** more than 0%, but less than 5%, of the employed labour force living in the CSD works in *any* CMA/CA urban core.

‡‡ CMA = census metropolitan area; CA = census agglomeration; and RST = rural and small towns.

§§ "Census subdivision" is the general term applying to municipalities, as determined by provincial equivalent (for example, Indian reserves, Indian settlements and unorganized territories). Examples of how some of Canada's communities are classified to each degree of rurality using the Metropolitan Influenced Zone (MIZ) classification can be found in Appendix A at the end of this report.

- No MIZ: includes all CSDs that have a small employed labour force (less than 40 people), as well as any CSD that has no commuters to a CMA/CA urban core (that is, none of the employed labour force living in the municipality works in *any* CMA/CA urban core).

MIZ commuting flows, like those used in the delineation of CMAs and CAs, are calculated using place of work data from the previous Census. In contrast to CMA/CA delineation, however, MIZ recognizes the possibility of *multiple centres of attraction*. Flows of commuters from a municipality in rural and small town (RST) Canada to employment in *any* larger urban centre (with an urban core population of 10,000 or more) are combined to determine the degree of influence (strong, moderate, weak or no influence) that one or more larger urban centres has on that municipality.[93] The classification and its methodology have been extensively validated by Statistics Canada.[92]

The MIZ definition distinguishes populations with less access to the labour markets of larger urban centres from those with greater access. "Commuter flows" is used as a proxy for the "access" of a population to services such as health and education facilities, financial institutions, shopping centres, cultural centres and sports facilities. They reflect the relative influence of an urban centre on a rural area. Appendix A presents Canada's CSDs and their corresponding MIZ classification by province in order to provide an idea of where each type of MIZ area is generally located.*** It is important to note that No MIZ areas (such as Indian Reserves) often, though not always, appear on this map as dots located within otherwise Weak MIZ or even Moderate MIZ CSDs.

Strengths and Limitations

The MIZ definition is based on administrative boundaries and allows for the heterogeneity of rural communities—unlike a dichotomous urban/rural definition. It also allows comparisons between urban areas (CMA/CAs) and four different categories of rurality. On the other hand, this definition does not deal with or is not related to the social representations of rural and urban. As well, it does not take into account the heterogeneity within the CMA/CA category. While there may be important intra-CMA/CA variations, it was not the goal of this study to examine them. All CMAs/CAs were grouped together for this study in order to examine the heterogeneity/variations in different rural areas and to compare them to urban areas as a whole.

*** An electronic portable document format (PDF) file that allows different regions of Canada to be magnified to show greater detail can be accessed at the following website: <http://geodepot.statcan.ca/Diss/Maps/ReferenceMaps/n_sac_e.cfm>.

3.2 Data Sources and Analytical Methods

This section describes the data sources used for this report, as well as their respective analytical approaches. The following data sources were used: 1) Canadian annual mortality data; 2) Canadian Cancer Registry; and 3) Canadian Community Health Survey, Cycle 1.1, 2000–2001. A file containing each CSD of Canada and its respective MIZ category was merged with each data set listed above.

3.2.1 Canadian Annual Mortality Data

Analytical Approach

Records from the Canadian annual mortality database were aggregated to the CSD level and then to the national and provincial levels for the period of 1986 to 1996. The CSD boundaries were those of the 1996 Census. The Canadian annual mortality database uses the patient's CSD of residence. In other words, it refers to where people live, as opposed to where people died (which would be, in most cases, the CSD of a hospital or long-term care facility). The CSD data were subsequently assigned to an MIZ category in order to compare mortality rates for rural and urban areas. The comparisons were made using age-standardized mortality rates and standardized mortality ratios. The standard population was that of the 1991 Census. Causes of death, according to the ninth revision of the International Classification of Disease (ICD-9), were examined by ICD-9 chapters on the basis of their frequency in each age group. The chosen causes represent over 80% of all deaths (circulatory diseases, respiratory diseases, cancers, injuries, motor vehicle accidents, suicide, etc.).

The statistical significance of the standardized mortality ratio was tested using Byar's method and was based on the assumption of a Poisson distribution.[94] For the age-standardized mortality rates, the bootstrap method was used, which represents a log transformation method that allows for sampling variation in the denominator (reference) rate. All-cause and cause-specific mortality rates and ratios were stratified by the five rural and urban categories (and compared to the CMA/CA average as the reference group), age group and sex. The estimation of a linear urban-to-rural gradient was not pursued, as a preliminary analysis showed a nonlinear relation between mortality and rurality.

Multivariate Analysis

The potential association between area of residence (as classified by the MIZ definition) and all-cause, suicide and motor vehicle accident mortality was studied in multivariate regression analyses to account for the effect of socio-demographic and economic determinants of health. Poisson regression was used to model mortality risk variations by geographic location and population characteristics for men and women separately, and for the total Canadian population; 1996 Census data and geographic boundaries and the Canadian annual mortality data were used. Age, sex and CSD-specific mortality counts for the period of 1986 to 1996 and the three causes were computed. Deaths occurring in that period were grouped to mitigate the potential problems inherent in small-area analysis, specifically the likelihood of only a few cases in the numerator for the calculation of any of the rates. The analyses carried out were performed separately for different age groups (0 to 44, 45 to 64 and 65+) and sex.

In addition to the MIZ variable, the following selected population characteristics were derived from the 1996 Census and used as control variables: north/south location,[†††] percentage of the population who completed secondary school, median household income, average number of persons per household, percentage of movers derived from five-year mobility status, percentage population change from 1991 to 1996, percentage of Aboriginal People, percentage married, percentage of immigrants, percentage of private dwellings in need of major repairs, percentage of occupations unique to primary industry (referred to as primary occupations), unemployment rate and percentage of health occupations. Since it is possible that health professionals may not work and live in the same CSD, the percentage health occupations variable was analyzed at the census division (CD) level. Where applicable, the variables were expressed as a percentage of the relevant census subpopulation aged 15 and over. The census variables were categorized on the basis of a descriptive analysis of quartiles and means.

Other important aspects of health, such as smoking, inactivity and poor diet, may interact to contribute to the higher or lower death rates in rural areas. It was not possible to control for the contribution of each of these factors to the association between mortality rates and place of residence.

Data Quality and Limitations

Complete Census data were available for 78.6% of the 5,984 CSDs defined in 1996 due to the small size of the population in the remaining 21.4% of the CSDs, but the share of the CSDs included in our study varied by MIZ: 75.3% for CMAs/CAs, 99.1% for Strong MIZ, 93.9% for Moderate MIZ, 82.3% for Weak MIZ and 50.1% for No MIZ. Area suppression (that is, the suppression of data for CSDs with small populations) explains the unavailability of some Census data at the CSD level. Area suppression results in the suppression of all information for geographic areas with populations below 40 persons. Also, data on income variables in areas with populations below 250 persons or fewer than 40 private households are suppressed. Note that the socio-economic variables are enumerated on the long Census of Population questionnaire, which is completed by a 20% sample of households. Thus, information for CSDs with a population of 250 inhabitants would be based on a sample of 50 Census respondents.

Sex-specific models used specific mortality rates, but the covariates were based on the sex-combined population (with the exception of unemployment rate and percentage primary occupations). In all Poisson models, the CMA/CA category was selected as the reference category. A relative risk (RR) significantly above or below 1 is indicative of a higher or lower mortality risk, respectively, than the reference group. All models, fitted by the SAS GENMOD procedure, showed reasonable fit as determined by the likelihood ratio statistic or deviance.

††† The north/south category is also CSD based. CSDs were assigned to the north if their representative point fell north of the north–south line.[249] Each MIZ is assigned one of the following category: north, north transition, south transition or south.

3.2.2 Canadian Cancer Registry

Analytical Approach

A similar methodology was used for the analysis of cancer incidence data. Records were aggregated to the CSD level and then to the national and provincial levels for the period from 1986 to 1996. The CSD boundaries were those of the 1996 Census. Age-standardized incidence rates and ratios were calculated using the 1991 Census population as a standard. Incidence rates and ratios were calculated for 40 cancer sites.

Statistical significance of the standardized incidence rates was tested using Byar's method and was based on the assumption of a Poisson distribution; exact confidence limits were calculated when the observed number of cancers was two or less.[94] For the age-standardized incidence rates, the bootstrap method was used, which represents a log transformation method that allows for sampling variation in the denominator (reference) rate. All-cause and cause-specific incidence rates and ratios were stratified by the five rural and urban categories (using CMA/CA as the reference group), age group and sex.

3.2.3 Canadian Community Health Survey 2000–2001

Analytical Approach

The analysis of the Canadian Community Health Survey was done in two stages. Bivariate analyses were first performed to examine the differences in health status between urban and rural communities. Age-standardized prevalence rates for over 40 indicators were calculated by sex and by the urban group (that is, the CMA/CA group) and the non-CMA/CA groups (that is, for all MIZ categories) (refer to Appendix D for the list of indicators). The standard population used for this analysis was the 2001 Census population. Data were weighted to take into account the complex sample design, to adjust for non-response and for post-stratification. The bootstrap procedure was used to calculate 95% confidence intervals (CI).

Multivariate Analysis

Following the bivariate analysis, multivariate logistic regression analyses were performed to ascertain the relations between selected health determinants and place of residence (as measured by the MIZ). The goal of this analysis was to assess whether place of residence has an independent effect on specific health outcomes after several determinants of health have been controlled for. Key health status outcomes were chosen: self-rated health, stress levels, chronic conditions, body mass index (BMI) and smoking. Data were weighted to take into account the complex sample design, to adjust for non-response and for post-stratification. The bootstrap procedure was used to calculate 95% confidence intervals.

Data Quality and Limitations

As the CCHS is a sample of all CSDs in Canada, not all the CSDs are included in the analysis. As well, it is important to note that persons living on Indian reserves or Crown lands, the clientele of institutions (such as prisons, nursing homes or mental health facilities), full-time members of the Canadian Armed Forces and residents of certain remote regions are excluded from this survey. Therefore, it can be expected that the associations or the proportions reported for some of the most rural/remote areas are underestimated.

3.2.4 Deriving Life and Health Expectancy Measures

This section describes the methods that were used to calculate life expectancy and health expectancy by MIZ category. Life tables are a valuable tool for health evaluation. While their primary use is to model life expectancy at birth, life tables can be used to derive health expectancy, years of life lost and many other models depicting the burden of disease or poor health for a population.

Life Expectancy

Life tables were derived by categories of rurality (MIZ) using an adapted method.[95] This method has been validated for small populations, including rural areas. The Canadian annual mortality data for the most recent years available (1999 to 2001) were used to calculate age- and sex-specific mortality rates by categories of rurality (MIZ). Life expectancy by sex and MIZ were then obtained by means of a previously described method.[95, 96] Comparisons of life expectancies (between categories of rurality) were made according to the methods described by Chiang[95] and others.

Health-Adjusted Life Expectancy

"Health expectancy" describes a family of indices that combine mortality (that is, life expectancy) with different measures of health-related quality of life, of which health adjusted life expectancy (HALE) is one particular type of measure.[97] HALE is a measure that incorporates both the quantity and quality of life by representing the number of expected years of life equivalent to years lived in full health, based on the average experience in a population. Health expectancy was calculated using a modified version of the Sullivan method.[98] This prevalence-based, life table technique weights the years of life lived according to a measure of health status. In this study, these measures included the Health Utility Index (HUI) from the CCHS. Using methods similar to those for mortality, the prevalence or mean health status was estimated for 20 age groups for each subpopulation. The Canadian annual mortality data and information from the CCHS on health-related quality of life (using the HUI) were used to calculate HALE by MIZ categories. HALE by sex and MIZ were obtained using methods previously described.[98, 99] Comparisons of HALE by MIZ were made using other previously described methods.[100]

3.3 General Statistical Notes and Limitations

Throughout this report, the estimates are provided with 95% confidence intervals. Reported statistics are taken to be significantly different if 95% confidence intervals do not overlap. In the text, rates described as "significantly different" can be taken to be statistically significantly different at the 95% level. The small population in Weak and No MIZ sometimes restricts the amount of data available to calculate the rates. The level of uncertainty associated with rates calculated for these areas is certainly greater than for areas with large populations (such as CMAs/CAs). Consequently, confidence intervals have been calculated and accompany the presented rates and ratios so that the level of uncertainty associated with them is clearly expressed. These confidence intervals do not describe the uncertainty associated with potential bias, such as the uncertainty in proper CSD identification. Numerical values for the figures are provided in Appendix C and Appendix D.

Chapter 4 Results

This section of the report is organized into five main sections:

- *Socio-demographic characteristics*—the proportion of the population and selected socio-economic factors by place of residence are presented.
- *Health behaviours*—the proportions of the population who reported a select number of health behaviours as part of the CCHS, Cycle 1.1, are presented by place of residence. Additionally, multivariate regression analyses were performed to assess the impact of other socio-demographic and health behaviour characteristics on smoking as the outcome variable.
- *Overall indicators of health status*—all-cause mortality, life expectancy and health-adjusted life expectancy, as well as health status and quality of life indicators, are presented by sex and place of residence. Additionally, multivariate regression analyses were performed to assess the impact of other socio-demographic and health behaviour characteristics on all-cause mortality risk, self-reported health, self-reported stress and BMI.
- *Chronic conditions*—circulatory disease, cancer, respiratory disease, diabetes and arthritis/rheumatism data are presented. This section is divided into several subsections, each subsection corresponding to a specific health condition. For certain types of cancer, like breast or prostate cancer, information on the screening practice of Canadians derived from the CCHS is presented. Where appropriate, detailed descriptions and comparisons of death rates between rural areas and urban areas for the period from 1986 to 1996 and standardized mortality ratios are presented.‡‡‡ Additionally, multivariate regression analyses were performed to assess the association between place of residence and chronic diseases.
- *Injuries and poisonings*—presents data on motor vehicle accidents, other injuries and poisonings and suicides. Detailed descriptions and comparisons of death rates between rural areas and urban areas for the period from 1986 to 1996 are presented. Additionally, multivariate regression analyses were performed to examine the association between place of residence and mortality risks due to motor vehicle accidents or suicide, by age group and sex, while controlling for important predictors.

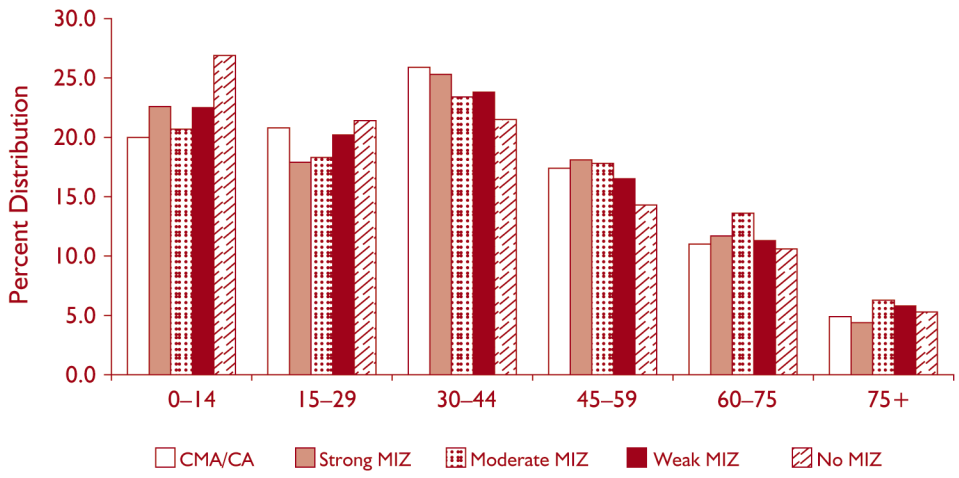
‡‡‡ Note that the analyses presented here were also done using more recent mortality data (1997 to 2000) and the same patterns were found (data not shown).

4.1 Socio-Demographic Characteristics

Data from the 1996 Census show that rural areas have younger populations, whereas urban centres have a higher proportion of individuals 30 to 59 years of age (Figure 2). Moderate MIZ areas had the highest proportions of individuals 60 years of age and over.

Figure 2

Age Distribution of Canadians, by 15-Year Age Groups and Place of Residence, Census of Canada, 1996

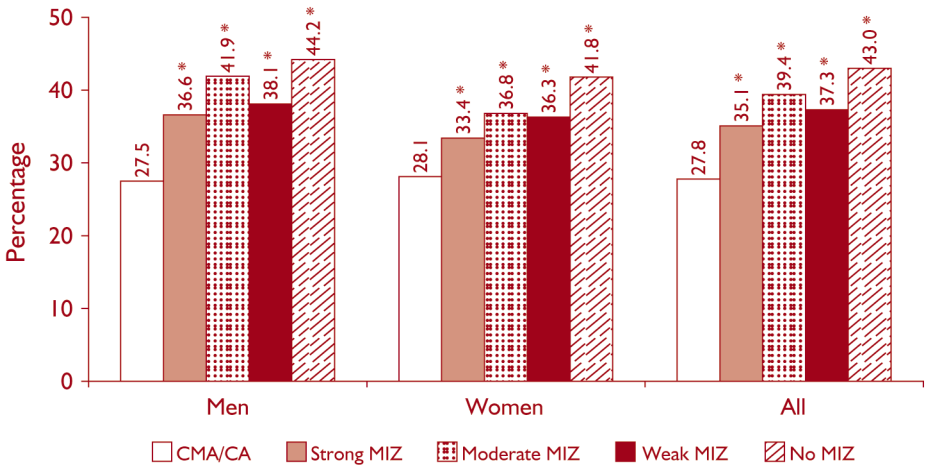


Data source: Census of Canada 1996, Statistics Canada.

Strong urban–rural variations were observed for most of the selected socio-economic factors. Higher proportions of low levels of formal education (CMA/CA: 27.8%; No MIZ: 43.0%) (Figure 3), low income (CMA/CA: 32.4%; No MIZ: 49.9%) (Figure 4) and unemployment (CMA/CA: 33.4%; No MIZ: 37.1%) (data not shown) were reported in rural areas. Sense of community belonging was our only measure of social capital. There were statistically significant differences in the proportion of people reporting a somewhat to very strong sense of community belonging by place of residence, with the lowest proportion being in CMA/CA areas and the highest in No MIZ areas (CMA/CA: 56.2%; No MIZ: 76.8%) (Figure 5). Other selected socio-demographic characteristics that were collected as part of the CCHS analysis are shown in Table D–1, Appendix D. The same socio-economic indicators were examined by regions (Atlantic, Quebec, Ontario, Prairies and British Columbia), and similar patterns were found (data not shown).

Figure 3

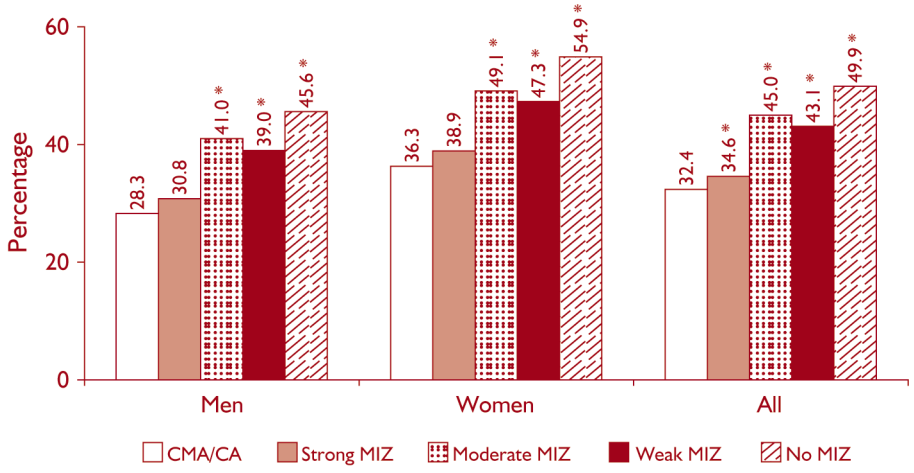
Age-Standardized Proportion of Individuals Reporting Less Than Secondary School Graduation, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 4

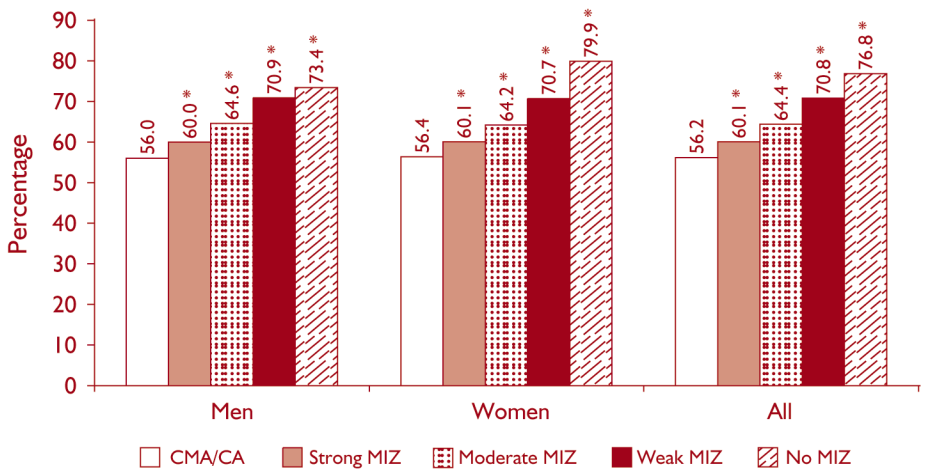
Age-Standardized Proportion of Individuals Reporting Low/ Low-Middle Income, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 5

Age-Standardized Proportion of Individuals Reporting a Somewhat to Very Strong Sense of Community Belonging, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Discussion

All MIZ categories were disadvantaged on the socio-economic status indicators. Rural areas were more likely to have higher proportions of people with low income and less formal education level. On the other hand, a strong sense of community belonging was reported by rural area residents in greater proportions than by their urban counterparts. These results are similar to those reported in the literature review presented in Chapter 1.

The main limitation of this analysis is that, due to sample sizes, it was not possible to examine formal education levels, income by age group and place of residence, as well as source of income (employment or transfer payments) by place of residence. It was also not possible to examine income differences between MIZ areas located in the north and in the south. Standard costs of living, as well as income, may be higher in northern compared to southern rural communities. The chosen income variable, "income adequacy," takes into account the total household income and adjusts for family size. While this can minimize the north/south income discrepancies, it does not take into account the potential differences in standard costs of living between the northern and the southern communities.

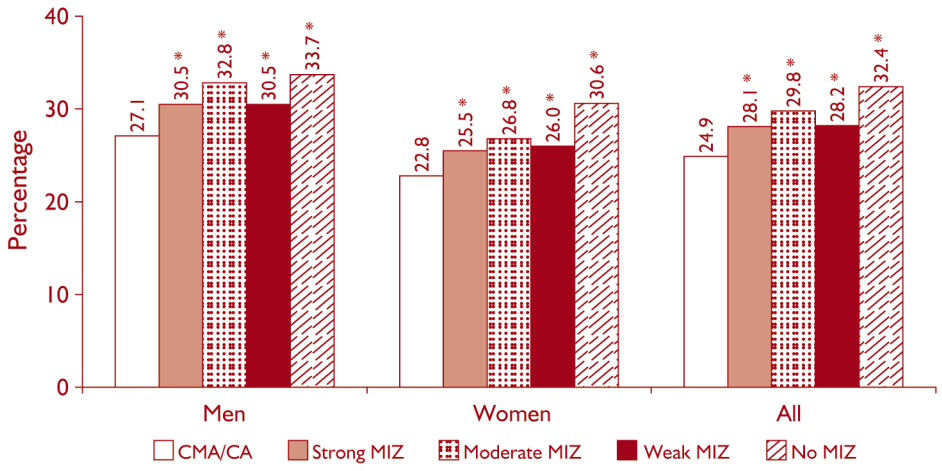
The impact of these socio-economic factors on several health outcomes will be discussed in the following sections of the report.

4.2 Health Behaviours

Smoking rates (which include both daily and occasional smokers), second-hand smoke exposure and eating the recommended five servings or more of fruit and vegetables each day showed the strongest urban–rural differences among the seven health behaviours examined. Significantly higher proportions of rural Canadians (CMA/CA: 24.9%; No MIZ: 32.4%), particularly men, were smokers (Figure 6) or were exposed to second-hand smoke (CMA/CA: 27.0%; No MIZ: 34.2%) (Figure 7). Lower proportions of rural residents reported eating the recommended five servings of fruit and vegetables each day (CMA/CA: 38.2%; No MIZ: 31.1%) (Figure 8). Women living in Strong and Weak MIZ areas reported higher proportions of leisure time physical activity compared to their urban counterparts, whereas men living in Moderate MIZ areas reported a significantly lower proportion of leisure time physical activity compared to the proportion of men living in urban areas (Figure 9).

Figure 6

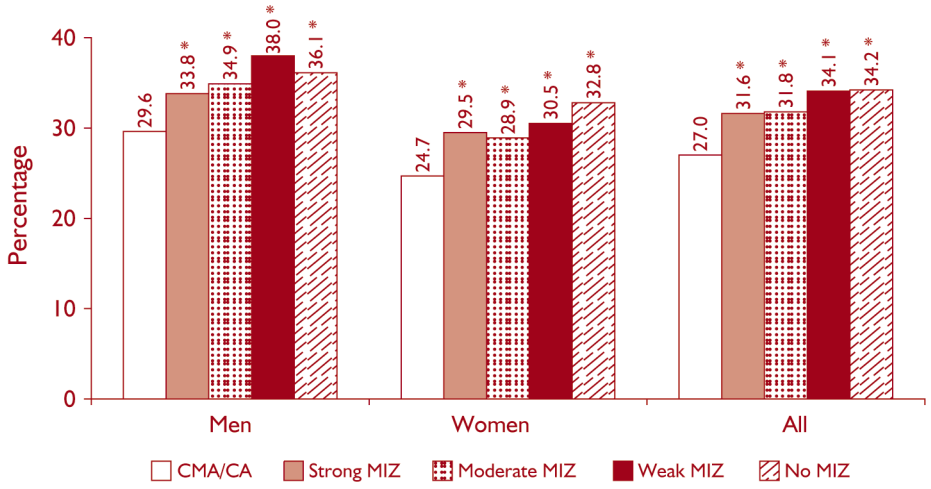
Age-Standardized Proportion of Smokers, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
The term "smokers" includes daily and occasional smokers.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 7

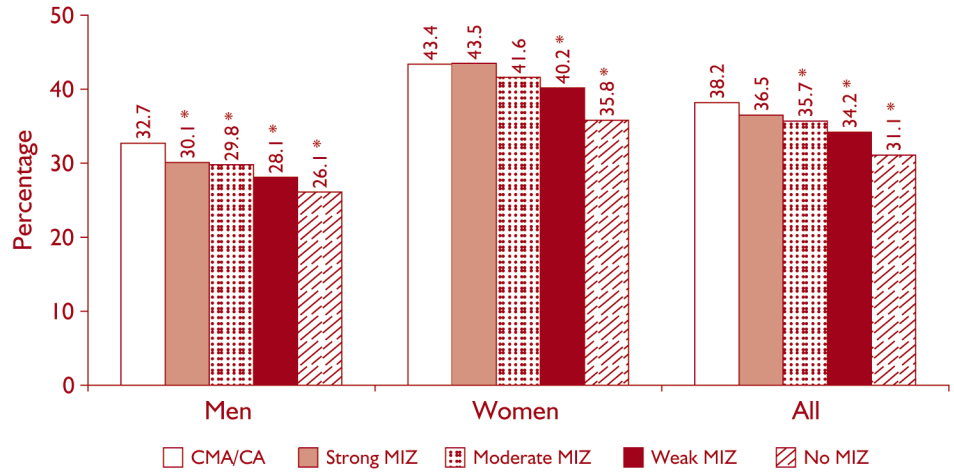
Age-Standardized Proportion of Individuals Who Reported Being Exposed to Second-Hand Smoke on Most Days, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 8

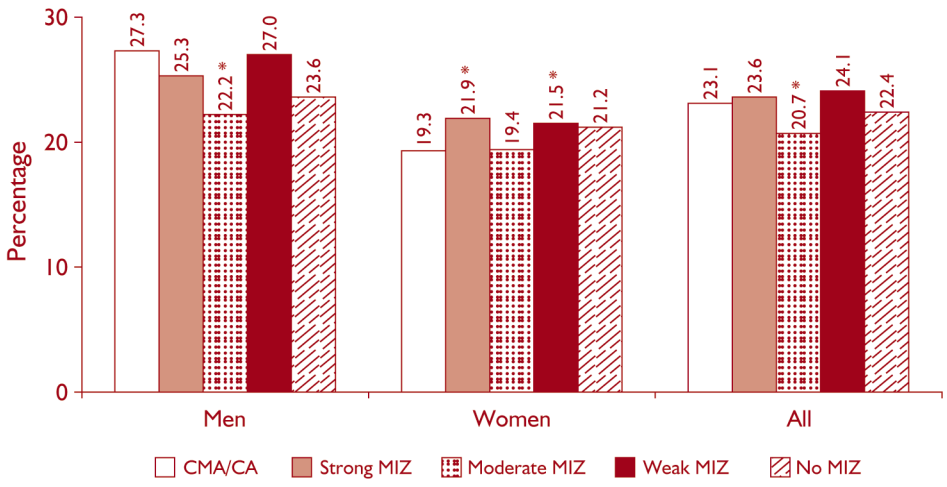
Age-Standardized Proportion of Individuals Who Reported Eating Five or More Servings of Fruit and Vegetables Each Day, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 9

Age-Standardized Proportion of Reported Leisure Time Physical Activity, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Multivariate Analysis

This sub-section presents the results of the multivariate regression analysis of the association between place of residence and smoking. The methodology for this analysis is described in Section 3.2.3.

The association between smoking and place of residence as defined by the MIZ categories was examined by sex. The association was no longer statistically significant after controlling for a number of determinants of health (Table 3). Socio-demographic, economic and health behaviour predictors were also included in the regression models. The predictors of smoking were similar for Canadian men and women. The predictors that did show a significant difference in increasing the risk of smoking for either a daily or occasional smoker included (from predictors of highest increased risk to lowest increased risk) being of Aboriginal descent, being less than 45 years of age, regularly consuming alcohol, being physically inactive and having poor or fair self-rated health. Increased risks of smoking were also significantly associated with lower income, lower education and increasing stress levels.

Table 3

Adjusted Odds Ratios (OR) Estimates for the Association Between Place and Smoking, by Sex, Canada, 2000–2001[i, ii]

Variable Referent Group = 1.0	Men Smoking	Women Smoking
Place of residence[iii]		
Strong MIZ	1.01 (0.91–1.12)	0.98 (0.89–1.09)
Moderate MIZ	1.04 (0.95–1.13)	0.99 (0.91–1.08)
Weak MIZ	0.96 (0.89–1.03)	0.95 (0.88–1.03)
No MIZ	1.03 (0.85–1.26)	1.11 (0.92–1.33)
Age[iv]		
<45 years of age	1.87 (1.75–2.00)*	2.06 (1.93–2.20)*
Aboriginal status—yes	2.59 (2.08–3.21)*	3.78 (3.18–4.51)*
Race—non-Caucasian (excluding Aboriginal populations)[v]	0.63 (0.56–0.71)*	0.29 (0.25–0.33)*
Income[vi]		
Middle-high	1.30 (1.20–1.40)*	1.35 (1.24–1.47)*
Middle-low	1.49 (1.36–1.63)*	1.50 (1.37–1.64)*
Low	2.27 (2.03–2.54)*	2.08 (1.88–2.31)*
Education[vii]		
Secondary degree/no post-secondary degree	1.48 (1.37–1.59)*	1.56 (1.46–1.67)*
Less than secondary degree	1.91 (1.77–2.06)*	1.67 (1.55–1.80)*
Worked in past 12 months—no	0.66 (0.58–0.75)*	---
Alcohol consumption—regular	1.56 (1.46–1.67)*	1.47 (1.38–1.56)*
Self-rated health—poor/fair	1.24 (1.13–1.36)*	1.28 (1.18–1.38)*
Stress level[viii]		
A bit stressful	1.15 (1.07–1.24)*	1.13 (1.05–1.21)*
Quite a bit/extremely stressful	1.37 (1.27–1.48)*	1.51 (1.39–1.64)*
Physical activity[ix]		
Moderate	---	---
Inactive	1.46 (1.37–1.55)*	1.26 (1.19–1.33)*

i. Confidence intervals were determined using 500 bootstrap weights to account for the complex survey design.
ii. --- Excluded during modelling; n/a not included in modelling; * statistically significant at $p < 0.05$.
iii. Referent group is CMA/CA.
iv. Referent group is ≥45 years of age.
v. Referent group is Caucasian.
vi. Referent group is high income.
vii. Referent group is postsecondary degree.
viii. Referent group is not very/not at all stressful.
ix. Referent group is active.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Discussion

As reported in the Institut national de santé publique du Québec's report on rural and urban health,[40] place of residence seems to be a marker for some lifestyle behaviours such as smoking, leisure time physical activity and dietary practices. These lifestyle behaviours are all related to the development of a number of health problems.

This analysis of the CCHS showed that residents of rural areas reported higher smoking rates, were more likely to have been exposed to second-hand smoke and were less likely to eat the recommended five servings or more of fruit and vegetables. The reported leisure time physical activity rates were quite similar in rural and urban areas, but there were different geographic patterns for men and women.

The variations found between the different geographic areas could be associated with or caused by many factors. These factors could differ for each place of residence category and could be specific to each of the health behaviours examined as part of this study. The contribution of modifiable risk factors to the prevalence of several health problems has been widely evaluated, and the distribution of these risk factors has been shown to be closely linked with socio-economic status.

The hypothesis that place of residence had an independent effect on smoking rates above and beyond other important determinants of health was examined in our multivariate regression analysis. While the bivariate analysis of smoking rates showed strong geographic differences, when important confounders were controlled, the association between smoking and rural place of residence became non-significant. This lends support to the hypothesis that socio-economic status could be a mediator between place of residence and the adoption of certain lifestyle behaviours. As well, we observed in the previous section on socio-economic factors (Section 4) a constant decline in socio-economic indicators as the degree of rurality increased.

However, other potential explanations for the higher proportions of unhealthy behaviours reported in rural communities could also be considered (such as reduced access to recreational facilities in rural areas, rural people's awareness of healthy lifestyle choices or access to a variety of healthy food at reasonable cost in rural areas). These factors were not considered in our multivariate analysis, as there is a gap in geographically appropriate secondary national data on these important covariates.

Of particular concern in both urban and rural areas is the prevalence of smoking among young adults and adolescents. Due to sample issues, it was not possible to examine smoking rates by age group and place of residence. However, a recent Canadian study is providing clear indications that smoking in younger age groups is an important public health issue in rural areas.[67] For instance, the smoking prevalence was 21% in girls living in northern regions of Canada. Given that smoking habits often start before the age of 18, preventing smoking at a younger age could be considered a key issue to address in order to reduce the overall prevalence of smoking in both rural and urban areas.

Another important public health issue that is receiving increasing attention is the exposure to second-hand smoke. Effective interventions, such as smoking bans in public areas, have been successfully implemented throughout Canada. Tobacco-related illnesses as a result of exposure to second-hand smoke are clearly present in both urban and rural areas. However, our study showed that greater proportions of people living in rural areas reported being exposed to second-hand smoke daily compared to urban areas. As well, some evidence suggests a greater tolerance of second-hand smoke in rural settings. The national Social Climate of Tobacco Control survey, done in the U.S. in 2001, suggested that rural respondents indicated a greater tolerance of tobacco use in the household, in the car and around children than those living in urban areas.[101] Whether this is the case in Canada is unknown. This issue, as well as the effectiveness of interventions such as smoking bans and sales restrictions to people aged over 18 years old, is a potential area for development in the rural context.

4.3 Overall Indicators of Health Status

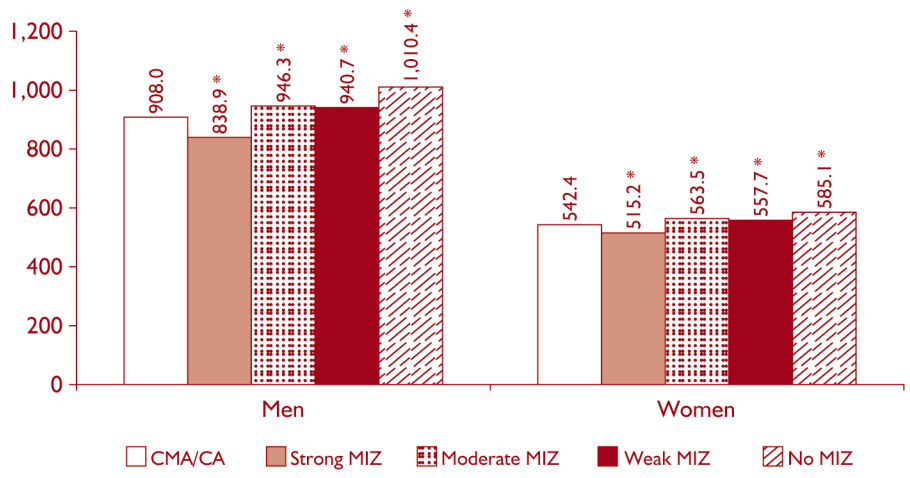
This section covers several measures of overall health status. All-cause mortality rates and ratios are described by age, sex and place of residence in Sub-Section 4.3.1, followed by life expectancy and health-adjusted life expectancy in Sub-Section 4.3.2. Finally, self-reported health and quality of life indicators are presented in Sub-Section 4.3.3.

4.3.1 All-Cause Mortality

The all-cause mortality rates (age-standardized mortality rates) of both Canadian men and women of all ages (Figure 10) increased with increasing remoteness of place of residence. The exception to this observation is that both men and women living in Strong MIZ areas had significantly lower all-cause mortality rates. Moving further from the urban centres, the all-cause mortality rates were higher in Moderate MIZ, Weak MIZ and No MIZ areas.

Figure 10

Age-Standardized All-Cause Mortality Rates (per 100,000) Among Men and Women (All Ages), by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

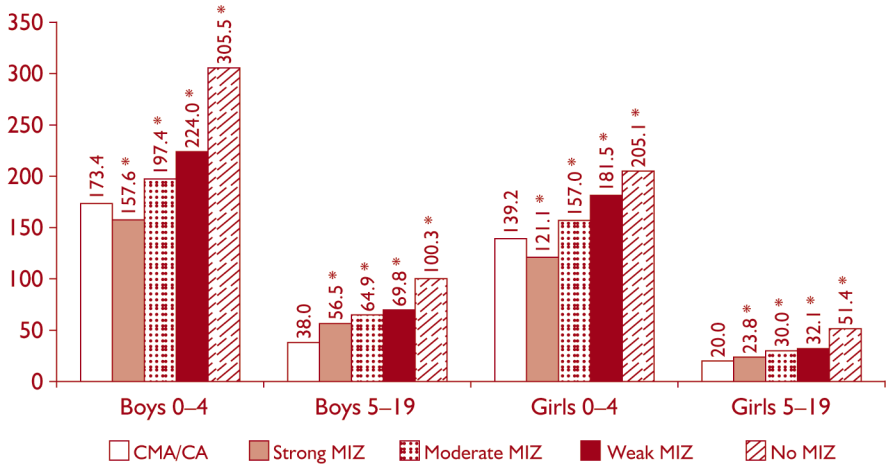
Age-Specific All-Cause Mortality Rates

Age-standardized mortality rates are higher in areas that are more remote. Looking at the age breakdowns, significantly lower all-cause mortality rates in Strong MIZ areas and higher all-cause mortality rates in Moderate MIZ, Weak MIZ and No MIZ areas were confirmed in most age groups. Two exceptions to this finding include Canadians aged 5 to 19, among whom there was a significantly higher all-cause mortality rate in Strong MIZ areas for both sexes (Figure 11), and those aged 20 to 44, among whom there was no significant difference between urban and Strong MIZ areas (Figure 12). In people aged 65 and over, there was no particular pattern, as the rates in rural areas were either significantly lower or not significantly different than in urban areas (Figure 13).

For both sexes, the mortality risks in each age group tended to be higher in rural and remote areas, although among people aged 65 and over the risks were statistically lower in most MIZ categories (Table 4). Children and adolescents aged 5 to 19 living in the two most remote zones (Weak and No MIZ) had particularly high mortality risks, with standardized mortality ratios ranging from 1.60 to 2.64.

Figure 11

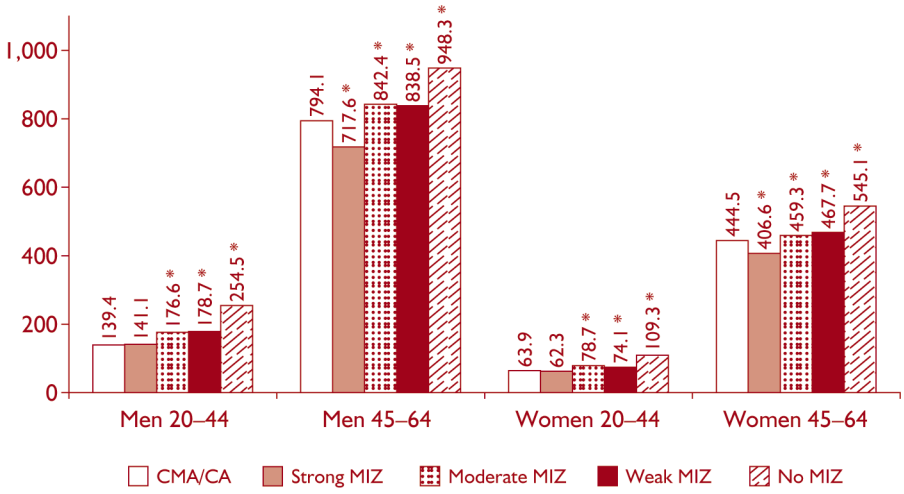
Age-Standardized All-Cause Mortality Rates (per 100,000) Among Boys and Girls Aged 0 to 19 Years, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 12

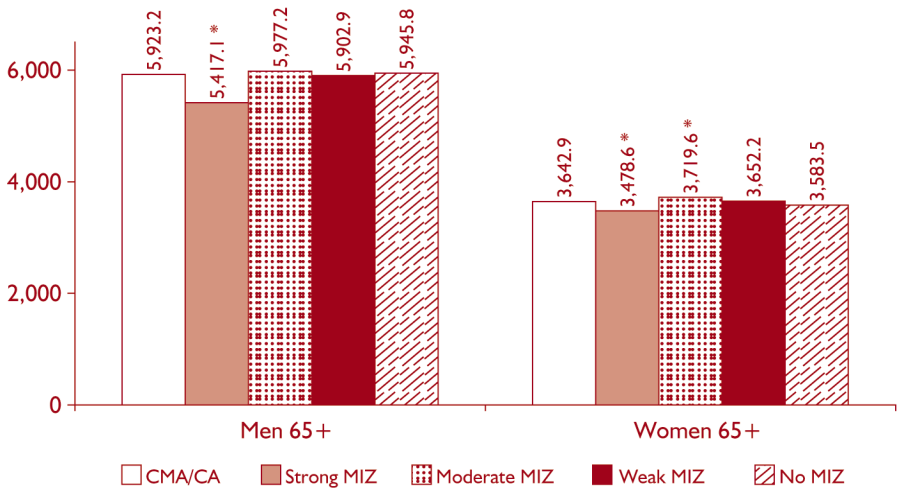
Age-Standardized All-Cause Mortality Rates (per 100,000) Among Men and Women Aged 20 to 64 Years, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 13

Age-Standardized All-Cause Mortality Rates (per 100,000) Among Men and Women Aged 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 4

Standardized All-Cause Mortality Ratios, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	0.91 (0.85–0.97)*	1.15 (1.09–1.20)*	1.3 (1.24–1.36)*	1.77 (1.62–1.92)*
5–19	1.49 (1.14–1.58)*	1.71 (1.63–1.79)*	1.84 (1.76–1.92)*	2.64 (2.42–2.87)*
20–44	1.00 (0.97–1.03)	1.26 (1.23–1.29)*	1.28 (1.26–1.31)*	1.86 (1.78–1.95)*
45–64	0.90 (0.89–0.91)*	1.06 (1.05–1.07)*	1.06 (1.04–1.07)*	1.19 (1.15–1.23)*
65+	0.91 (0.90–0.92)*	1.01 (1.00–1.01)	0.99 (0.99–1.00)	1.00 (0.99–1.02)
Total	0.92 (0.91–0.93)*	1.04 (1.03–1.04)*	1.04 (1.03–1.04)*	1.12 (1.10–1.14)*
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	0.87 (0.81–0.94)*	1.13 (1.07–1.20)*	1.31 (1.24–1.38)*	1.48 (1.33–1.65)*
5–19	1.19 (1.08–1.31)*	1.50 (1.40–1.60)*	1.60 (1.50–1.71)*	2.55 (2.24–2.88)*
20–44	0.97 (0.93–1.01)	1.23 (1.19–1.27)*	1.16 (1.12–1.20)*	1.73 (1.60–1.86)*
45–64	0.91 (0.89–0.93)*	1.03 (1.01–1.05)*	1.05 (1.03–1.07)*	1.22 (1.17–1.28)*
65+	0.96 (0.95–0.97)*	1.02 (1.02–1.03)*	1.00 (1.00–1.01)	0.98 (0.96–1.00)
Total	0.95 (0.94–0.96)*	1.03 (1.03–1.04)*	1.02 (1.02–1.03)*	1.06 (1.04–1.08)*
Age Group	**All**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	0.90 (0.85–0.94)*	1.14 (1.10–1.18)*	1.30 (1.26–1.35)*	1.65 (1.54–1.76)*
5–19	1.40 (1.33–1.47)*	1.65 (1.59–1.71)*	1.77 (1.70–1.83)*	2.62 (2.44–2.81)*
20–44	1.00 (0.98–1.02)	1.27 (1.24–1.29)*	1.26 (1.24–1.29)*	1.86 (1.78–1.93)*
45–64	0.92 (0.91–0.94)*	1.06 (1.05–1.07)*	1.07 (1.05–1.08)*	1.22 (1.19–1.26)*
65+	0.96 (0.95–0.97)*	1.00 (1.00–1.01)	0.99 (0.98–0.99)*	0.88 (0.87–0.89)*
Total	0.96 (0.95–0.96)*	1.06 (1.05–1.06)*	1.06 (1.05–1.06)*	1.13 (1.12–1.15)*

Reference group is CMA/CA = 1.0

* Statistically significant at $p < 0.05$.

Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Multivariate Analysis

Multivariate regression analyses were carried out to examine the association between all-cause mortality and place of residence. Multivariate Poisson regression analyses were performed for the following three age groups: 0 to 44 years, 45 to 64 years and 65+ years. The methodology for these analyses is described in Sub-Section 3.2.1.

The association between all-cause mortality and place of residence was not explained by the selected determinants of health included in our regression analysis for men and women aged 0 to 44 years. Place of residence still had an independent and statistically significant effect on the all-cause risk of mortality in this age group. Compared to people living in a CMA/CA, the total population aged 0 to 44 living in a rural and remote area had an 11% to 33% increase in mortality risk (Table 5). The risks increased with increasing rurality in both sex-separated and sex-combined analyses.

Low proportions of individuals having completed secondary school and a low median household income were strong predictors of increased mortality risk in both men and women. Ethnic composition also had a strong effect on mortality risk; a proportion of less than 10% of Aboriginal People within the census subdivision (CSD) was associated with a 53% to 61% reduction in mortality risk, and a proportion of immigrants of less than 5% was associated with a 5% reduction of the mortality risk. Slightly higher mortality risks were also associated with small household size (that is, fewer than three individuals per household), with a proportion of less than 5% of individuals working in medical occupations and with less than 50% of people within the CSD being married. People living in CSDs located in the north had a 26% increased risk of dying from any causes, compared to people living in CSDs located in the south.

Another regression was performed excluding all CSDs located in the north and the effect of a rural place of residence remained significantly higher compared to urban places of residence for this age group (Appendix E).

Table 5

Adjusted Relative Risk (RR) Estimates for the Association Between Place of Residence and All-Cause Mortality, People Aged 0 to 44 Years, Canada, 1986 to 1996

	Men RR (95% CI)	Women RR (95% CI)	Total Population RR (95% CI)
Place of Residence			
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.10 (1.07, 1.14)	*1.08 (1.03, 1.12)	*1.11 (1.08, 1.15)
Moderate MIZ	*1.17 (1.14, 1.21)	*1.19 (1.15, 1.24)	*1.20 (1.17, 1.23)
Weak MIZ	*1.20 (1.16, 1.23)	*1.18 (1.12, 1.22)	*1.20 (1.18, 1.24)
No MIZ	*1.32 (1.23, 1.41)	*1.27 (1.15, 1.40)	*1.33 (1.25, 1.42)
% Completed Secondary School			
75–100%	Reference	Reference	Reference
50–74%	*1.20 (1.17, 1.24)	*1.13 (1.09, 1.18)	*1.20 (1.17, 1.23)
25–49%	*1.27 (1.21, 1.33)	*1.17 (1.10, 1.24)	*1.26 (1.21, 1.31)
0–24%	*1.74 (1.45, 2.07)	*1.31 (1.01, 1.71)	*1.63 (1.39, 1.91)
% Married			
≥50%	Reference	Reference	Reference
<50%	*1.20 (1.18, 1.22)	*1.14 (1.11, 1.16)	*1.18 (1.16, 1.20)
Median Household Income			
≥$40,000	Reference	Reference	Reference
$20,000–<$40,000	*1.20 (1.18, 1.22)	*1.16 (1.13, 1.19)	*1.20 (1.17, 1.22)
<$20,000	*1.36 (1.23, 1.51)	*1.52 (1.33, 1.75)	*1.43 (1.31, 1.57)
% Unemployment			
≥15%	Reference	Reference	Reference
10%–<15%	*0.96 (0.94, 0.98)	0.98 (0.95, 1.03)	*0.92 (0.90, 0.94)
<10%	*0.87 (0.85, 0.89)	0.95 (0.92, 1.00)	*0.91 (0.89, 0.93)
% Medical Occupations			
≥5%	Reference	Reference	Reference
<5%	*1.06 (1.04, 1.08)	*1.04 (1.02, 1.07)	*1.06 (1.04, 1.08)
% Aboriginal People			
≥10%	Reference	Reference	Reference
<10%	*0.71 (0.68, 0.74)	*0.66 (0.62, 0.70)	*0.71 (0.68, 0.73)
% Immigrants			
≥5%	Reference	Reference	Reference
<5%	*0.95 (0.93, 0.97)	*0.95 (0.93, 0.98)	*0.96 (0.95, 0.98)

(table continued on next page)

Table 5 (cont'd)

	Men RR (95% CI)	Women RR (95% CI)	Total Population RR (95% CI)
% Movers (Inter-CSD)			
≥20%	Reference	Reference	Reference
<20%	*0.90 (0.88, 0.92)	*0.93 (0.91, 0.95)	*0.90 (0.88, 0.91)
Average Number of Persons per Family			
≥3%	Reference	Reference	Reference
<3%	*1.19 (1.16, 1.22)	*1.15 (1.12, 1.18)	*1.18 (1.16, 1.20)
North vs. South			
North	*1.25 (1.19, 1.32)	*1.24 (1.15, 1.33)	*1.26 (1.21, 1.32)
South	Reference	Reference	Reference

* RR estimate statistically different from reference (1.00) at $p < 0.05$.
Data sources: Canadian annual mortality data, 1986 to 1996; 1996 Census, Statistics Canada.

Table 6 shows that there was still an independent association between place of residence categories and all-cause mortality risks among people aged 45 to 64 years. Living in a rural area was associated with a higher mortality risk in this age group, although of slightly smaller magnitude compared to people aged 0 to 44 years. The RRs for place of residence were between 1.04 for Strong MIZ and 1.16 in No MIZ areas. Predictors associated with increased mortality risks in this age group were low proportions of individuals having completed secondary school (less than 74%), low median household income (less than $40,000), small household size, a decreasing CSD population and low proportions of individuals working in primary industry occupations. Marital status (less than 50% of the CSD population being married) was also associated with higher mortality risk, but had a weaker effect for members of this age group when compared to their younger counterparts. Residents of CSDs located in the north had a significantly higher risk of dying compared to residents of southern CSDs (RR = 1.20; CI 1.13, 1.26). A smaller proportion of Aboriginal People within a CSD, a migration rate of less than 20% and lower unemployment (that is, less than 15%) were associated with a decreased mortality risk.

Table 6

Adjusted Relative Risk (RR) Estimates for the Association Between Place of Residence and All-Cause Mortality, People Aged 45 to 64 Years, Canada, 1986 to 1996

	Men RR (95% CI)	Women RR (95% CI)	Total Population RR (95% CI)
Place of Residence			
CMA/CA	Reference	Reference	Reference
Strong MIZ	1.04 (1.00, 1.07)	1.02 (0.98, 1.06)	*1.04 (1.01, 1.07)
Moderate MIZ	*1.08 (1.05, 1.11)	*1.06 (1.03, 1.09)	*1.07 (1.05, 1.10)
Weak MIZ	*1.10 (1.07, 1.13)	*1.06 (1.03, 1.10)	*1.09 (1.07, 1.12)
No MIZ	*1.14 (1.06, 1.22)	*1.12 (1.03, 1.22)	*1.16 (1.09, 1.23)
% Completed Secondary School			
75–100%	Reference	Reference	Reference
50–74%	*1.20 (1.17, 1.23)	*1.16 (1.12, 1.19)	*1.19 (1.16, 1.22)
25–49%	*1.21 (1.16, 1.26)	*1.18 (1.13, 1.24)	*1.23 (1.19, 1.28)
0–24%	*1.27 (1.04, 1.55)	*1.23 (1.09, 1.40)	*1.32 (1.10, 1.59)
% Married			
≥50%	Reference	Reference	Reference
<50%	*1.15 (1.13, 1.17)	*1.08 (1.06, 1.10)	*1.12 (1.11, 1.14)
Median Household Income			
≥$40,000	Reference	Reference	Reference
$20,000–<$40,000	*1.12 (1.10, 1.14)	*1.09 (1.06, 1.11)	*1.11 (1.09, 1.13)
<$20,000	*1.23 (1.12, 1.35)	*1.21 (1.09, 1.34)	*1.22 (1.13, 1.33)
% Unemployment			
≥15%	Reference	Reference	Reference
10%–<15%	*0.94 (0.92, 0.96)	0.99 (0.96, 1.02)	*0.94 (0.92, 0.96)
<10%	*0.87 (0.85, 0.89)	0.97 (0.94, 1.00)	*0.92 (0.90, 0.94)
% Primary Occupations			
≥10%	Reference	Reference	Reference
<10%	*1.18 (1.16, 1.21)	*1.40 (1.35, 1.46)	*1.29 (1.26, 1.32)
% Aboriginal People			
≥10%	Reference	Reference	Reference
<10%	*0.86 (0.82, 0.90)	*0.81 (0.77, 0.86)	*0.86 (0.82, 0.89)
% Movers (Inter-CSD)			
≥20%	Reference	Reference	Reference
<20%	*0.93 (0.92, 0.95)	*0.95 (0.93, 0.97)	*0.93 (0.92, 0.95)
Average Number of Persons per Family			
≥3%	Reference	Reference	Reference
<3%	*1.15 (1.12, 1.17)	*1.08 (1.06, 1.11)	*1.12 (1.10, 1.14)
North vs. South			
North	*1.16 (1.09, 1.23)	*1.16 (1.08, 1.24)	*1.20 (1.13, 1.26)
South	Reference	Reference	Reference

* = RR estimate statistically different from reference (1.00) at $p < 0.05$.
Data sources: Canadian annual mortality data, 1986 to 1996; 1996 Census, Statistics Canada.

The results of the sex-specific regressions of this age group showed some interesting differences. The effect on mortality of a CSD proportion of less than 50% married people was doubled in men compared to women (8% in women versus 16% in men). An average of less than three persons per family had a greater impact on men's mortality risk than on women's (RR = 1.08 in women, compared to RR = 1.15 for men). The protective effect of low unemployment rates was not statistically significant for women, but led to significantly reduced mortality risk in men.

A regression analysis removing all northern CSDs was also performed for this age group, and the effect of rural places of residence remained unchanged (Appendix E).

Table 7 shows the relative risk estimates for the association between place of residence and mortality in the population aged 65 years and over. In this sub-population, the effect of place of residence is weaker compared to the other sub-groups. Living in a rural area still had a small independent effect on all-cause mortality in men living in Moderate, Weak and No MIZ areas, with risks 7% to 9% higher compared to CMA/CA. Among women, a small significant higher risk was found for Moderate and Weak MIZ areas only (RR 1.05 and 1.03, respectively).

The effect of the selected determinants of health was also lessened in this age group, particularly in women. The most significant determinants of health (those which led to an increased mortality risk) for women were living in a CSD where less than 50% of the population was married (RR 1.04), where less than 10% of the population had an occupation in the primary sector (RR 1.26) and where the proportion of immigrants was lower than 5% (RR 1.03). Statistically significant protective effects were found where there was a low unemployment rate, a lower than 10% Aboriginal population and a low migration percentage outside the CSD. Living in a northern CSD was associated with a 12% increased mortality risk.

Among men, most of the determinants of health controlled for in the regression had a significant effect on the mortality risks. Low median household income, lower proportions of married individuals, lower proportions of individuals working in primary occupations, lower proportions of immigrants within a CSD and living in a northern CSD were factors associated with a higher mortality risk in this analysis. A low unemployment rate, less than 10% Aboriginal People within a CSD and low percentage of movers were associated with a reduction in mortality risk for men aged 65 and over.

Removing CSDs located in the north did not change the effect of rural places of residence on mortality in that age group.

Table 7

Adjusted Relative Risk (RR) Estimates for the Association Between Place of Residence and All-Cause Mortality, People Aged 65 and Over, Canada, 1986 to 1996

	Men RR (95% CI)	Women RR (95% CI)	Total Population RR (95% CI)
Place of Residence			
CMA/CA	Reference	Reference	Reference
Strong MIZ	1.02 (1.00, 1.04)	1.01 (0.99, 1.03)	*1.03 (1.01, 1.05)
Moderate MIZ	*1.07 (1.06, 1.09)	*1.05 (1.04, 1.07)	*1.07 (1.06, 1.09)
Weak MIZ	*1.09 (1.07, 1.11)	*1.03 (1.01, 1.05)	*1.07 (1.05, 1.09)
No MIZ	*1.08 (1.04, 1.13)	1.00 (0.95, 1.05)	*1.08 (1.03, 1.12)
% Completed Secondary School			
75–100%	Reference	Reference	Reference
50–74%	*1.11 (1.10, 1.13)	*1.06 (1.04, 1.08)	*1.09 (1.08, 1.11)
25–49%	*1.07 (1.04, 1.10)	1.02 (0.99, 1.04)	*1.07 (1.05, 1.10)
0–24%	1.09 (0.94, 1.26)	1.11 (0.92, 1.33)	*1.16 (1.01, 1.33)
% Married			
≥50%	Reference	Reference	Reference
<50%	*1.09 (1.08, 1.11)	*1.04 (1.03, 1.06)	*1.05 (1.04, 1.06)
Median Household Income			
≥$40,000	Reference	Reference	Reference
$20,000–<$40,000	*1.03 (1.02, 1.05)	*1.02 (1.01, 1.03)	*1.03 (1.02, 1.04)
<$20,000	*1.11 (1.05, 1.17)	0.99 (0.93, 1.07)	*1.07 (1.01, 1.13)
% Unemployment			
≥15%	Reference	Reference	Reference
≥10%–<15%	*0.97 (0.96, 0.99)	0.98 (0.96, 1.00)	*0.96 (0.94, 0.97)
<10%	*0.95 (0.93, 0.96)	*0.97 (0.95, 0.99)	*0.96 (0.95, 0.97)
% Primary Occupations			
≥10%	Reference	Reference	Reference
<10%	*1.15 (1.13, 1.17)	*1.26 (1.23, 1.29)	*1.19 (1.17, 1.21)
% Aboriginal People			
≥10%	Reference	Reference	Reference
<10%	*0.95 (0.92, 0.98)	*0.95 (0.92, 0.98)	*0.95 (0.93, 0.98)
% Immigrants			
≥5%	Reference	Reference	Reference
<5%	*1.09 (1.08, 1.10)	*1.03 (1.02, 1.05)	*1.07 (1.06, 1.08)
% Movers (Inter-CSD)			
≥20%	Reference	Reference	Reference
<20%	*0.95 (0.94, 0.96)	*0.96 (0.95, 0.97)	*0.95 (0.95, 0.96)
North vs. South			
North	*1.09 (1.03, 1.14)	*1.12 (1.05, 1.19)	*1.12 (1.07, 1.18)
South	Reference	Reference	Reference

* RR estimate statistically different from reference (1.00) at $p < 0.05$.
Data sources: Canadian annual mortality data, 1986 to 1996; 1996 Census, Statistics Canada.

Discussion

Previous descriptions of mortality have shown conflicting results: some studies have reported poorer outcomes in rural and remote areas, whereas others have conferred an advantage on rural populations. Our report shows that, for all age groups up to 64 years, the all-cause mortality risks were higher in rural than urban areas, with the highest risks of premature death (prior to the age of 65 years) being identified among children and adolescents. For example, the all-cause standardized mortality ratio for ages 5 to 19 living in No MIZ areas was 2.64 (95% CI 2.42, 2.87) for boys and 2.55 (95% CI 2.24, 2.88) for girls.

In contrast to the increased risks experienced by rural residents under the age of 65, rural residents aged 65 and over did not have greater all-cause mortality risks than their urban counterparts. All-cause mortality rates for this age group were significantly lower in Strong, Weak and No MIZ compared to urban areas. Lower risks of overall mortality among the rural elderly are supported by similar results found in other studies of place of residence and mortality.[34] Part of this age variation in mortality according to place of residence may be explained by migration. It has been suggested that urban centres may be selected by persons at highest risk of death as they relocate to be closer to medical facilities or family members, thereby contributing to mortality risk differentials between place of residence categories.[34, 38]

Our regression results lend some support to these hypotheses. Migration was among the significant confounders of the association between place of residence and all-cause mortality. While internal migration seems to be an important confounder of the association between place of residence and mortality, it did not explain away the effect of place of residence. Our results point to the need for a better understanding of the migration process (that is, who moves where, and at what stage in life).

Some studies have examined the effect of migration on the health of rural communities. The chronically unhealthy are more likely to change residence. Bentham[102] found that among the elderly, unhealthy people were more inclined to move. This is corroborated by another study showing not only that women who needed specialist care were more likely to move from a rural/remote to a more urban area, but also that women who did move had poorer physical health than those women who remained in rural/remote areas.[103] Migration can also be triggered by a search for services and possibly other physical and social amenities.[103] While local moves triggered by long-term poor health are not likely to influence the spatial pattern of health, longer-distance moves may do so. A Canadian study of migration patterns in rural and small towns reported that for the age group 70 years and over, out-migration exceeded migration into rural areas.[104] Therefore, areas with high out-migration of unhealthy individuals would make that area become "healthier." As mobility is also sensitive to age, young adults and the elderly having the highest propensity to move, it would be expected that with increasing age the link between interregional mobility and chronic illness and disability is likely to be stronger, as the elderly make major adjustments to their living arrangements to be closer to family members or services.[103]

These studies contributed to the better understanding of the impact of migration on the health of rural residents, but there are still a lot of unknown issues, such as, What is the size and direction of health-selective migration?, Are healthy or unhealthy people more likely to move? and How is this relationship affected by well-known predictors of health and mobility such as age, sex, living arrangements and socio-economic status? Does the health-selective migration contribute to creating health disparities in rural areas? All these questions need to be investigated in order to improve our understanding of the effect of migration on the differences found in mortality rates between rural and urban areas.

North and south is another geographic indicator inherent to rural–urban MIZ categories. As it was possible that the rural–urban differences were reflective of north/south disparities, the variable was included in the multivariate analyses for all-cause mortality. The relative risk was significantly higher in the north compared to the south. However, the inclusion of this component did not change the relationship between rural places of residence and all-cause mortality. The mortality risks remained significantly higher in rural areas for both men and women of all ages, and a rural place of residence was still independently associated with mortality after controlling for selected determinants of health.

4.3.2 Life Expectancy and Health-Adjusted Life Expectancy

This section presents the results of an analysis of life expectancy (LE) at birth and health-adjusted life expectancy (HALE) at birth by MIZ category and sex. The methodology is described in Sub-Section 3.2.4.

Table 8 provides the 1999 to 2001 average life expectancy at birth for both sexes in each MIZ category of Canada. Women have higher life expectancy than men in all MIZ categories. The sex difference ranges from 4 to 7 years, the highest difference being in No MIZ areas (7.46 years) and the lowest in Strong MIZ areas (4.13 years).

LE at birth is higher in men and women living in Strong MIZ areas, but the difference is significant only in men. It decreases as the degree of rurality increases, except for men living in Strong MIZ. Men living in No MIZ areas had the shortest LE (73.98), and it was 2.79 years shorter than that of men living in CMAs/CAs and 3.38 years shorter than that of men living in Strong MIZ areas. The differences in LE across MIZ categories were not as clear for women. Women living in Weak MIZ areas had the lowest LE, but the difference between them and those living in CMAs/CAs was only 0.14 years, which was not statistically significant. The largest difference was found between women living in Weak MIZ areas and those living in Strong MIZ areas, with a statistically significant difference of 0.20 years.

Table 8
Life Expectancy (LE) at Birth, by MIZ and Sex, 1999 to 2001

MIZ	Males LE	95% CI	Diff. From CMA	Females LE	95% CI	Diff. From CMA
CMA	76.77	76.73, 76.81	0.00	81.43	81.35, 81.50	0.00
Strong MIZ	77.36*	77.32, 77.40	0.59	81.49	81.42, 81.57	0.07
Moderate MIZ	75.71*	75.66, 75.75	-1.06	81.44	81.36, 81.52	0.01
Weak MIZ	75.02*	74.97, 75.07	-1.75	81.29	81.20, 81.37	-0.14
No MIZ	73.98*	73.92, 74.04	-2.79	81.44	81.36, 81.52	0.01
Canada	76.50	76.46, 76.54	-0.27	81.42	81.34, 81.50	-0.01

Reference group is CMA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1999 to 2001, Statistics Canada.

Table 9 presents HALE at birth by sex and MIZ category. Overall HALE was 70.54 years for women and 67.69 years for men. The HALE gaps between men and women were narrower than the gaps in LE for all MIZ categories, with the widest gap occurring in the No MIZ category (4.42 years). HALE years lost due to health problems were higher among women (10.19 to 11.55 years) than men (8.51 to 8.86 years) in all categories. Interestingly, the population with the highest number of years lost due to health problems was men living in CMAs/CAs, whereas in women it was those living in No MIZ areas. The highest HALE was observed again for both men and women in Strong MIZ areas. HALE significantly decreased with increasing rurality for men in all other MIZ categories. In women, a completely different pattern was found. Women in No MIZ had the lowest HALE, whereas those in other MIZ categories had higher HALE as compared with CMA/CA.

Table 9
Health-Adjusted Life Expectancy (HALE), by MIZ and Sex, 1999 to 2001

MIZ	Males HALE	95% CI	Diff. From CMA	Females HALE	95% CI	Diff. From CMA
CMA	67.91	67.70, 68.12	0.00	70.55	70.32, 70.77	0.00
Strong MIZ	68.74*	68.30, 69.18	0.83	71.30*	70.83, 71.78	0.76
Moderate MIZ	67.21*	66.87, 67.55	-0.70	71.05	70.66, 71.43	0.50
Weak MIZ	66.21*	65.89, 66.53	-1.70	70.70	70.35, 71.04	0.15
No MIZ	65.47*	64.70, 66.24	-2.43	69.89	69.01, 70.76	-0.66
Canada	67.69	67.44, 67.93	-0.22	70.54	70.27, 70.81	-0.01

Reference group is CMA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1999 to 2001, Statistics Canada.

Discussion

Health status was examined through life expectancy (LE) and health-adjusted life expectancy measures (HALE). For men, LE was higher in urban areas than in other MIZ categories, though people living in Strong MIZ areas seem to be advantaged, even compared with those living in CMAs/CAs. Strong MIZ areas are advantaged, from a rural point of view, because they have the least distance to an urban area. These results are in line with our mortality results, showing that the mortality risks were higher among men, and rural men were more likely than urban men to die prematurely. Interestingly, the lowest LE in men (73.98 years in No MIZ areas) was very close to the American men LE, at 74.8 years. As well, the lowest LE in women (81.29 years in Weak MIZ areas) was higher than the American women LE, which was 80.1 years (Hoyert et al, 2003).[247] A Canadian study of LE among men and women aged 45 years and older found that differences between low and high educational levels produced the larger effects with respect to mortality: nearly six years of life expectancy gains for both men and women with the highest educational levels. Differences between the lower and higher income levels were 3.3 years for men and 3.8 years for women.[105] The differences found in socio-economic status (SES) were larger than the differences created by place of residence; the highest impact of place of residence was among men living in No MIZ areas with a difference of 2.79 years compared to those living in CMAs/CAs. However, place of residence remains an important factor to take into account when looking at LE disparities.

HALE measures health in different ways than mortality-based indicators and can be seen as reflecting current concepts of health more accurately.[97] As well, an advantage of a utility-based measure of health expectancy such as HALE is the ability to evaluate the equivalent influences of mortality and health-related quality of life together to create a combined perspective of health.[97] Since HALE captures a relatively broad perspective of health, even small differences have important public health significance.[97] The 2.4-year HALE difference between men living in CMAs/CAs and men living in No MIZ areas suggests that there are important disparities between the most remote areas and the metropolitan areas of Canada. According to our mortality analysis, these disparities are likely to be attributable, at least partially, to deaths due to accident and chronic disease (refer to Sections 4.4 and 4.5 for a detailed description of accidents and chronic disease mortality). Rural men not only had the shortest life expectancy, but also experienced a smaller proportion of their life in good health than their urban counterparts. Sex differences were narrower for HALE than for LE (between 4 and 7.4 years in LE, compared with 2.5 and 4.4 years in HALE). Compared with men, women had higher LE, but lived a smaller proportion of their life in a healthy state.

4.3.3 Self-Reported Health and Quality of Life

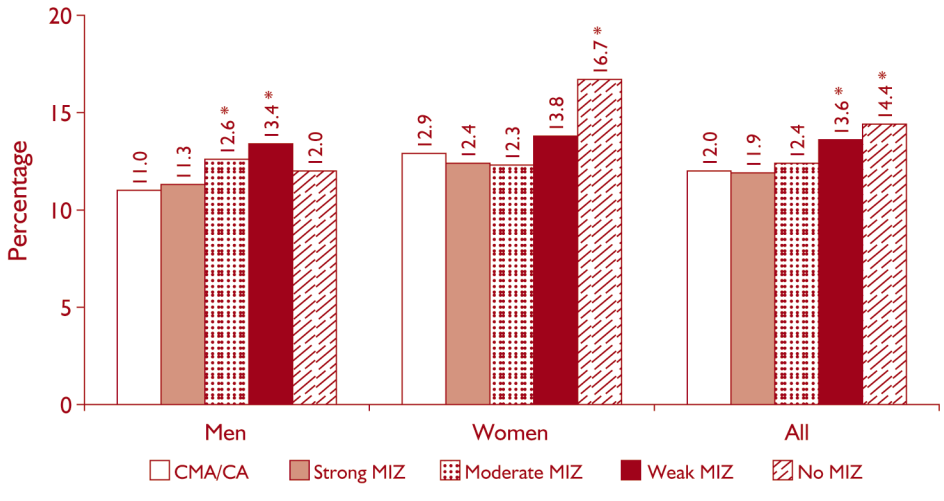
This section presents the results for self-rated health by place of residence as well as specific indicators of quality of life, such as disability rates. The prevalence of mental disorders is also addressed in this section.

Statistically higher proportions of Weak and No MIZ residents reported having a fair/poor health status (CMA/CA: 12.0%; No MIZ: 14.4%), compared with urban Canadians (Figure 14). Significantly greater proportions of rural Canadians aged 20 to 64 years reported being overweight than their urban counterparts (CMA/CA: 46.9%; No MIZ: 57.2%) (Figure 15). Yet lower proportions of rural Canadians reported low self-esteem (CMA/CA: 14.2%; No MIZ: 9.6%) (data not shown) or a quite to extremely stressful life (CMA/CA: 26.1%; No MIZ: 22.8%) (Figure 16).

When disability measures are considered, a significantly lower proportion of men living in Strong and Weak MIZ areas reported having no difficulties with daily activities (Figure 17). A significantly lower proportion of women living in Strong MIZ areas reported a Health Utility Index (HUI) score indicative of disability, compared with women living in a CMA/CA (Figure 18). Generally, the percentage of people reporting mental disorders (such as agoraphobia, major depressive episode, mania, panic disorder and social phobia) declined with increasing rurality. Women reported higher percentages of mental disorders, with the exception of those living in No MIZ areas. There were, however, no significant differences between urban and rural areas in either sex or for sex combined (Figure 19). No clear patterns were found for the other disability measures examined (see Appendix D, Table D–3).

Figure 14

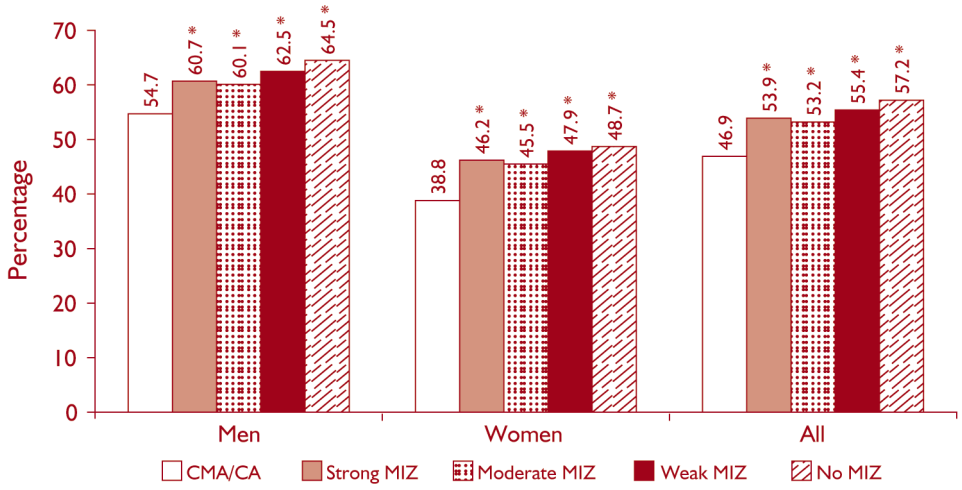
Age-Standardized Proportion of Individuals With Fair/Poor Self-Reported Health, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 15

Age-Standardized Proportion of Individuals Aged 20 to 64 Who Reported Being Overweight/Obese (Body Mass Index >25.0), by Sex and Place of Residence, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at p <0.05.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

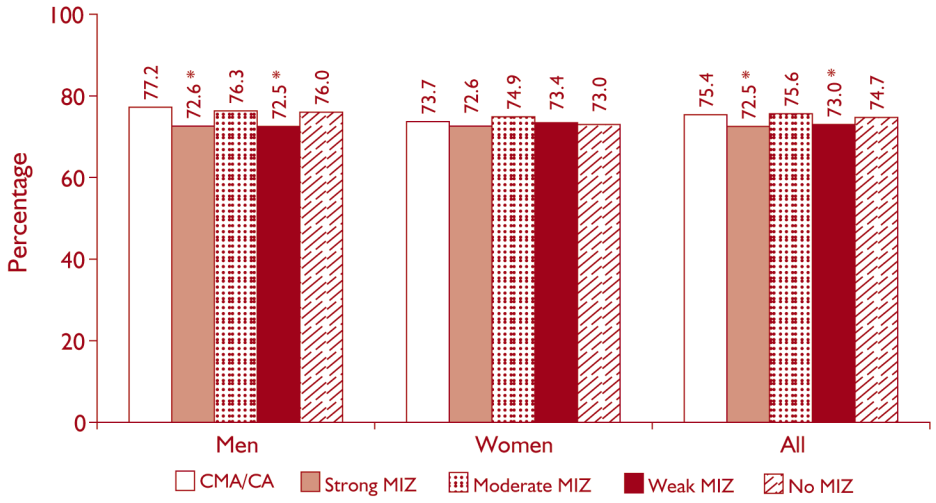
Figure 16

Age-Standardized Proportion of Individuals Reporting a Quite to Extremely Stressful Life, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Reference group is CMA/CA.
* Statistically significant at p <0.05.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 17

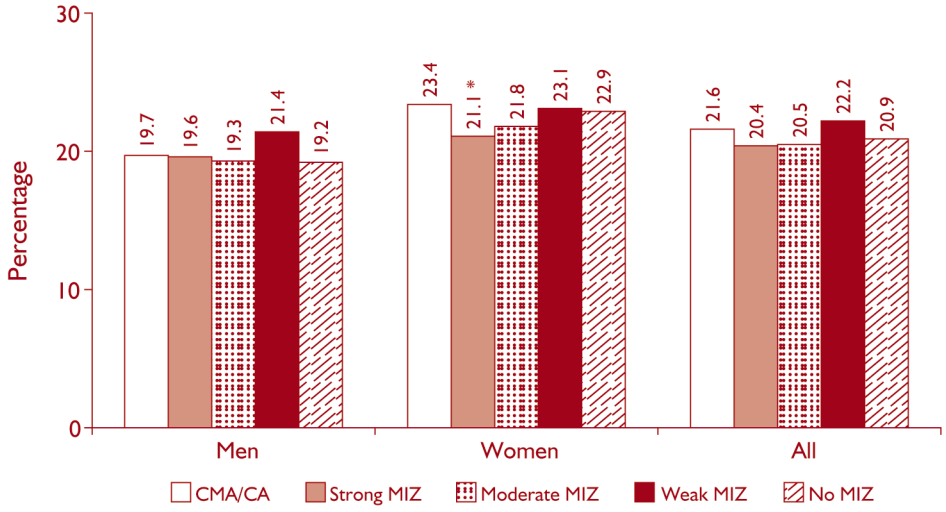
Age-Standardized Proportion of Individuals Reporting No Difficulties With Daily Activities, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at p <0.05.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 18

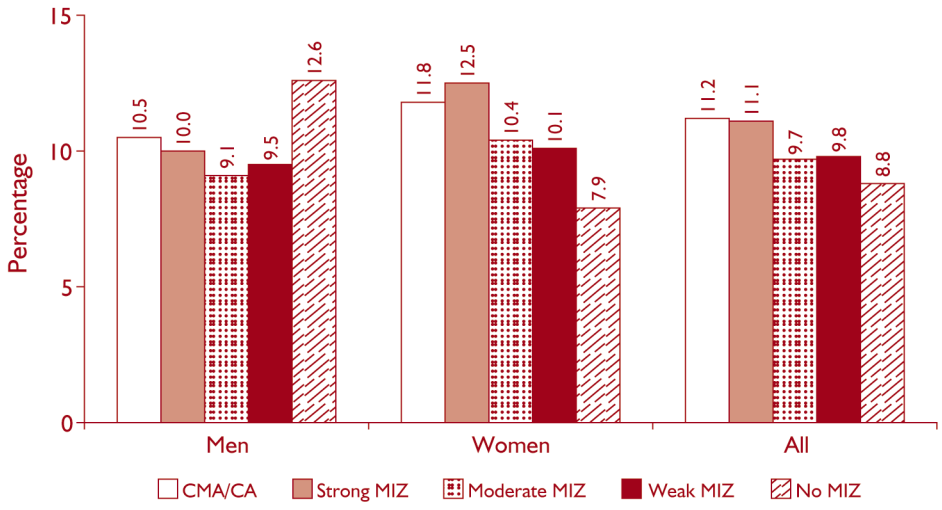
Age-Standardized Proportion of Individuals With a Health Utility Index Indicative of Disability, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at p <0.05.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Figure 19

Age-Standardized Proportion of Individuals Meeting the Criteria for Selected Mental Disorders in the Previous 12 Months, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2002–2003



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Selected mental disorders include agoraphobia, major depressive episode, mania, panic disorder and social phobia.
Data source: Canadian Community Health Survey, Cycle 1.2, 2002–2003, Statistics Canada.

Multivariate Analysis

This section presents the results of our multivariate regression analysis of the association between place of residence and self-rated health, reporting being overweight and stress levels. The methodology for this analysis is described in Sub-Section 3.2.3.

Compared with living in a CMA/CA, living in a rural area did not always negatively affect the three selected health outcomes chosen for this analysis. For self-rated health, the association between reporting fair/poor health and place of residence as defined by the MIZ categories was no longer significant after controlling for a number of determinants of health (Table 10). The exception to this was Canadian women living in moderate MIZ areas, who had a significantly decreased risk of reporting poor/fair self-rated health (odds ratio [OR] = 0.86, CI 0.76, 0.98).

Socio-demographic and health behaviour predictors were also included in the regression models. The predictors of reporting either "poor" or "fair" health were similar for Canadian men and women. The predictors that did show a significant difference in increasing the risk of lower health ratings include (from predictors of highest increased risk to lowest increased risk) having one or more chronic diseases, reporting being overweight or obese, being depressed, not having worked in the past 12 months, not being married, smoking, not having a strong sense of belonging to the community, not eating five or more servings of fruit and vegetables each day (women only), experiencing some food insecurity in the household and getting older. Increased risk of reporting poor/fair health was also associated with increasing pain severity, higher stress levels, lower income, decreasing physical activity and lower formal education levels.

Table 10

Adjusted Odds Ratios (OR) Estimates for the Association Between Place and Selected Health Indicators of Canadian Men and Women[i, ii]

Variable Referent Group = 1.0	Men		
	Self-Rated Health	BMI ≥25	Stress Level
Place of residence[iii]			
Strong MIZ	0.97 (0.83–1.13)	1.20 (1.08–1.32)*	0.95 (0.85–1.06)
Moderate MIZ	1.05 (0.93–1.18)	1.21 (1.12–1.30)*	0.85 (0.78–0.93)*
Weak MIZ	1.12 (1.00–1.27)	1.26 (1.17–1.35)*	0.86 (0.79–0.94)*
No MIZ	0.97 (0.78–1.22)	1.41 (1.18–1.69)*	0.94 (0.70–1.23)
Age—different for each category[iv]	1.04 (1.03–1.04)*	0.75 (0.69–0.82)*	0.79 (0.73–0.85)*
Body mass index[v]			
25–30 (overweight)	2.07 (1.43–3.00)*	n/a	n/a
>30 (obese)	1.42 (1.24–1.62)*		
Marital status[vi]			
Divorced/separated/widowed	1.15 (1.01–1.29)*	n/a	1.13 (1.03–1.24)*
Single	1.54 (1.34–1.76)*		0.72 (0.66–0.78)*
Aboriginal status—yes	n/a	1.68 (1.38–2.04)*	n/a
Race—non-White	---	0.50 (0.45–0.55)*	0.81 (0.72–0.91)*
Income[vii]			
Middle-high	1.24 (1.08–1.43)*	0.87 (0.81–0.93)*	0.85 (0.79–0.91)*
Middle-low	1.63 (1.41–1.87)*	0.77 (0.70–0.83)*	---
Low	2.08 (1.75–2.46)*	0.65 (0.59–0.73)*	1.33 (1.19–1.50)*
Education[viii]			
Secondary degree/no post-secondary degree	1.27 (1.12–1.43)*	0.93 (0.87–0.99)*	0.81 (0.75–0.88)*
Less than secondary degree	1.79 (1.60–2.00)*	1.06 (0.98–1.14)	0.74 (0.69–0.80)*
Worked in past 12 months—no	1.64 (1.35–2.00)*	1.43 (1.24–1.64)*	0.77 (0.65–0.90)*
Smoking—yes	1.28 (1.16–1.42)*	0.64 (0.60–0.68)*	1.29 (1.21–1.38)*
Alcohol consumption—regular	n/a	---	n/a
Stress level[ix]			
A bit stressful	1.39 (1.24–1.55)*	n/a	n/a
Quite a bit/extremely stressful	2.23 (1.96–2.55)*		
Physical activity[x]			
Moderate	1.43 (1.24–1.64)*	1.21 (1.12–1.31)*	1.12 (1.01–1.23)*
Inactive	2.04 (1.80–2.31)*	1.24 (1.16–1.33)*	1.35 (1.24–1.47)*
Chronic disease—yes	3.20 (2.91–3.52)*	1.66 (1.56–1.77)*	1.27 (1.19–1.37)*
Activity limitation—yes	n/a	1.14 (1.07–1.22)*	n/a
Pain severity[xi]			
Moderate	1.40 (1.17–1.67)*	n/a	n/a
Severe	2.35 (1.80–3.06)*		
Sense of belonging to the community—no	1.26 (1.15–1.38)*	n/a	1.18 (1.11–1.27)*
Depression—yes	1.89 (1.62–2.20)*	n/a	n/a
Eating ≥5 servings of fruit/vegetables—no	---	1.16 (1.09–1.22)*	n/a
Some food insecurity—yes	1.29 (1.32–1.48)*	n/a	n/a

(table continued on next page)

Table 10 (cont'd)

Variable Referent Group = 1.0	Women		
	Self-Rated Health	BMI ≥25	Stress Level
Place of residence[iii]			
Strong MIZ	0.98 (0.85–1.14)	1.21 (1.10–1.33)*	0.95 (0.86–1.04)
Moderate MIZ	0.86 (0.76–0.98)*	1.19 (1.10–1.27)*	0.85 (0.78–0.92)*
Weak MIZ	1.05 (0.94–1.17)	1.30 (1.21–1.40)*	0.84 (0.79–0.91)*
No MIZ	1.24 (0.96–1.59)	1.33 (1.11–1.60)*	0.86 (0.73–1.02)
Age—different for each category[iv]	1.03 (1.02–1.03)*	0.78 (0.73–0.84)*	0.71 (0.66–0.76)*
Body mass index[v]			
25–30 (overweight)	1.33 (1.12–1.58)*	n/a	n/a
>30 (obese)	1.40 (1.26–1.57)*		
Marital status[vi]			
Divorced/separated/widowed	---	n/a	1.18 (1.10–1.26)*
Single	1.27 (1.12–1.44)*		---
Aboriginal status—yes	n/a	1.73 (1.45–2.05)*	n/a
Race—non-White	1.37 (1.16–1.63)*	0.58 (0.52–0.65)*	0.81 (0.73–0.90)*
Income[vii]			
Middle-high	1.30 (1.12–1.50)*	1.10 (1.03–1.17)*	0.83 (0.78–0.89)*
Middle-low	1.66 (1.42–1.95)*	1.06 (0.99–1.14)	0.88 (0.82–0.95)*
Low	2.18 (1.84–2.59)*	---	---
Education[viii]			
Secondary degree/no post-secondary degree	1.19 (1.07–1.33)*	1.08 (1.01–1.15)*	0.79 (0.75–0.84)*
Less than secondary degree	1.72 (1.54–1.91)*	1.32 (1.23–1.41)*	0.73 (0.68–0.79)*
Worked in past 12 months—no	1.40 (1.13–1.72)*	1.33 (1.19–1.50)*	0.87 (0.77–0.99)*
Smoking—yes	1.29 (1.17–1.41)*	0.74 (0.70–0.78)*	1.43 (1.34–1.52)*
Alcohol consumption—regular	n/a	0.71 (0.67–0.75)*	n/a
Stress level[ix]			
A bit stressful	1.32 (1.18–1.47)*	n/a	n/a
Quite a bit/extremely stressful	2.00 (1.78–2.25)*		
Physical activity[x]			
Moderate	1.40 (1.19–1.65)*	1.34 (1.24–1.45)*	1.07 (0.98–1.17)
Inactive	2.09 (1.82–2.39)*	1.62 (1.51–1.74)*	1.27 (1.18–1.37)*
Chronic disease—yes	2.70 (2.46–2.98)*	1.85 (1.74–1.96)*	1.29 (1.21–1.37)*
Activity limitation—yes	n/a	1.43 (1.34–1.52)*	n/a
Pain severity[xi]			
Moderate	1.68 (1.44–1.96)*	n/a	n/a
Severe	3.57 (2.92–4.37)*		
Sense of belonging to the community—no	1.18 (1.08–1.29)*	n/a	1.25 (1.18–1.33)*
Depression—yes	1.93 (1.72–2.17)*	n/a	n/a
Eating ≥5 servings of fruit/vegetables—no	1.13 (1.03–1.23)*	---	n/a
Some food insecurity—yes	1.31 (1.16–1.47)*	n/a	n/a

i. Confidence intervals were determined using 500 bootstrap weights to account for the complex survey design.
ii. --- Excluded during modeling; n/a: not applicable; * statistically significant at $p < 0.05$.
iii. Referent group is CMA/CA.
iv. Referent group for "stress level" is ≥45 years of age; referent group for "BMI ≥25" is ≥60 years of age; age variable is continuous for modelling of "self-rated health."
v. Referent group is BMI 18.5–24.9.
vi. Referent group is married/common-law.
vii. Referent group is high income.
viii. Referent group is postsecondary degree.
ix. Referent group is not very/not at all stressful.
x. Referent group is active.
xi. Referent group is mild.

Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Another set of regressions was performed to examine the association between place of residence and being overweight or obese (that is, having a BMI of ≥25). In the bivariate analysis, rural communities had greater proportions of people aged 20 to 64 who reported being overweight or obese (Figure 15). The multivariate regression analysis shows that a rural place of residence is still independently associated with the risk of being overweight or obese, even after controlling for important covariates (Table 10). This was true for both Canadian men and women. The risk was 19% to 41% higher in rural Canadians compared to their urban counterparts.

The predictors associated with an increased risk of being overweight or obese included being of Aboriginal origin, having one or more chronic diseases, not having worked in the past 12 months, being moderately active or inactive in leisure time activities, not eating the recommended five or more servings of fruit or vegetables each day and reporting activity limitations in daily activities. There were also a number of predictors that were associated with a decreased risk of being overweight or obese and they included being a current smoker, getting older, regularly consuming alcohol (women only) and having a lower income (men only).

Finally, the association between self-reported stress and place of residence was examined. Stress levels were significantly lower in rural areas in the bivariate analysis (Figure 16). The odds of reporting high stress levels were modelled by sex. Living in Moderate and Weak MIZ areas was still independently associated with a decreased risk of reporting high levels of stress, compared to living in urban areas (Table 10). The predictors that were associated with higher odds of reporting high levels of stress included being a current smoker, having one or more chronic diseases, having a weak sense of belonging to the community and being divorced, separated or widowed.

Discussion

Although our findings suggest that rural residents tend to die prematurely and report a lower SES than their urban counterparts, this is not reflected in the analysis of health-related quality of life indicators; there were no significant differences between rural and urban residents on most of the measures examined (HUI, disability days, pain severity, stress and activity limitations). However, overweight or obesity and self-reported stress (Moderate and Weak MIZ) were the health outcomes still independently associated with a rural place of residence, once the important covariates were controlled for in a regression analysis. Perhaps these results reflect that there could be better indicators to measure quality of life in rural areas. The ones that were used for this analysis are disease-related impacts on the quality of life of Canadians. The impact of an illness on the daily life of rural residents could be mitigated by social capital factors, such as resilience, that could not be examined in this study.

Significantly higher proportions of residents of the most rural/remote areas reported fair/poor health than those living in urban areas, particularly women who lived in No MIZ areas. People living in Strong MIZ areas reported similar proportions of fair/poor health compared with those living in CMA/CAs. However, when selected determinants of health and chronic diseases were controlled for, the differences between urban and rural areas were no longer statistically significant in either men or women. The determinants of health accounted for the differences in self-rated health between the rural and urban areas.

Similar results were found in a study of the health status of Manitoba's elderly, which reported that self-rated health was similar in urban and rural elderly respondents in both bivariate and multivariate analysis.[106] Moreover, rural participants' satisfaction with their health was considerably greater than that of their urban counterparts.[106] Another Canadian study found that in major metropolitan areas a significantly higher proportion of the population rated their health as excellent, compared with residents of rural areas, small and northern towns.[89] The same pattern was found in young Canadians aged 12 to 17 years.[67] As the authors did not perform a regression analysis of their results, it is not known whether those differences would remain after controlling for the determinants of health, though the data were income-standardized.

Our analysis of the CCHS mental health and well-being data (Cycle 1.2) suggested that there were no significant differences between urban and rural areas in the prevalence of mental disorders, and this is consistent with an Australian study that examined data from a national survey of mental health and well-being.[107] The prevalence in our study tended to be smaller for more rural areas. As well, our analysis of depression (CCHS Cycle 1.1) found that the proportions of people who met the case depression criteria were not statistically different between urban and rural residents, but showed a tendency to be lower in rural areas. Our analyses were limited by small cell sizes, preventing an examination of other specific mental health conditions by age, sex or MIZ category. It is important to note that the CCHS is self-reported and that specific populations may have been less likely to report having a mental health condition diagnosed by a health professional.

The importance of mental health on an individual's physical health has been increasingly recognized. Although there are a limited number of studies that have investigated access to and use of mental health services,[108–110] many obstacles to services common to individuals with mental illness are more pronounced in rural areas, such as distance and sparse population, personal stigma, visibility, confidentiality and lack of resources.[111] Community factors can play a significant role in the mental health of individuals. Issues such as population growth and decline,[112] housing quality[113] and financial concerns[114] all have an impact on mental health. Access to services plays an important role in treating mental illness in rural communities, as does increasing public awareness about the treatment of mental illness.[115] Combating the stigma of mental illness has been identified by the Canadian Alliance for Mental Illnesses and Mental Health as one of the most pressing priorities for improving the mental health of Canadians.[116] Stigma and discrimination associated with mental illness can lead individuals to remain quiet about

their condition, delay seeking health care because of confidentiality concerns, avoid following recommended treatments and avoid sharing concerns with individuals in their usual web of support in the community.[117] A U.S. study examining the relation between growing up in a rural or urban environment and perceptions of mental health and mental illness in high school students found that rural students showed more acceptance of alcohol abuse and viewed depression as more unhealthy than did urban students.[118] These differences may reflect the dissimilarities in the way that rural and urban individuals view health. Researchers suggest that research into rural mental health issues remains neglected.[86, 119]

4.4 Chronic Conditions

Section 4.4 presents the results of our analysis of several chronic diseases. It presents mortality, incidence and prevalence data where appropriate. The chronic diseases that have been examined as part of this study are circulatory diseases, high blood pressure, cancer, respiratory diseases, diabetes and arthritis. Finally, the results of a multivariate regression analysis looking at the association between chronic diseases and place of residence are presented.

4.4.1 Circulatory Disease

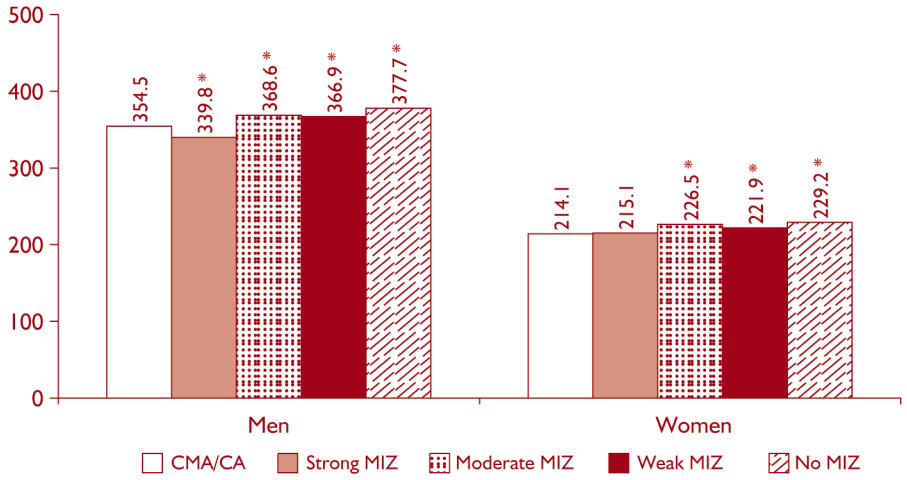
This section discusses mortality due to the broad category of circulatory diseases (ICD-9, Chapter 7, codes 390 to 459), as well as the prevalence of high blood pressure.

Mortality Rates

Mortality due to circulatory disease was higher in men compared to women and generally higher in Moderate, Weak and No MIZ areas (Figure 20). With respect to the age breakdowns, these trends were confirmed in people aged 20 and over (Figures 21 and 22). Few deaths attributable to circulatory disease occurred in the younger age groups (0 to 4 and 5 to 19), though the circulatory disease mortality rates are significantly higher in Weak and No MIZ areas among the youngest of Canadians (Appendix C, Table C–2). The rates among elderly people were slightly higher in Moderate, Weak and No MIZ areas, compared to CMA/CA (Figure 22). The risk of dying prematurely from circulatory diseases was higher among people living in rural/remote areas (Table 11). The risk was particularly high among people aged 20 to 44 living in No MIZ areas (SMR for men: 1.55; SMR for women: 1.61).

Figure 20

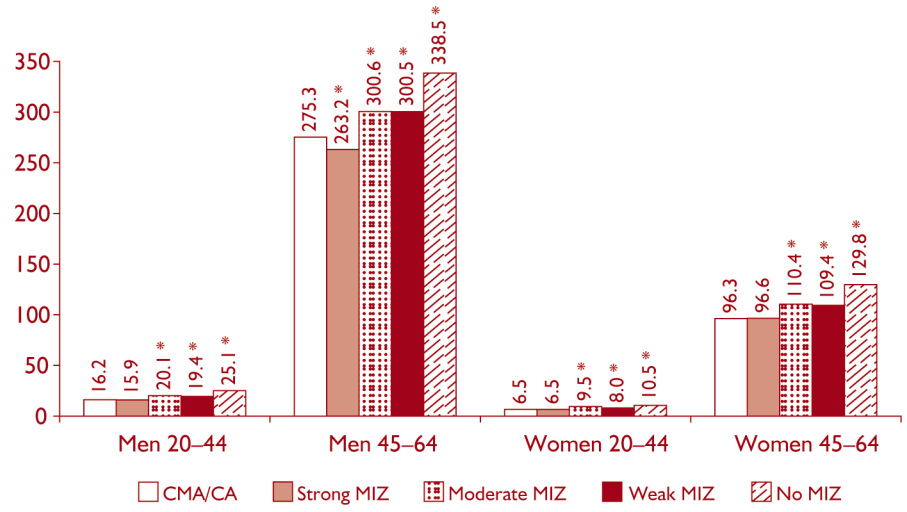
Age-Standardized Circulatory Disease Mortality Rates (per 100,000) Among Canadians (All Ages), by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 21

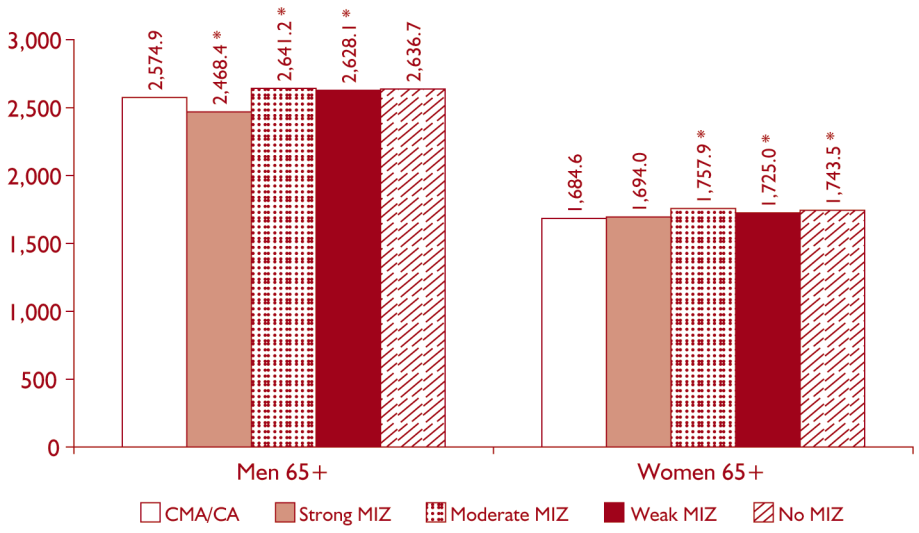
Age-Standardized Circulatory Disease Mortality Rates (per 100,000) Among Men and Women Aged 20 to 64 Years, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 22

Age-Standardized Circulatory Disease Mortality Rates (per 100,000) Among Men and Women Aged 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 11

Standardized Circulatory Disease Mortality Ratios, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	s	s	s	s
5–19	s	s	s	s
20–44	0.97 (0.89–1.02)	1.24 (1.16–1.32)*	1.20 (1.12–1.28)*	1.55 (1.33–1.80)*
45–64	0.96 (0.93–0.98)*	1.09 (1.07–1.11)*	1.09 (1.07–1.12)*	1.23 (1.16–1.30)*
65+	0.95 (0.94–0.97)*	1.02 (1.01–1.03)*	1.02 (1.01–1.03)*	1.03 (1.00–1.05)
Total	0.95 (0.94–0.97)*	1.04 (1.03–1.05)*	1.04 (1.03–1.05)*	1.07 (1.04–1.09)*
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	s	s	s	s
5–19	s	s	s	s
20–44	0.99 (0.86–1.14)	1.44 (1.31–1.59)*	1.22 (1.09–1.35)*	1.61 (1.25–2.05)*
45–64	1.00 (0.95–1.05)	1.14 (1.10–1.19)*	1.13 (1.09–1.18)*	1.34 (1.22–1.47)*
65+	1.01 (0.99–1.02)	1.04 (1.03–1.05)*	1.02 (1.01–1.03)*	1.03 (1.00–1.06)
Total	1.01 (0.99–1.02)	1.05 (1.04–1.06)*	1.03 (1.02–1.04)*	1.06 (1.03–1.09)*

(table continued on next page)

Table 11 (cont'd)

Age Group	All			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	0.95 (0.63–1.37)	0.98 (0.71–1.32)	1.47 (1.13–1.87)*	1.90 (1.11–3.05)*
5–19	0.90 (0.63–1.26)	1.20 (0.94–1.51)	1.01 (0.77–1.30)	1.32 (0.72–2.21)
20–44	1.00 (0.93–1.07)	1.32 (1.25–1.39)*	1.22 (1.16–1.29)*	1.61 (1.14–1.83)*
45–64	0.99 (0.97–1.02)	1.12 (1.10–1.14)*	1.12 (1.10–1.15)*	1.29 (1.23–1.36)*
65+	1.01 (0.99–1.02)	1.06 (1.05–1.06)*	1.05 (1.04–1.05)*	1.06 (1.04–1.08)*
Total	1.00 (0.99–1.01)	1.07 (1.06–1.07)*	1.06 (1.05–1.06)*	1.10 (1.08–1.12)*

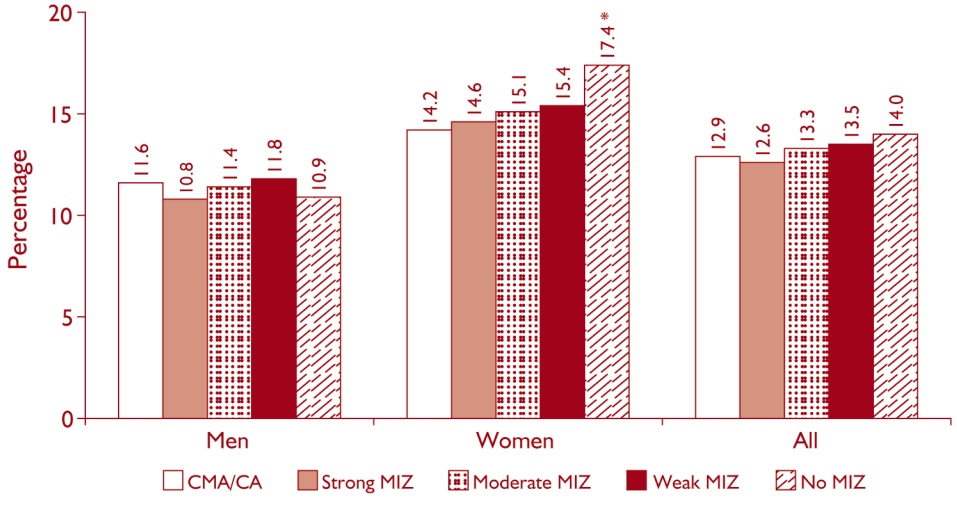
Reference group is CMA/CA = 1.0.
* Statistically significant at $p < 0.05$.
s Data suppressed.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

High Blood Pressure

No significant differences in the proportions of men diagnosed with high blood pressure were reported between men living in rural areas and men living in urban areas (Figure 23). Only No MIZ areas reported a higher proportion of women diagnosed with high blood pressure than their urban counterparts.

Figure 23

Age-Standardized Prevalence of High Blood Pressure, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Discussion

Overall circulatory disease mortality risks were examined. These conditions represent the leading causes of death in Canada, making them important public health issues. Circulatory disease mortality risk is significantly higher in all MIZ categories among both men and women, with the exception of Strong MIZ areas. Differences between Strong MIZ and CMAs/CAs were either non-significant or statistically lower in Strong MIZ. This pattern was true for both men and women across all age groups. However, in the other rural MIZ areas, working-age men (20 to 64) were particularly at risk of dying from these diseases, their rates being three times as high as in women of the same age.

Mortality rates from circulatory diseases have slowly declined over recent years, but the absolute numbers have increased because of the aging of the population (this does not always seem to be the case for rural areas, where the risks of dying prematurely from circulatory diseases were also higher). Circulatory diseases are related to a variety and complex set of risk factors. Factors such as age, gender, race and ethnicity and heredity are considered non-modifiable risk factors. However, factors such as smoking, obesity and lack of physical activity are modifiable. Our analysis of the CCHS shows that smoking, hypertension and obesity rates are significantly higher among rural residents compared to their urban counterparts.

A lower SES has been associated in the literature with higher cardiovascular mortality risks.[120–122] As well, differentials in cardiovascular mortality by geographic region have been reported, with higher rates in rural compared with metropolitan areas and higher prevalence of cardiovascular disease risk factors in rural areas.[51, 123, 124] However, when SES factors are controlled for, the higher risks of cardiovascular mortality in rural areas became non-significant.[124] This result suggests that SES could partially explain the differences found in mortality rates between urban and rural areas. It is also possible that a higher fatality rate in rural areas is influenced by differences in the seriousness of the disease between urban and rural areas, differences in access to acute care, in the management of the disease or in the natural course of the disease.[125–127] Ethnicity has also been shown to be related to cardiovascular disease risk factors and outcomes. In Canada, some studies have found that Aboriginal Peoples have a higher prevalence of cardiovascular disease, compared with the general population.[128, 129] This has important implications for rural areas, as some of these communities have large Aboriginal populations.

Modifiable risk factors can be influenced through evidence-based preventive measures. Assessing the presence of risk factors, targeting modifiable risk factors, screening, disseminating warning sign information and increasing blood pressure and cholesterol screening are among the effective interventions that can be implemented in both rural and urban areas.[231–235]

4.4.2 Cancer

This section discusses cancer incidence and mortality due to the broad category of neoplasms (ICD-9, Chapter 2, codes 140 to 239). It then provides further analysis of mortality from specific cancers: lung, colorectal, breast, cervical and prostate cancer.

Cancer Incidence

This section of the report presents the results of the analysis of the Canadian Cancer Registry, 1986 to 1996. The methodology is described in Sub-Section 3.2.2.

When looking at the incidence rates of all cancers combined in men, men living in Strong MIZ areas had the lowest incidence rate (Table 12). The incidence rates of all cancer combined were generally lower in rural areas among both men and women. The lowest rates were found in Strong MIZ areas. The incidence rates of all cancers in women followed a similar pattern, with the lowest incidence rate also being observed in Strong MIZ areas (Table 13). The incidence rates of breast, cervical, lung, prostate and colorectal cancers are described in further detail in their respective sections.

For the incidence rates of specific cancers, the majority were lower in rural areas than in urban areas. One exception to this observation was the higher incidence rates of lip cancer for men living in rural areas (Table 12). Interestingly, the other buccal cavity cancer sites (tongue/gum/mouth/pharynx, salivary gland and esophagus) showed significantly higher rates among urban male residents. The incidence rates of five other types of cancer were generally significantly higher among urban men compared to rural men (that is, colon, liver, melanoma, prostate and non-Hodgkin's lymphoma). There were no or only sporadic significant differences in the incidence of the remaining 31 types of cancer. For women, the incidence rates of six types of cancer were generally significantly higher among urban women (breast, tongue/gum/mouth/pharynx, lung, ovary, bladder and thyroid cancer) (Table 13). There were no or only sporadic significant differences in the incidence of the remaining 33 types of cancer.

Cancer incidence by region of Canada (British Columbia, Prairies, Ontario, Quebec and the Atlantic provinces) was also examined as part of this study. Patterns similar to the national analysis of cancer incidence were found (data not shown).

Table 12

Age-Standardized Incidence Rates per 100,000 Among Men All Ages, by Cancer Site and Place of Residence, Canada, 1986 to 1996

Site	CMA/CA	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
All cancers	463.8 (462.4–465.2)	418.7 (414.1–423.4)*	446.5 (443.0–450.0)*	430.6 (426.8–434.4)*	456.2 (446.6–465.9)
Lip	3.1 (3.0–3.2)	5.9 (5.3–6.5)*	7.0 (6.6–7.5)*	8.1 (7.6–8.7)*	12.6 (11.1–14.4)*
Tongue, gum, mouth, pharynx	10.5 (10.3–10.7)	8.2 (7.6–8.9)*	9.3 (8.8–9.8)*	8.4 (7.9–8.9)*	8.1 (6.9–9.5)*
Esophagus	5.9 (5.8–6.1)	5.2 (4.7–5.7)*	5.1 (4.8–5.5)*	5.1 (4.7–5.5)*	5.6 (4.6–6.7)
Stomach	15.2 (14.9–15.4)	12.8 (12.0–13.6)*	15.6 (14.9–16.2)	15.5 (14.8–16.2)	16.2 (14.4–18.1)
Colon and rectum	62.2 (61.7–62.7)	57.6 (55.9–59.4)*	60.0 (58.8–61.3)*	56.5 (55.1–57.9)*	60.1 (56.7–63.8)
Liver	4.9 (4.8–5.1)	2.7 (2.4–3.1)*	3.3 (3.0–3.6)*	3.0 (2.7–3.3)*	3.4 (2.6–4.3)*
Pancreas	11.2 (11.0–11.4)	10.3 (9.6–11.0)	10.8 (10.3–11.3)	11.6 (11.0–12.2)	10.0 (8.7–11.6)
Larynx	8.0 (7.8–8.1)	6.8 (6.2–7.4)*	7.7 (7.3–8.2)	7.1 (6.6–7.6)*	7.0 (5.9–8.3)
Lung	90.4 (89.8–91.0)	79.9 (77.9–81.9)*	92.3 (90.7–93.9)	85.5 (83.9–87.2)*	92.4 (88.1–96.8)
Melanoma skin	10.2 (10.0–10.4)	9.0 (8.3–9.7)*	8.5 (8.0–9.0)*	8.4 (7.9–8.9)*	7.8 (6.6–9.2)*
Prostate	108.0 (107.3–108.7)	99.5 (97.2–101.8)*	103.5 (101.8–105.2)*	102.0 (100.1–103.9)*	106.9 (102.4–111.7)
Testis	4.7 (4.5–4.8)	4.3 (3.8–4.7)	3.7 (3.3–4.0)*	4.0 (3.6–4.3)*	4.0 (3.2–5.0)
Bladder	27.7 (27.3-–28.0)	25.4 (24.2–26.6)*	26.7 (25.8–27.5)	25.1 (24.2–26.0)*	27.7 (25.5–30.2)

(table continued on next page)

Table 12 (cont'd)

Site	CMA/CA	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Kidney	14.7 (14.4–14.9)	12.4 (11.7–13.2)*	13.9 (13.3–14.5)	14.3 (13.6–15.0)	15.6 (13.9–17.5)
Brain and other nervous system	8.3 (8.1–8.5)	7.3 (6.8–8.0)*	8.1 (7.6–8.6)	7.3 (6.8–7.8)*	8.4 (7.2–9.8)
Ill-defined and unknown sites	15.4 (15.2–15.7)	14.7 (13.8–15.6)	13.6 (13.0–14.3)*	13.6 (13.0–14.3)*	12.5 (11.0–14.2)*
Hodgkin's	3.2 (3.1–3.4)	2.9 (2.6–3.3)	3.0 (2.7–3.3)	2.8 (2.5–3.1)	2.9 (2.2–3.8)
Non-Hodgkin's lymphoma	18.1 (17.9–18.4)	15.8 (15.0–16.7)*	15.8 (15.2–16.5)*	15.5 (14.8–16.3)*	15.3 (13.6–17.2)*
Multiple myeloma	5.9 (5.8–6.1)	5.8 (5.3–6.4)	6.1 (5.7–6.5)	5.1 (4.7–5.5)*	6.4 (5.3–7.7)
Leukemia	14.0 (13.8–14.2)	13.8 (13.0–14.7)	14.0 (13.4–14.6)	12.9 (12.2–13.5)*	13.0 (11.5–14.7)

* Statistically significant at $p < 0.05$.
Reference group is CMA/CA.
Data source: Canadian Cancer Registry 1986–1996, Statistics Canada.

Table 13

Age-Standardized Incidence Rates per 100,000 Among Women (All Ages), by Cancer Site and Place of Residence, Canada, 1986 to 1996

Site	CMA/CA	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
All cancers	335.8 (334.8–336.8)	302.5 (298.8–306.3)*	318.0 (315.2–320.9)*	314.3 (311.1–317.4)*	323.5 (315.3–331.8)*
Tongue, gum, mouth, pharynx	3.8 (3.7–3.9)	2.9 (2.6–3.3)*	3.0 (2.8–3.3)*	3.2 (2.9–3.6)*	3.4 (2.7–4.4)
Lip	0.6 (0.5–0.6)	0.7 (0.5–0.9)	0.8 (0.7–1.0)*	0.9 (0.8–1.1)*	0.9 (0.6–1.5)
Stomach	6.7 (6.6–6.8)	5.4 (4.9–5.9)*	6.9 (6.5–7.3)	6.6 (6.2–7.0)	7.2 (6.1–8.5)
Colon and rectum	43.2 (42.8–43.5)	43.1 (41.7–44.5)	45.4 (44.4–46.5)*	42.6 (41.5–43.8)	44.7 (41.8–47.8)
Gallbladder	3.0 (2.9–3.1)	2.9 (2.5–3.2)	3.0 (2.8–3.3)	3.3 (3.0–3.6)	3.7 (2.9–4.6)
Pancreas	8.3 (8.2–8.5)	7.5 (6.9–8.1)*	8.2 (7.8–8.7)	8.7 (8.2–9.2)	8.4 (7.2–9.8)
Lung	38.5 (38.1–38.9)	32.2 (31.0–33.4)*	33.5 (32.6–34.5)*	33.9 (32.8–34.9)*	32.9 (30.3–35.6)*
Melanoma skin	8.6 (8.4–8.8)	8.6 (7.9–9.2)	7.7 (7.2–8.2)*	8.2 (7.7–8.8)	7.4 (6.2–8.8)
Breast	98.4 (97.9–99.0)	86.3 (84.3–88.4)*	89.3 (87.8–90.8)*	88.7 (87.0–90.4)*	90.7 (86.4–95.2)*
Cervix	9.6 (9.4–9.8)	8.1 (7.5–8.8)*	9.8 (9.3–10.4)	11.3 (10.7–12.0)*	13.1 (11.4–14.9)*

(table continued on next page)

Table 13 (cont'd)

Site	CMA/CA	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Uterus (excluding cervix)	19.2 (19.0–19.5)	17.1 (16.3–18.1)*	18.9 (18.2–19.6)	17.8 (17.1–18.6)*	18.8 (16.9–20.9)
Ovary	13.7 (13.5–13.9)	12.0 (11.3–12.8)*	12.2 (11.7–12.8)*	12.3 (11.7–13.0)*	12.0 (10.5–13.7)
Bladder	7.3 (7.1–7.4)	6.1 (5.6–6.6)*	7.1 (6.7–7.5)	5.9 (5.5–6.3)*	5.5 (4.5–6.7)*
Kidney	7.3 (7.2–7.5)	7.5 (7.0–8.2)	8.2 (7.7–8.7)*	8.2 (7.7–8.7)*	8.4 (7.2–9.9)
Brain and other nervous system	5.8 (5.7–6.0)	5.8 (5.3–6.3)	5.4 (5.1–5.8)	5.3 (4.9–5.8)	5.6 (4.7–6.8)
Thyroid	6.6 (6.4–6.7)	5.1 (4.6–5.7)*	5.1 (4.7–5.5)*	5.4 (5.0–5.9)*	5.5 (4.4–6.7)
Ill-defined and unknown sites	10.3 (10.2–10.5)	9.0 (8.4–9.7)*	10.7 (10.2–11.2)	10.7 (10.2–11.3)	11.4 (10.0–13.0)
Non-Hodgkin's lymphoma	12.4 (12.2–12.6)	11.7 (11.0–12.4)	12.3 (11.7–12.9)	11.7 (11.1–12.3)	12.1 (10.6–13.8)
Multiple myeloma	3.9 (3.8–4.0)	4.2 (3.8–4.7)	3.8 (3.6–4.2)	3.6 (3.3–4.0)	3.8 (3.0–4.7)
Leukemia	8.6 (8.4–8.7)	8.1 (7.5–8.7)	8.5 (8.0–9.0)	7.7 (7.3–8.2)*	9.0 (7.8–10.5)

* Statistically significant at $p < 0.05$.
Reference: CMA/CA.
Data source: Canadian Cancer Registry, 1986 to 1996, Statistics Canada.

Discussion

Overall, the incidence rates of most cause-specific cancers were lower in rural areas than in urban areas. The only cancer site in our analysis that showed increasing rates from urban to rural areas was lip cancer in men. The incidence among rural men was 1.5 to 4 times higher than in CMA/CA, whereas lip cancer rates among women were not significantly different between urban and rural areas. Unlike other cancer sites, the age-specific incidence showed that even men aged 20 to 44 were at increased risk of being diagnosed with lip cancer. Similar findings have been reported elsewhere, including Australia,[130] Scandinavia, southern Europe and other parts of North America.[131, 132] It is also important to note that lip cancer has a low mortality rate, which is attributable to the slow growth rate of lip cancers, the rarity of lymph node metastases and the accessibility of the site for complete surgical excision.[130]

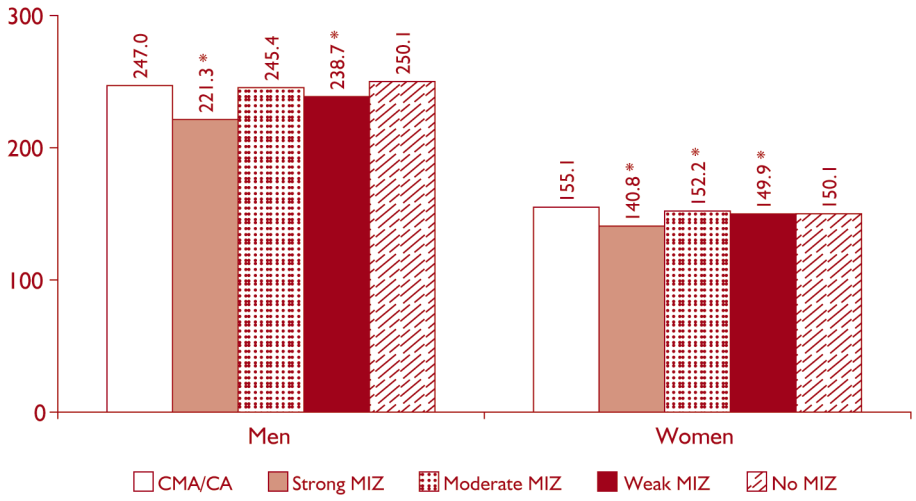
The independent effect of tobacco use has been linked to higher rates of lip cancer, and the differences between urban and rural areas could be partially explained by higher smoking rates in rural areas. However, the major etiologic factor linked to lip cancer is ultraviolet radiation exposure. It was not possible to control for race, but other studies have observed higher rates of lip cancer in fair-complexioned populations that lack the protective effects of natural skin pigments against the carcinogenic action of solar radiation.[133] Lip cancer has been reported to occur far more frequently in men employed in outdoor activities, such as farming, leading to several studies on this unique subpopulation.[134–136] In a meta-analysis of cancer among farmers, lip cancer was the only cancer clearly elevated in this occupational group.[136] Differences in sun exposure and the use of sun protection between urban and rural residents could also contribute to the differences between geographic regions. However, it was not possible to examine this particular risk factor because of the absence of data on sun exposure and/or protection. Very few studies have examined the use of sunscreen and other sun protection behaviours in rural populations. An Australian study found that protection against unsafe sun exposure was at least as good in rural areas as in cities, but it did not look at sun protection behaviours by occupation.[46]

All-Cancer Mortality

Overall, cancer mortality rates were slightly lower in rural than urban areas. As well, cancer mortality rates for men were higher than for women (Figure 24). Among men of all age groups, the rates were generally lower in rural than urban areas, although most of the time the differences were not statistically significant (Figures 25 and 26). Among women, one exception to the overall pattern was found in those aged 20 to 44 living in Moderate and No MIZ areas, where the rates were significantly higher than in urban areas (Figure 25). The mortality risks among these women were respectively 1.12 and 1.22 times higher than women living in urban areas (Table 14). There were no significant urban–rural patterns for any cancer mortality rates in the 0-to-4 and 5-to-19 age groups (Appendix C, Table C–3).

Figure 24

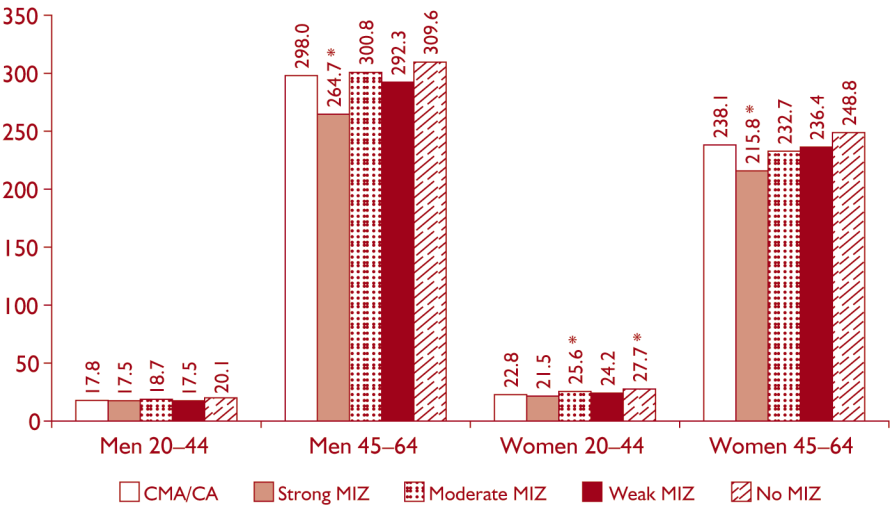
Age-Standardized All-Cancer Mortality Rates (per 100,000) Among Men and Women (All Ages), by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 25

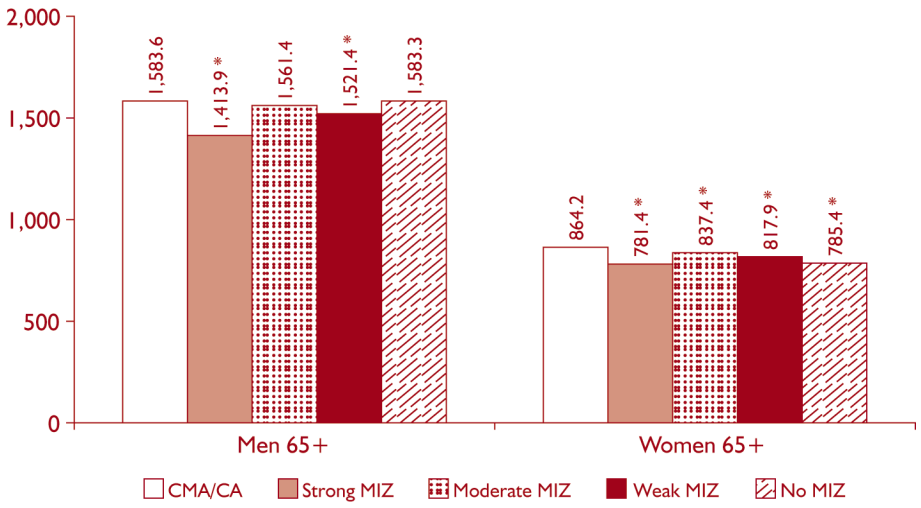
Age-Standardized All-Cancer Mortality Rates (per 100,000) Among Men and Women Aged 20 to 64 Years, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 26

Age-Standardized All-Cancer Mortality Rates (per 100,000) Among Men and Women Aged 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 14

Standardized All-Cancer Mortality Ratios, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	s	s	s	s
5–19	s	s	s	s
20–44	0.98 (0.90–1.06)	1.05 (0.99–1.12)	0.98 (0.91–1.05)	1.14 (0.96–1.35)
45–64	0.89 (0.86–0.91)*	1.01 (0.99–1.03)	0.98 (0.95–1.00)	1.04 (0.98–1.10)
65+	0.88 (0.87–0.90)*	0.98 (0.97–1.00)	0.96 (0.95–0.97)*	1.00 (0.97–1.03)
Total	0.89 (0.88–0.91)*	0.99 (0.98–1.00)	0.97 (0.98–1.00)	1.01 (0.98–1.04)
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	s	s	s	s
5–19	s	s	s	s
20–44	0.94 (0.87–1.01)	1.12 (1.06–1.18)*	1.06 (1.00–1.13)	1.22 (1.04–1.41)*
45–64	0.91 (0.88–0.93)*	0.98 (0.95–1.00)	0.99 (0.97–1.01)	1.04 (0.97–1.11)
65+	0.90 (0.88–0.93)*	0.97 (0.96–0.99)*	0.95 (0.93–0.96)*	0.91 (0.87–0.95)*
Total	0.91 (0.89–0.92)*	0.98 (0.97–0.99)*	0.96 (0.95–0.98)*	0.96 (0.92–0.99)*

(table continued on next page)

Table 14 (cont'd)

Age Group	All			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	0.88 (0.62–1.21)	0.97 (0.74–1.25)	0.87 (0.65–1.13)	1.21 (0.68–2.00)
5–19	1.21 (1.03–1.41)*	1.08 (0.94–1.23)	0.97 (0.84–1.11)	0.77 (0.77–1.11)
20–44	0.95 (0.90–1.01)	1.08 (1.04–1.13)*	1.02 (0.97–1.07)	1.17 (1.05–1.31)*
45–64	0.90 (0.88–0.92)*	1.00 (0.98–1.01)	1.00 (0.97–1.01)	1.05 (1.00–1.09)
65+	0.93 (0.91–0.94)*	1.01 (1.00–1.02)	0.99 (0.98–0.99)*	1.02 (0.99–1.04)
Total	0.92 (0.91–0.94)*	1.01 (1.00–1.02)	0.99 (0.98–1.00)	1.03 (1.01–1.05)*

* Statistically significant at $p < 0.05$.
s Data suppressed.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Lung Cancer

Incidence Rates

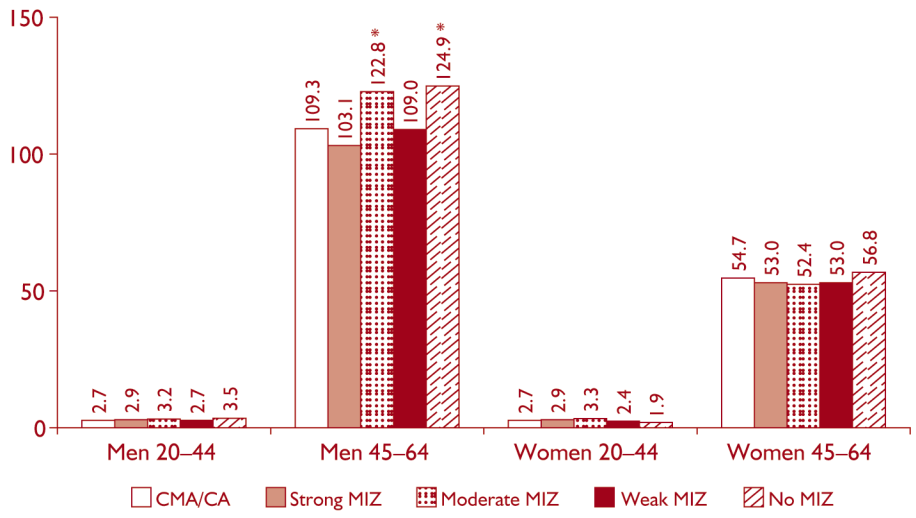
The lung cancer incidence rates for men were either lower or not significantly different compared to urban areas (Table 12). The incidence rates for men living in Strong and Weak MIZ areas were lower than those of their urban counterparts (CMA/CA: 90.4 per 100,000; Strong MIZ: 79.9 per 100,000; Weak MIZ: 85.5 per 100,000). Lung cancer incidence rates were lower for women living in all rural areas compared to those of women living in urban areas (Table 13), with women living in Strong MIZ areas having the lowest incidence rate (Strong MIZ: 32.2 per 100,000).

Mortality Rates

Lung cancer mortality rates among men were up to four times higher than among women. Mortality rates from lung cancer in both urban and rural areas tended to be similar in most age groups and both sexes, with few exceptions (Figures 27 and 28). Men aged 45 to 64 living in Moderate and No MIZ areas had significantly higher mortality rates than men of the same age living in urban areas (Figure 27). Mortality rates were statistically lower in women aged 65 years and older, and in men living in Strong and Weak MIZ areas. When the standardized mortality ratios are examined, men aged 45 to 64 years living in Moderate and No MIZ were found to have risks respectively 1.12 and 1.15 times as high as men living in urban areas (Table 15).

Figure 27

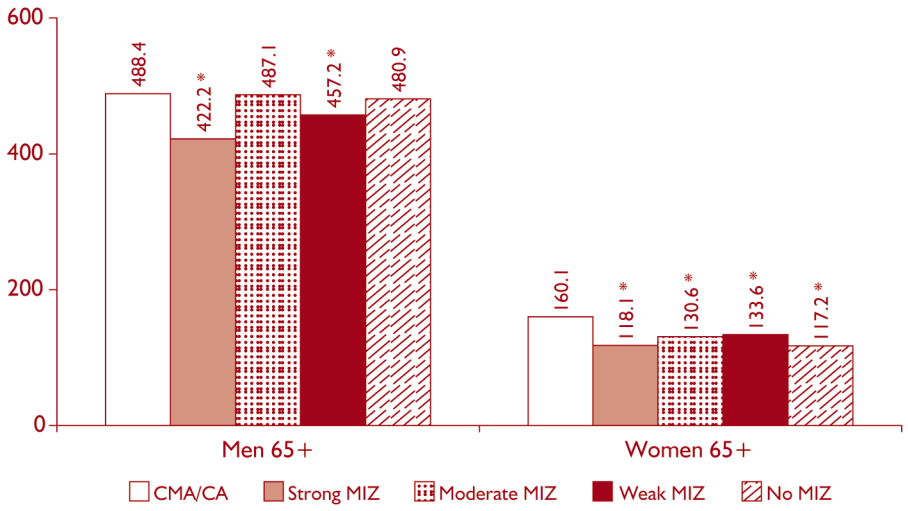
Age-Standardized Lung Cancer Mortality Rates (per 100,000) Among Men and Women Aged 20 to 64 Years, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 28

Age-Standardized Lung Cancer Mortality Rates (per 100,000) Among Men and Women Aged 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 15

Standardized Lung Cancer Mortality Ratios, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
20–44	1.06 (0.86–1.29)	1.17 (1.00–1.37)	1.02 (0.85–1.21)	1.31 (0.84–1.95)
45–64	0.94 (0.90–0.99)*	1.12 (1.08–1.16)	1.00 (0.96–1.04)	1.15 (1.04–1.26)*
65+	0.87 (0.84–0.90)*	1.00 (0.98–1.02)	0.94 (0.91–0.96)*	0.98 (0.93–1.05)
Total	0.89 (0.87–0.92)*	1.04 (1.02–1.05)*	0.96 (0.94–0.98)*	1.03 (0.98–1.08)
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
20–44	1.05 (0.85–1.29)	1.20 (1.02–1.41)	0.89 (0.72–1.07)	0.73 (0.38–1.27)
45–64	0.97 (0.90–1.03)	0.96 (0.91–1.01)	0.97 (0.91–1.03)	1.04 (0.89–1.19)
65+	0.74 (0.69–0.75)*	0.81 (0.78–0.85)*	0.83 (0.80–0.87)*	0.72 (0.64–0.82)*
Total	0.83 (0.80–0.87)*	0.87 (0.84–0.90)*	0.88 (0.85–0.91)*	0.82 (0.75–0.90)*
Age Group	**All**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
20–44	1.06 (0.91–1.22)	1.19 (1.06–1.33)*	0.95 (0.83–1.09)	1.03 (0.72–1.43)
45–64	0.97 (0.93–1.01)	1.08 (1.05–1.11)*	1.00 (0.97–1.03)	1.14 (1.05–1.23)*
65+	0.89 (0.87–0.92)*	1.00 (0.98–1.02)	0.96 (0.94–0.99)*	1.00 (0.94–1.05)
Total	0.92 (0.90–0.94)*	1.03 (1.01–1.04)*	0.98 (0.96–0.99)*	1.04 (0.99–1.08)

Reference group is CMA/CA = 1.00.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Discussion

Lung cancer is the leading cause of cancer death in Canada, accounting for 26% of cancer deaths in women and 30% of cancer deaths in men.[137] By far the most important risk factor for lung cancer is smoking: 90% of all lung cancers are estimated to be smoking-related, either through active smoking or through passive smoke exposure.[138] Other risk factors that have been linked to lung cancer, after the effects of smoking have been controlled for, include SES,[139] occupational exposure, air pollution,[140, 141] family history, dietary factors[142] and physical inactivity.[143]

Although no clear urban–rural differences were found for lung cancer mortality, the higher rates found in moderate MIZ and no MIZ areas among men aged 45 to 64 years of age were statistically significant. The incidence of lung cancer was also significantly higher among men of this age group living in the above-mentioned areas.

Historically, men have smoked more than women, but whereas smoking rates among men have been declining for several decades, the decline among women has only recently begun.[144, 145] This decline in women's smoking rates, though, does not encompass all age groups: the smoking rates of teenage girls were higher than those observed among teenage boys in 2003, and the same pattern was found in rural and northern teenage girls.[89, 146] Even though smoking rates are declining in the overall population, our analysis of the 2000–2001 CCHS showed that age-standardized smoking rates were higher among rural men and women.

Lung cancer has a long latency period; one study reported a 30-year population latency period based on ecologic data.[147] As a result, there has been little change at the national level in five-year relative survival ratios.[148] It has been noted that certain populations in Canada have higher rates of smoking than the general population.[144] Unless the smoking rates in these specific subpopulations change drastically in the near future, it can be hypothesized that stronger urban–rural differences will be observed.

Recently, environmental tobacco smoke and a non-smoker's right to clean air have become a major public health and political issue. In an effort to improve the air quality of non-smokers, five provinces/territories and at least 75 municipalities have enacted 100% smoke-free legislation and by-laws as of 2005.[149] As mentioned previously, it is unknown whether those interventions are successfully applied in rural areas, and their effectiveness needs to be evaluated within the rural context.

Colorectal Cancer

Incidence Rates

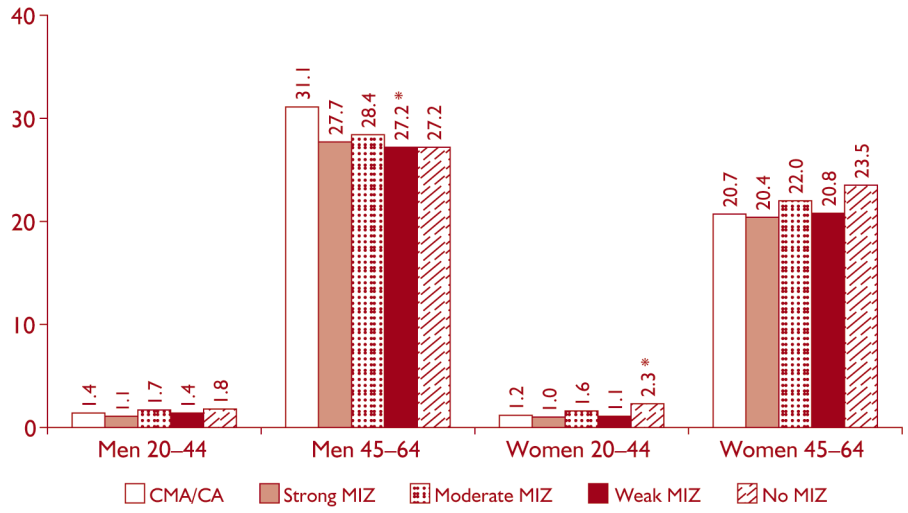
Colorectal cancer incidence rates in men living in Strong, Moderate and Weak MIZ areas were lower than those in urban areas (CMA/CA: 62.2 per 100,000; Strong MIZ: 57.6 per 100,000; Moderate MIZ: 60.0 per 100,000; Weak MIZ: 56.5 per 100,000) (Table 12). Women had lower overall incidence rates of colorectal cancer than men (Table 13). The incidence rates for women living in rural areas were generally similar to the rate for women living in urban areas.

Mortality Rates

There tended to be no significant difference in the rates of death due to colorectal cancer between rural and urban areas for both sexes (Figures 29 and 30). Exceptions to this observation among men include lower mortality rates for those aged 45 to 64 who were living in Weak MIZ areas and those aged 65 years and older who were living in Strong, Moderate and Weak MIZ areas compared to their urban counterparts. Exceptions among women included higher mortality rates for those aged 20 to 44 living in No MIZ areas and lower rates among those aged 65 years and older who were living in Weak MIZ areas. When the standardized mortality ratios are examined, the risks in rural areas are generally found to be significantly lower than or similar to those living in urban areas (Table 16).

Figure 29

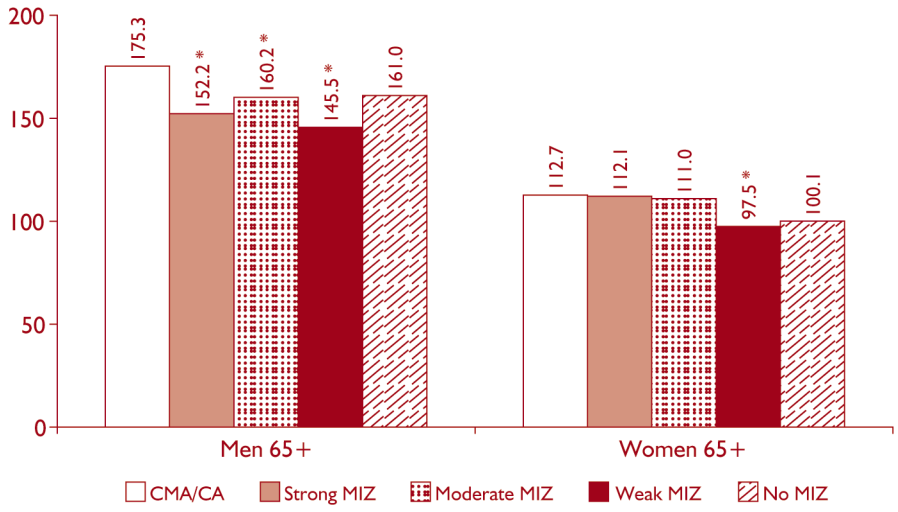
Age-Standardized Colorectal Cancer Mortality Rates (per 100,000) Among Men and Women Aged 20 to 64 Years, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 30

Age-Standardized Colorectal Cancer Mortality Rates (per 100,000) Among Men and Women Aged 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 16

Standardized Colorectal Cancer Mortality Ratios, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
20–44	0.83 (0.59–1.13)	1.27 (1.02–1.57)	1.01 (0.78–1.30)	1.28 (0.66–2.23)
45–64	0.89 (0.82–0.98)*	0.91 (0.85–0.98)	0.87 (0.81–0.95)*	0.87 (0.71–1.07)
65+	0.86 (0.82–0.91)*	0.91 (0.87–0.95)*	0.83 (0.79–0.87)*	0.92 (0.83–1.03)
Total	0.87 (0.83–0.91)*	0.92 (0.89–0.95)*	0.84 (0.81–0.88)*	0.92 (0.84–1.01)
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
20–44	0.83 (0.58–1.17)	1.28 (1.01–1.61)*	0.88 (0.64–1.17)	1.87 (1.02–3.13)*
45–64	0.99 (0.88–1.10)	1.06 (0.97–1.15)	1.00 (0.91–1.10)	1.12 (0.89–1.40)
65+	1.00 (0.94–1.06)	0.99 (0.95–1.03)	0.86 (0.82–0.91)*	0.87 (0.78–1.00)
Total	0.99 (0.94–1.04)	1.01 (0.97–1.04)	0.89 (0.85–0.93)*	0.95 (0.85–1.06)

(table continued on next page)

Table 16 (cont'd)

Age Group	All			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
20–44	0.83 (0.65–1.05)	1.28 (1.09–1.49)*	0.95 (0.78–1.15)	1.55 (1.01–2.27)*
45–64	0.94 (0.88–1.01)	0.98 (0.93–1.03)	0.93 (0.88–0.99)*	0.98 (0.84–1.14)
65+	0.95 (0.91–0.99)*	0.97 (0.94–0.99)*	0.87 (0.84–0.89)*	0.94 (0.87–1.02)
Total	0.94 (0.91–0.98)*	0.97 (0.95–1.00)	0.88 (0.86–0.91)*	0.96 (0.89–1.03)

Reference group is CMA/CA = 1.00.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Discussion

There were no clear differences in colorectal cancer incidence or mortality rates between rural and urban areas. Colorectal cancer is the second leading cause of cancer death in Canadian men and the third leading cause of cancer death in Canadian women.[137] It is the third most frequently diagnosed cancer in both men and women in Canada.[89, 137] Although nationwide increases in the age-standardized five-year survival ratios for colorectal cancers were observed across both sexes and all age groups,[148] it is expected that the absolute numbers of colorectal cancer incidence and mortality will increase as the population ages. Some risk factors that have been associated with this disease include age, diet and personal and family medical history.[150] The exact causes of colorectal cancer are not known, however, since most persons who develop this condition are asymptomatic and have no personal history of colorectal cancer, no adenomatous polyps, no family history of colorectal neoplasia, no inflammatory bowel disease and no unexplained anemia.[150]

As colorectal cancer is one of a number of slowly progressing cancers that affects a relatively large number of Canadians, much discussion has focused on the feasibility of a population-based screening program in Canada. Given lag times that have been estimated to be as long as 10 years from polyp to carcinoma,[151] this time period would allow screening programs to detect colorectal cancer at an early and curable stage. Evidence from randomized controlled trials has shown that colorectal screening can reduce the incidence of colorectal cancer and prevent colorectal–cancer-related deaths. The Canadian Task Force on the Periodic Health Examination position is that "there is good evidence to include annual or biennial fecal occult blood testing" and "fair evidence to include flexible sigmoidoscopy in the periodic health examination of asymptomatic people over 50 years of age."[152] For people at above-average risk, "there is fair evidence to include either genetic testing or flexible sigmoidoscopy in the periodic health examination of people in kindreds with familial adenomatous polyposis; there is fair evidence to include colonoscopy screening in the periodic health examination of patients in kindreds with hereditary non-polyposis colon cancer."[152] However, it has been shown

that rural residents are less likely to obtain preventive health care services.[153] Other studies have indicated that colorectal cancer screening can be cost-effective, though this modelling assumed a 67% screening adherence rate;[154] this is far higher than the approximately 40% adherence rate observed in other studies. Whether these guidelines would be applicable in a rural context is unknown.

The major barriers to colorectal cancer screening are twofold: patient-related barriers, including low test acceptance and compliance with a screening test that some may find embarrassing or unpleasant; and physician-related barriers, including physician practice routines and inadequate discussion of colorectal cancer screening with patients.[155, 156] Although there are guidelines that support colorectal cancer screening, studies report that about 40% of physicians do not routinely recommend colorectal screening to their patients.[155–158] Currently, neither access to nor availability of screening services seems to drive colorectal screening utilization,[155, 159] but access for rural populations could become important in the future if colonoscopy becomes more popular and rates of adherence to colorectal screening improve.[155]

Breast Cancer

This section discusses breast cancer incidence, the age-specific mortality rates and the self-reported use of mammography services.

Incidence Rates

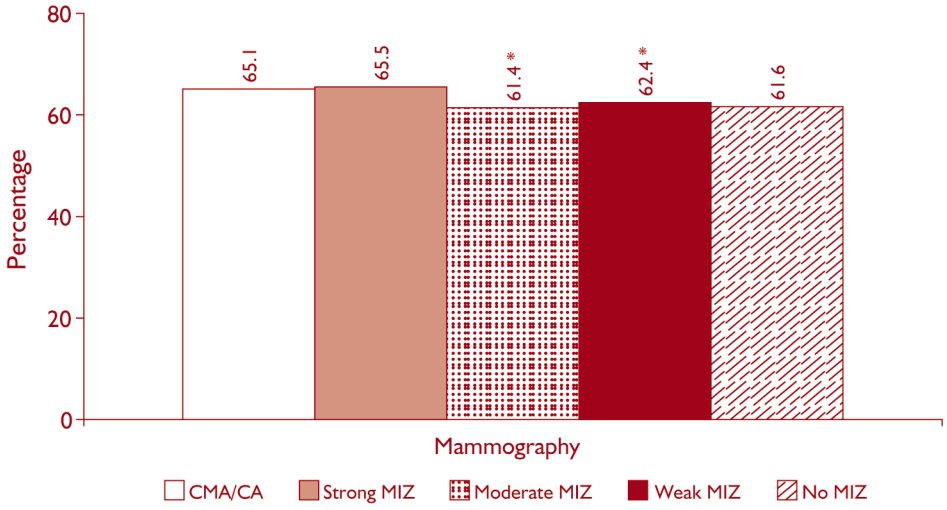
Breast cancer incidence rates were significantly lower in rural areas compared to urban areas (Table 13). Women living in Strong MIZ areas had the lowest incidence rates (Strong MIZ: 86.3 per 100,000).

Screening Practice

As part of the Canadian Community Health Survey 2000–2001, women aged 50 to 69 years old were asked whether they had a mammography exam in the past two years. Women living in Moderate MIZ (61.4%) and Weak MIZ (62.4%) areas were significantly less likely to have had a mammography compared to their urban counterparts (Figure 31).

Figure 31

Age-Standardized Proportion of Mammography Examination Among Women Aged 50 to 69 Years of Age, by Place of Residence, Canada, 2000–2001



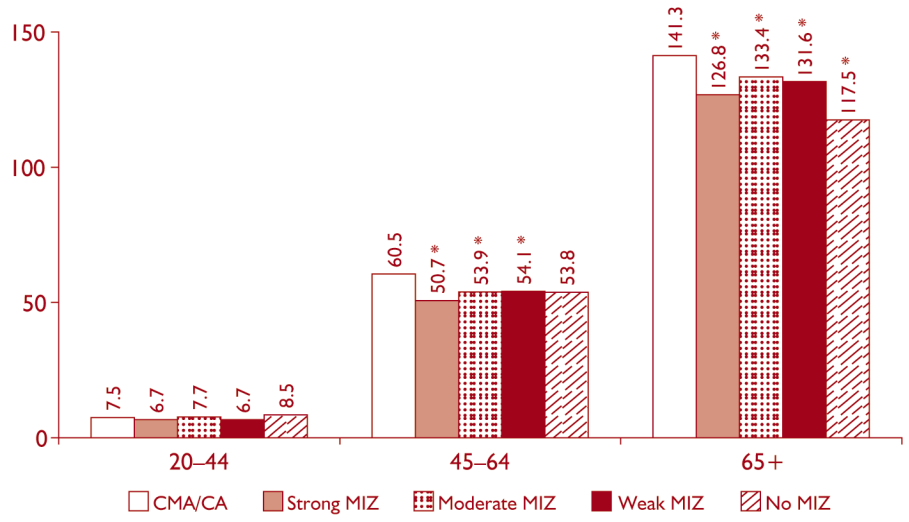
Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Mortality Rates

Rural women had significantly lower mortality rates due to breast cancer at 45 to 64 and 65 years and older, compared with urban women in the same age groupings (Figure 32). There was no statistical difference in breast cancer mortality rates in the 20-to-44 age group. Although the differences were not always statistically significant, standardized mortality ratios were lower in all rural areas, and the same pattern was found for all age groups (Table 17).

Figure 32

Age-Standardized Breast Cancer Mortality Rates (per 100,000) Among Women Aged 20 to 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 17

Standardized Breast Cancer Mortality Ratios, by Age and Place of Residence, Canada, 1986 to 1996

Age Group	Women			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
20–44	0.89 (0.78–1.02)	1.02 (0.92–1.14)	0.90 (0.80–1.01)	1.14 (0.85–1.49)
45–64	0.84 (0.78–0.90)*	0.89 (0.84–0.94)*	0.89 (0.84–0.95)*	0.89 (0.76–1.03)
65+	0.90 (0.85–0.95)*	0.95 (0.91–0.98)*	0.93 (0.89–0.97)*	0.83 (0.74–0.93)*
Total	0.49 (0.25–0.88)*	0.92 (0.65–1.26)	0.95 (0.65–1.34)	0.54 (0.11–1.53)

Reference group is CMA/CA = 1.0.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Discussion

Breast cancer is the second leading cause of cancer death and the most commonly diagnosed cancer in women in Canada.[137] Risk factors include age, country of birth, hormonal factors (affected by age at menarche, age at menopause, age at the first full-term pregnancy and nulliparity), long-term use of hormone replacement therapy, obesity, radiation, family and genetic risks, diet and alcohol, physical activity and smoking.[160–164]

Our study showed that breast cancer mortality, as well as incidence, was lower among rural women compared to their urban counterparts. Although rural areas have higher obesity and smoking rates, lower physical activity and poor dietary factors, which would tend to increase the risk of breast cancer, other factors associated with breast cancer may have a protective effect on rural populations. For example, rural populations have higher teen pregnancy rates and lower age at first birth, generally associated with a lower breast cancer risk.[164] Data on age at menarche and menopause are not regularly collected in Canada. Although the impacts of these risk factors are relatively weak compared with the risk of increasing age or smoking, rural populations may be achieving a small amount of protection against breast cancer.

An alternative explanation to consider is that the lower rural breast cancer mortality and incidence rates are related to access to screening and treatment. Several studies have reported lower mammography rates in rural areas compared with urban areas,[165] and this is supported by our analysis of mammography use.

The National Strategy and Action Plan: Rural, Remote and Northern Women and Men with Breast Cancer, developed by the Canadian Breast Cancer Network, indicated that rural, remote and northern women living in remote areas of Canada were less likely to receive screening mammograms, were given a diagnosis at a more advanced stage, had a worse five-year survival rate than urban women, received surgery that was more aggressive in nature and had fewer treatment options because of the need to travel for radiotherapy.[166] A qualitative study identified such themes as increased financial burden, dealing with social isolation, difficulties in accessing high-quality information and health services and increased travel for treatment for rural women with breast cancer, all of which act as barriers against breast cancer screening and treatment.[166, 167]

The Canadian Task Force on the Periodic Health Examination position is that "there is good evidence for screening women aged 50–69 years by clinical examination and mammography, every 1 to 2 years."[168] However, it was also concluded that there is insufficient evidence to recommend the inclusion or exclusion of screening mammography from the periodic health examination of women aged 40 to 49 at average risk of breast cancer.[169] It is difficult to assess whether rural physicians are less likely to comply with these guidelines, but this issue, as well as the identified barriers to breast cancer screening, require further investigation.

Cervical Cancer

Incidence Rates

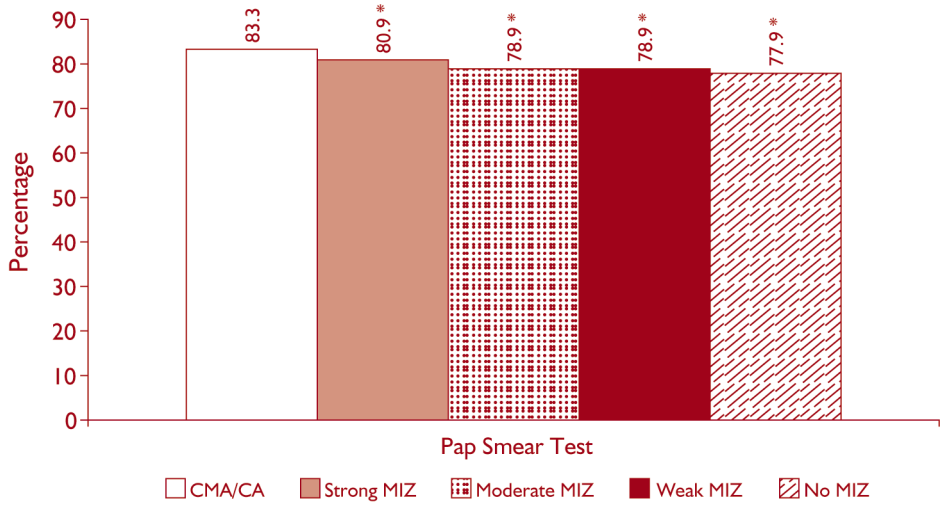
Cervical cancer incidence rates were significantly higher in the two most rural MIZ categories (Weak and No MIZ) compared to urban areas (Table 13). The incidence rates for these two categories were 11.3 per 100,000 and 13.1 per 100,000, respectively, compared with 9.6 per 100,000 in CMA/CA areas. Strong MIZ areas had a significantly lower incidence rate compared to CMA/CA and the other rural MIZ categories.

Screening Practice

As part of the Canadian Community Health Survey 2000–2001, women aged 18 to 69 years old were asked whether they had a Pap (Papanicolaou) test in the past three years. Smaller proportions of rural women reported having had a Pap test in the previous three years (CMA/CA: 83.3%; No MIZ: 77.9%) compared with urban women (Figure 33).

Figure 33

Age-Standardized Proportion of Pap Testing Among Women Aged 18 to 69 Years of Age, by Place of Residence, Canada, 2000–2001



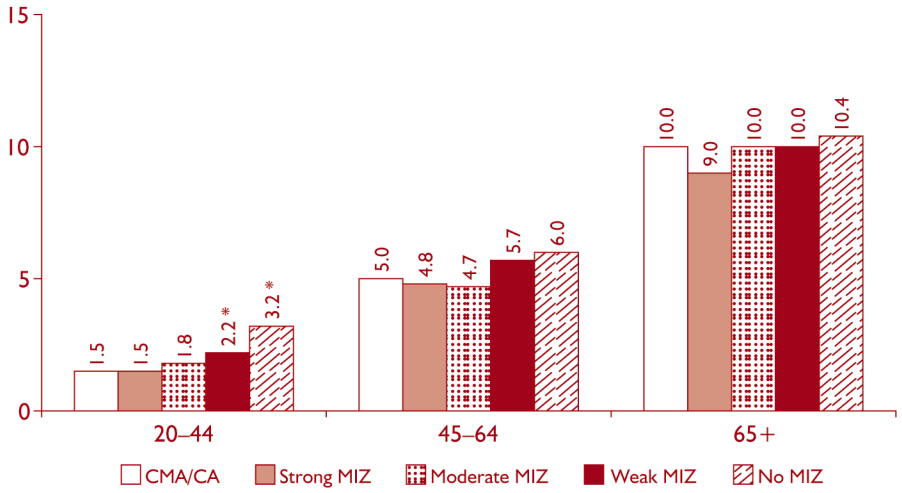
Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Mortality Rates

Consistent with the incidence rates, women aged 20 to 44 living in Weak and No MIZ areas had significantly higher mortality rates due to cervical cancer than urban Canadian women in the same age group (Figure 34). There was no statistical difference in cervical cancer mortality rates between women living in other MIZ categories and their urban counterparts or in women aged 45 years and over. Women aged 20 to 44 living in Weak and No MIZ areas had risks 1.50 and 2.16 times higher than urban women of the same age (Table 18).

Figure 34

Age-Standardized Cervical Cancer Mortality Rates (per 100,000) Among Women Aged 20 to 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at p <0.05.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 18

Standardized Cervical Cancer Mortality Ratios, by Age and Place of Residence, Canada, 1986 to 1996

Age Group	Women			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
20–44	0.98 (0.72–1.31)	1.18 (0.94–1.46)	1.50 (1.21–1.83)*	2.16 (1.32–3.33)*
45–64	0.95 (0.75–1.19)	0.93 (0.77–1.11)	1.14 (0.95–1.36)	1.17 (0.71–1.83)
65+	0.90 (0.72–1.11)	1.00 (0.87–1.15)	0.99 (0.84–1.16)	1.02 (0.67–1.51)
Total	0.93 (0.81–1.07)	1.01 (0.91–1.11)	1.14 (1.02–1.26)*	1.28 (0.99–1.64)

Reference group is CMA/CA = 1.0
* Statistically significant at p <0.05.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Discussion

Cervical cancer mortality rates were significantly elevated among rural women living in Weak and No MIZ areas, in women aged 20 to 44 years. Similarly, the incidence of cervical cancer was significantly higher among women (All Ages) and among those aged 20 to 44 living in Weak and No MIZ areas (data not shown).The results from our analysis of the CCHS demonstrated that lower proportions of rural women had had a Pap test in the past three years. It is possible that a potential lack of availability and access to Pap tests in rural and remote areas result in greater mortality from cervical cancer if the disease is consequently diagnosed at a later stage.

Cervical cancer is relatively uncommon in Canada, accounting for 1.9% of new cases of cancer and 1.3% of deaths due to cancer in women in 2004.[137] Several risk factors associated with cervical cancer have been identified, including human papillomavirus (HPV), tobacco smoking and a high number of live births.[170] Over the past several decades, there has been a decline in age-standardized cervical cancer incidence and mortality rates in Canada, usually attributed to the increased availability of Pap test screening programs and a decline in fertility rates.[170] Cervical cancer is one of a number of cancers that can be detected early, with the help of screening tests that have high sensitivity and specificity, and treated effectively. It is suggested that almost all cervical cancer mortality is preventable through regular screening, since the five-year survival rate with early detection is over 90%, and only 10% if cervical cancer is detected when symptoms become apparent.[171] In recent years, an increasing trend marked the resurgence of cervical cancer. This increased incidence may be driven by increased cancer detection through the use of new diagnostic techniques,[170] the increase in adenocarcinomas and adenosquamous carcinomas (forms of cervical cancer that are not detectable by Pap testing)[170] and an increase in HPV prevalence.[172]

The Pap test is the only test for cervical cancer that is suitable for general population screening.[171] Epidemiologic evidence has demonstrated that regular screening for cervical cancer with Pap tests has decreased the mortality rate among women who are sexually active or are 18 years of age or older. The Canadian Task Force (CTF) recommends that "there is fair evidence to include Pap [test] screening in the periodic health examination of sexually active women."[171] Although the case for general screening of the population with Pap tests has become routine, there is less evidence on which to base recommendations for the optimum frequency of screening. Canadian Task Force guidelines recommend annual screening following initiation of sexual activity or age 18; after two normal Pap tests, screening every three years is suggested to age 69.[171]

Barriers to being screened for cervical cancer include patient discomfort in receiving a Pap test from a male physician, not having a regular doctor, cultural beliefs and attitudes toward the test itself.[173] Significant predictors of the under-use of Pap screening include older age, lower education, lower income, non-English language barriers, ethnic background, single marital status and poor preventive health behaviours.[165, 174] These barriers are likely to be present in both urban and rural settings, although they may be reinforced in rural areas by the distances to travel to a health care clinic.[236]

Prostate Cancer

Incidence Rates

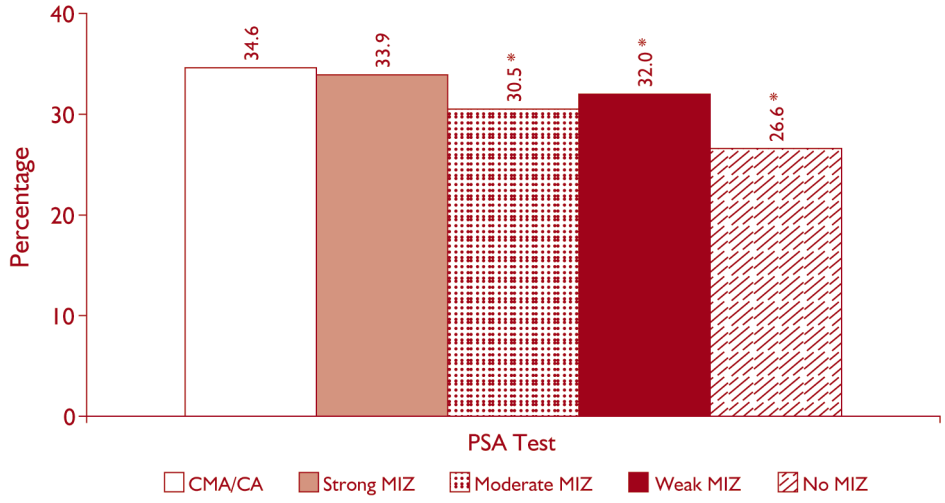
Prostate cancer incidence rates were lower in rural areas compared to urban areas (Table 13). Men living in Strong MIZ areas had the lowest incidence rate (Strong MIZ: 99.5 per 100,000).

Screening Practices

As part of the Canadian Community Health Survey 2000–2001, men aged 40 years and over were asked whether they had prostate-specific antigen (PSA) testing in the past 2 years. Men living in the more rural areas of Canada (Moderate MIZ: 30.5%; Weak MIZ: 32.0%; No MIZ: 26.6%) were less likely to have had a PSA test than men living in urban areas (Figure 35).

Figure 35

Age-Standardized Proportion of Prostate-Specific Antigen (PSA) Testing Among Men 40 Years of Age and Older, by Place of Residence, Canada, 2000–2001



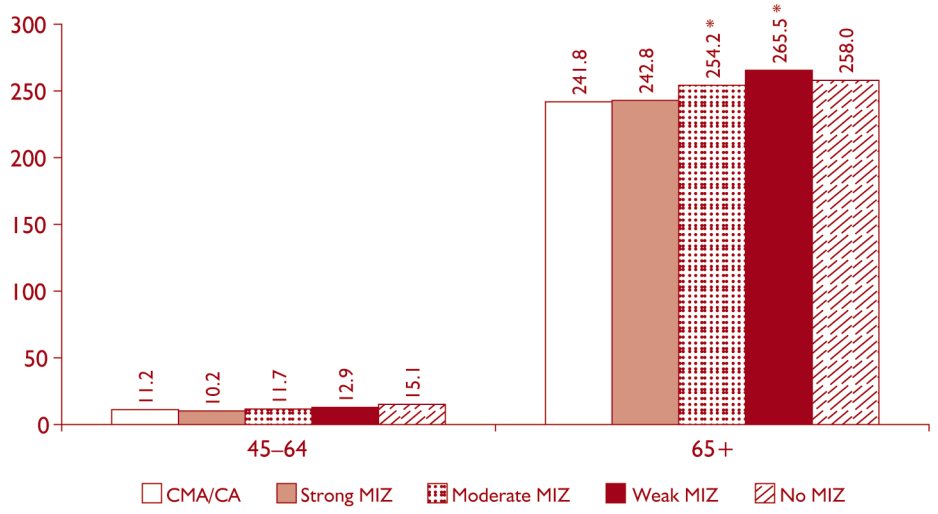
Reference group is CMA/CA.
* Statistically significant at $p < 0.05$
Data Source: Canadian Community Health Survey 2000-2001, Statistics Canada.

Mortality Rates

Men aged 65 years and over living in Moderate and Weak MIZ areas had significantly higher mortality rates due to prostate cancer compared to their urban counterparts (Figure 36). There was no statistical difference in prostate cancer mortality rates between men living in other MIZ categories and their urban counterparts or in men aged 45 to 64 years. The risk of dying from prostate cancer (SMR) was elevated among men aged 45 to 64 years living in Weak and No MIZ areas, with a risk of 16% and 36% higher compared with men living in CMA/CA (Table 19). Older rural men were also at increased risk, having a 5% and 10% increased risk in Moderate and Weak MIZ areas, respectively.

Figure 36

Age-Standardized Prostate Cancer Mortality Rates (per 100,000) Among Men Aged 45 to 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 19

Standardized Prostate Cancer Mortality Ratios, by Age and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
45–64	0.92 (0.79–1.06)	1.04 (0.93–1.16)	1.16 (1.03–1.30)	1.36 (1.02–1.76)
65+	0.99 (0.95–1.04)	1.05 (1.01–1.08)*	1.10 (1.06–1.13)*	1.07 (0.98–1.16)
Total	0.98 (0.94–1.03)	1.05 (1.02–1.08)*	1.10 (1.07–1.14)*	1.09 (1.01–1.18)*

Reference group is CMA/CA = 1.0.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Discussion

In our study, prostate cancer mortality was found to be slightly higher in most rural categories among men aged 65 years and over (Strong MIZ was the exception), but statistical significance was achieved for Moderate and Weak MIZ areas only. In contrast, when the incidence of prostate cancer was examined, the trend observed was reversed with significantly lower prostate cancer incidence rates found in Strong, Moderate and Weak MIZ areas. Data from U.S. studies have shown that African origin is a significant risk factor for prostate cancer; African-American men have a higher incidence rate and subsequent higher rate of mortality due to prostate cancer than white Americans in the same age group.[175] Part of the overall lower incidence rates of prostate cancer in Strong, Moderate and Weak MIZ areas could be attributed to a less diverse ethnic composition in rural Canada.

According to 2004 estimates from the National Cancer Institute of Canada, prostate cancer is the third leading cause of cancer death and the most commonly diagnosed cancer in men in Canada.[137] This is partially due to the introduction of the prostate-specific antigen (PSA) test used to routinely screen men for prostate cancer since the late 1980s.[175] It is a cancer that tends to develop slowly and results in cases of prostate cancer in men who do not die from the disease. The three main known risk factors for prostate cancer are age, family history and African ancestry—though dietary factors, occupational exposure (including pesticide use) and hormonal factors are currently under study as potential risk factors for prostate cancer.[175, 176]

Evidence for PSA testing remains to be established,[176, 177] although it is hoped that randomized controlled trials in the U.S. and Europe will provide some answers to whether screening for prostate cancer reduces death from that disease.[178, 179] In the meantime, the position of the Canadian Task Force on the Periodic Health Examination is that "there is insufficient evidence to include PSA screening in the periodic health examination of men over 50 years of age."[180] "Exclusion is recommended on the basis of low positive predictive value and the known risk of adverse effects associated with therapies of unproven effectiveness." In the absence of using the PSA test as a population-based screening tool, many professional bodies suggest "informed choice" screening, in which patients and physicians have an in-depth discussion of the PSA test and its implications to determine whether it will benefit them individually.[177, 181–183] For cases in which the PSA test may be beneficial, the probability of the man receiving a PSA test and the management of his prostate cancer could depend on where he lives. CCHS data show that lower proportions of men living in rural areas received PSA testing than their urban counterparts, and this may contribute to higher mortality due to prostate cancer in rural areas. Other possibilities are related to differences in management, perhaps associated with access to urologists.[237, 238]

4.4.3 Respiratory Disease

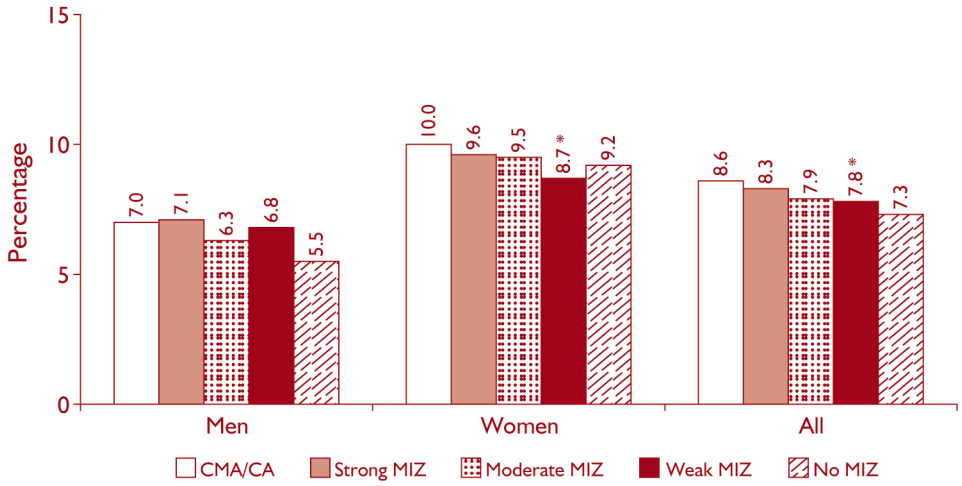
This section discusses prevalence of asthma as well as mortality due to the broad category of respiratory diseases (ICD-9, Chapter 8, codes 460 to 519).

Asthma

The Canadian Community Health Survey collected data on the self-reported prevalence of asthma. Of the eight chronic conditions that are included in this report, asthma was the only chronic condition whose prevalence appeared to decrease along the urban–rural continuum (Figure 37). For the most part, though, these differences were not statistically significant, with only women living in Weak MIZ areas reporting a prevalence of asthma significantly lower than their urban counterparts.

Figure 37

Age-Standardized Prevalence of Asthma, by Sex and Place of Residence, for People 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

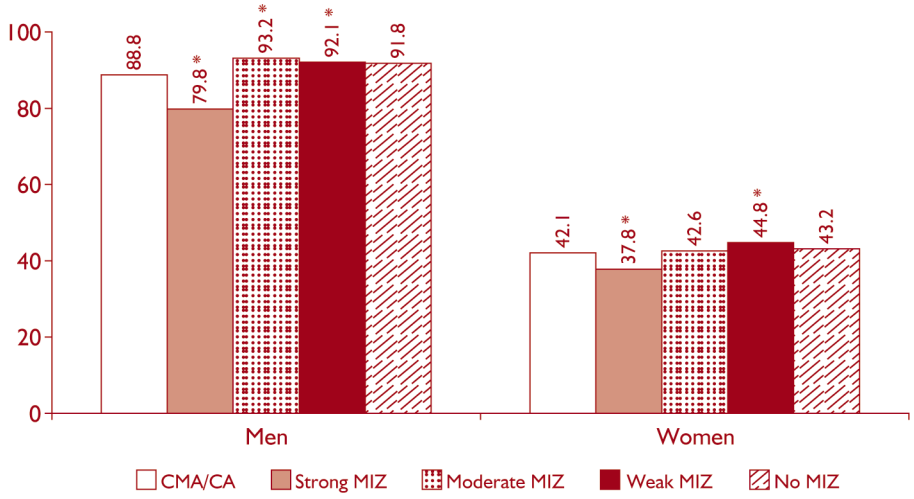
Mortality Rates

The overall mortality rates from respiratory diseases were higher in men compared to women (Figure 38). They tended to increase with increasing rurality for both men and women. Among men aged 45 years and over, the rates were significantly lower in Strong MIZ areas (Figures 39 and 40). Men aged 65 years and over living in Moderate MIZ had significantly higher death rates than those living in urban areas (Figure 40). A similar pattern was found for women, the rates being statistically lower in Strong MIZ among those aged 65 years and over. The rates were higher in the most remote areas (Weak and No MIZ) among women aged 45 to 64.

In terms of mortality risk, it was respectively 1.42 and 1.54 times higher among men and women aged 45 to 64 years living in No MIZ areas compared with those living in urban areas (Table 20). Although based on a small number of deaths, the risk of dying from a respiratory disease was significantly higher among rural children aged 0 to 4 years (SMR ranged from 1.42 in Moderate MIZ to 3.60 in No MIZ areas). No significant difference was found in children aged 5 to 19 years.

Figure 38

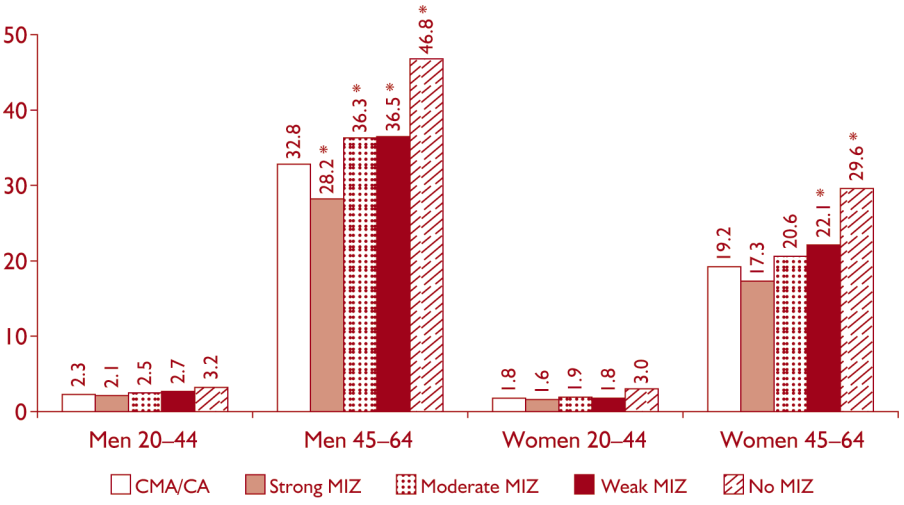
Age-Standardized All-Cause Respiratory Disease Mortality Rates (per 100,000) Among Men and Women (All Ages), by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at p <0.05.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 39

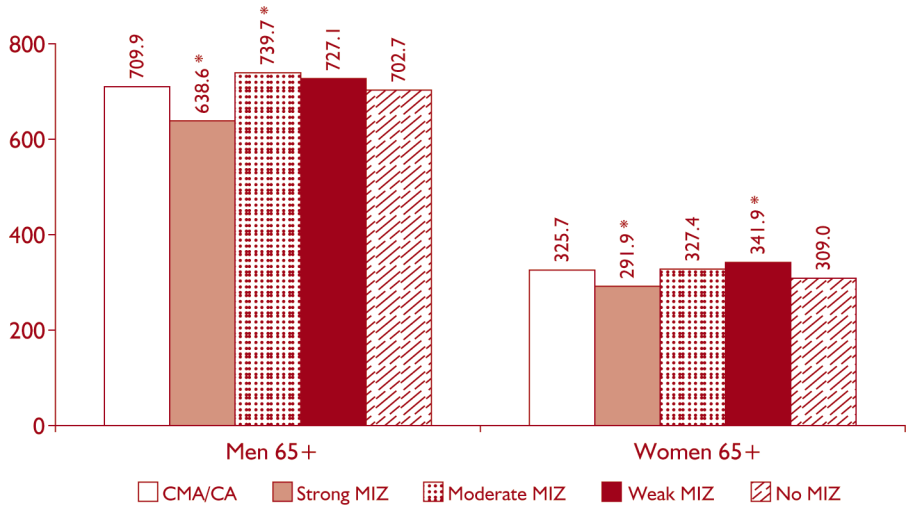
Age-Standardized Respiratory Disease Mortality Rates (per 100,000) Among Men and Women Aged 20 to 64 Years, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at p <0.05.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 40

Age-Standardized Respiratory Disease Mortality Rates (per 100,000) Among Men and Women Aged 65 Years and Over, by Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at p <0.05.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 20

Standardized Respiratory Disease Mortality Ratios, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	s	s	s	s
5–19	s	s	s	s
20–44	0.88 (0.68–1.11)	1.10 (0.92–1.31)	1.14 (0.95–1.36)	1.40 (0.89–2.10)
45–64	0.86 (0.78–0.94)*	1.10 (1.04–1.17)*	1.11 (1.04–1.19)*	1.42 (1.22–1.66)*
65+	0.89 (0.87–0.92)*	1.04 (1.02–1.06)*	1.02 (1.00–1.05)	1.00 (0.95–1.05)
Total	0.89 (0.87–0.92)*	1.05 (1.03–1.07)*	1.04 (1.02–1.06)*	1.04 (0.99–1.09)
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	s	s	s	s
5–19	s	s	s	s
20–44	0.85 (0.63–1.13)	1.05 (0.84–1.30)	1.00 (0.79–1.25)	1.65 (1.00–2.57)
45–64	0.90 (0.80–1.01)	1.07 (0.98–1.16)	1.15 (1.05–1.26)*	1.54 (1.26–1.88)*
65+	0.90 (0.86–0.93)*	1.01 (0.99–1.04)	1.05 (1.03–1.08)*	0.94 (0.88–1.01)
Total	0.90 (0.87–0.93)*	1.02 (0.99–1.04)	1.07 (1.04–1.09)*	1.01 (0.95–1.08)

(table continued on next page)

Table 20 (cont'd)

Age Group	All			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	1.28 (0.96–1.68)	1.42 (1.13–1.75)*	2.48 (2.11–2.91)*	3.60 (2.63–4.82)*
5–19	1.02 (0.70–1.44)	1.08 (0.81–1.41)	1.22 (0.92–1.58)	0.93 (0.40–1.82)
20–44	0.87 (0.72–1.04)	1.08 (0.94–1.24)	1.09 (0.94–1.25)	1.51 (1.09–2.04)*
45–64	0.89 (0.83–0.95)*	1.10 (1.05–1.16)*	1.14 (1.08–1.20)*	1.49 (1.32–1.68)*
65+	0.94 (0.92–0.97)*	1.08 (1.06–1.09)*	1.09 (1.07–1.11)*	1.05 (1.01–1.10)*
Total	0.94 (0.92–0.96)*	1.08 (1.07–1.10)*	1.10 (1.08–1.12)*	1.10 (1.06–1.15)*

Reference group is CMA/CA = 1.0.
* Statistically significant at $p < 0.05$.
s Data suppressed.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Discussion

Respiratory disease mortality risks were mostly significantly higher among rural residents, particularly among those aged 45 years and over and young children. Residents of Strong MIZ areas, however, had a reduced risk of dying from respiratory conditions compared with those living in metropolitan cities. As well, rural residents had an increased risk of dying from these conditions prematurely (that is, before the age of 65).

Although diseases of the respiratory system include a wide range of diseases, the top causes of mortality in this grouping are influenza, pneumonia and chronic obstructive pulmonary disease (COPD).[184] Deaths due to influenza and pneumonia are the sixth most common cause of death overall in Canada, and these deaths are sharply higher for older individuals. COPD is actually a mix of chronic respiratory diseases that are characterized by progressive airflow limitation with symptoms of shortness of breath, cough and sputum production.[185, 186] The two most common underlying processes that contribute to COPD are chronic bronchitis and emphysema. This condition usually progresses slowly over a period of years. Airflow limitation is minimally reversible with bronchodilators. Other respiratory diseases such as asthma and cystic fibrosis are also of concern to the health of Canadians, but the number of deaths is much smaller because of lower case fatality or prevalence rates.

Understanding the risk factors that contribute to influenza, pneumonia and COPD may help to explain some of the differences observed in overall respiratory disease mortality between urban and rural areas. Specific subgroups of the population, such as individuals at extremes of age, those with chronic cardio-respiratory disease or immunosuppression and some specific populations, such as Aboriginal Peoples, are at higher risk of severe lower respiratory tract infections that could lead to death.[184] Other factors, such as smoking and occupational exposure to dusts and some types of fumes, increase the risk of COPD.[184] The higher smoking rates, as well as the higher proportions of people who are exposed to second-hand smoke in rural areas, could contribute to the differences in mortality risk between rural and urban residents. Projections of COPD deaths in women show increased rates compared with men and could reflect the greater decrease in smoking prevalence among men than among women over the past 30 years.[187]

Many rural industries are based on manufacturing or are resource-based.[188] Occupational exposure to dusts and fumes produced in these industries may play an important part in respiratory disease mortality in rural areas. For example, respiratory disease is a well-recognized occupational problem among agricultural workers. Routinely collected statistics in Europe suggest that farmers have higher morbidity and mortality from certain respiratory diseases than the general population and other occupational groups.[189] Despite a lower prevalence of smoking, it has been shown that farmers have a greater exposure to grain dust, which has been associated with increased rates of COPD.[190] Other occupational groups, such as miners, may also be at greater risk of COPD. Occupational exposures and their link to respiratory disease mortality in rural areas were not examined as part of this study, but require further research attention.

Although other respiratory diseases, such as asthma, may contribute only slightly to respiratory disease mortality, treatment of acute or severe episodes of asthma that require immediate medical attention may be compromised in the most remote areas, where health services can be accessed only after travelling great distances.[191,192] Patient-related factors, such as denial and non-compliance with asthma management plans, and physician factors, such as inadequate assessment of asthma severity, continue to contribute to deaths from asthma.[184] Our analysis of the CCHS did not show any significant differences between CMA/CA and rural areas in the prevalence of asthma. However, it was not possible to examine the prevalence by place of residence and occupation because of the small number of observations in some rural categories. It is possible that an agricultural occupation could be associated with higher rates of asthma.[189]

Finally, it is important to note that respiratory disease mortality in general, and rates of death due to COPD in particular, may be underestimated. The actual cause of death of many decedents with COPD is attributed to other causes, such as congestive heart failure, rather than the underlying cause of COPD.[185–187]

4.4.4 Diabetes

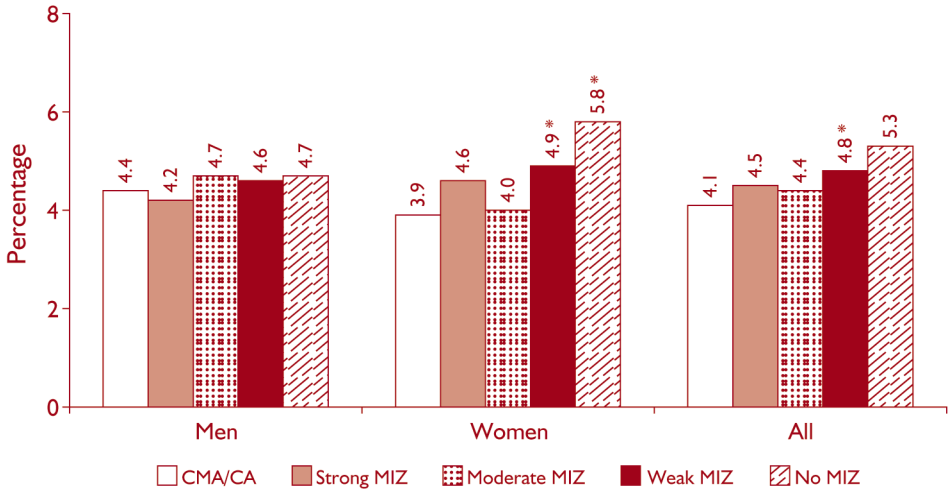
This section discusses prevalence and mortality due to diabetes (ICD-9, Chapter III, code 250).

Prevalence of Diabetes

Diabetes prevalence was similar in men living in urban and rural areas (CMA/CA: 4.4%). Women living in Weak and No MIZ areas had significantly higher prevalence rates compared to urban women (CMA/CA: 3.9%; Weak MIZ: 4.9%; No MIZ: 5.8%) (Figure 41).

Figure 41

Age-Standardized Prevalence of Diabetes, by Sex and Place of Residence, People 12 Years of Age and Over, Canada, 2000–2001



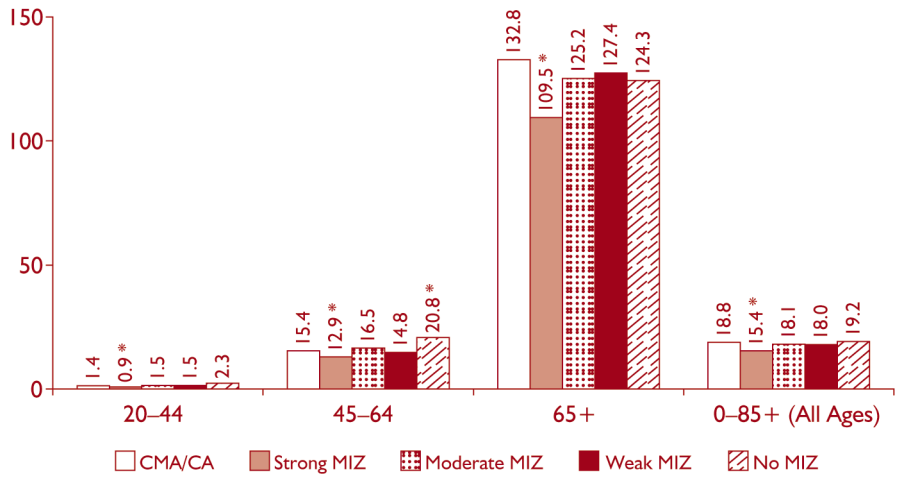
Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Mortality Rates

Although there are some statistical differences between urban and rural rates in the 20-to-44 and 45-to-64 age groups, their mortality rates from diabetes are relatively low. No clear pattern emerged in men, as the rates were quite similar between urban and rural areas (Figure 42). Men living in Strong MIZ areas had a significantly lower rate of diabetes mortality compared with men living in CMAs/CAs in all age groups examined. Men aged 45 to 64 years living in No MIZ areas had mortality rates from diabetes that were higher than those of their urban counterparts. Sex differences in the mortality rates due to diabetes are apparent according to place of residence. Rates among women aged 45 years and older increased with increasing rurality and were significantly higher in Moderate, Weak and No MIZ areas compared to urban areas (Figure 43).

Figure 42

Age-Standardized Mortality Rates From Diabetes (per 100,000) Among Men, by Age Group and Place of Residence, Canada, 1986 to 1996

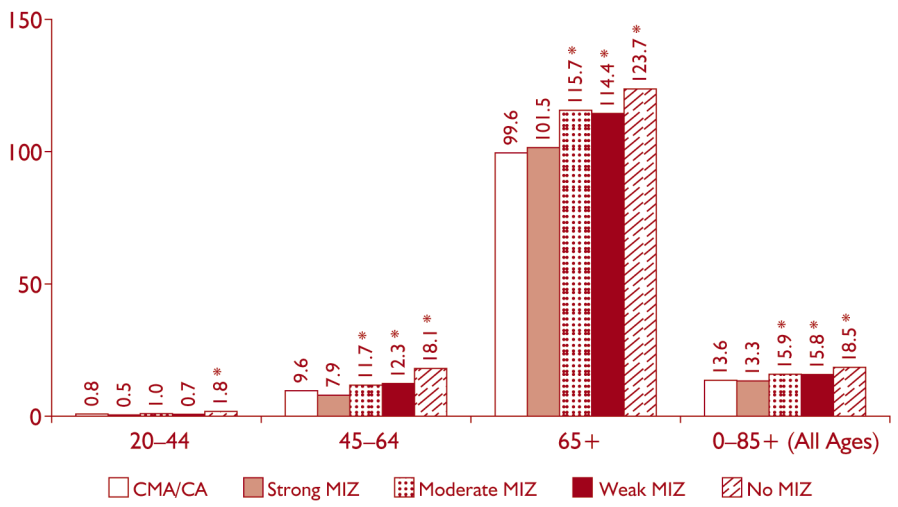


Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Mortality risks were not significantly elevated in rural men compared to their urban counterparts (Table 21). In women, the SMRs were significantly higher in those aged 45 years and over living in areas other than Strong MIZ areas, with risks being 15% to 88% higher than urban areas. As well, women aged 20 to 44 years living in No MIZ areas had 2.24 times the risk of dying from diabetes compared to urban women in the same age group.

Figure 43

Age-Standardized Mortality Rates From Diabetes (per 100,000) Among Women, by Age Group and Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 21

Standardized Mortality Ratios for Diabetes, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
20–44	0.62 (0.42–0.89)*	1.02 (0.80–1.29)	1.04 (0.81–1.32)	1.63 (0.93–2.65)
45–64	0.83 (0.73–0.95)*	1.07 (0.97–1.17)	0.96 (0.86–1.07)	1.34 (1.05–1.68)*
65+	0.82 (0.76–0.87)*	0.93 (0.89–0.97)*	0.96 (0.91–1.00)	0.93 (0.83–1.05)
Total	0.81 (0.76–0.86)*	0.96 (0.92–1.00)	0.96 (0.92–1.00)	1.02 (0.91–1.13)
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
20–44	0.60 (0.34–0.99)*	1.27 (0.93–1.69)	0.92 (0.63–1.31)	2.24 (1.12–4.02)*
45–64	0.83 (0.69–0.98)*	1.22 (1.09–1.36)*	1.28 (1.13–1.44)*	1.88 (1.44–2.42)*
65+	1.02 (0.96–1.08)	1.16 (1.11–1.21)*	1.15 (1.09–1.20)*	1.23 (1.10–1.37)*
Total	0.98 (0.93–1.04)	1.17 (1.12–1.21)*	1.16 (1.11–1.21)*	1.32 (1.20–1.46)*

(table continued on next page)

Table 21 (cont'd)

Age Group	All			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
20–44	0.62 (0.42–0.89)*	1.12 (0.92–1.34)	1.01 (0.82–1.23)	1.87 (1.23–2.72)*
45–64	0.84 (0.75–0.93)*	1.13 (1.05–1.21)*	1.09 (1.00–1.18)	1.56 (1.31–1.85)*
65+	0.93 (0.89–0.98)*	1.06 (1.03–1.10)*	1.07 (1.03–1.10)*	1.10 (1.01–1.19)*
Total	0.91 (0.87–0.95)*	1.07 (1.05–1.10)*	1.07 (1.04–1.10)*	1.18 (1.10–1.27)*

Reference group is CMA/CA = 1.00.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Discussion

Diabetes mellitus is an important cause of death, illness and disability in Canada. It affects approximately 5% of adults, which equates to over 1 million Canadians.[193, 194] Having diabetes substantially increases one's risk of developing blindness and end-stage renal disease; having lower limb amputations; and dying from coronary artery disease, stroke or peripheral vascular disease.[195, 196] In our study, rural residents reported a higher prevalence of diabetes, though the differences between urban areas and rural areas were only statistically significant in Weak and No MIZ areas. This was reflected in the mortality rates, which were significantly higher in No MIZ areas among people aged 20 to 64 years and in Moderate, Weak and no MIZ areas among women aged 65 years and over. There is a possibility that these results underestimate the true diabetes prevalence or mortality rates. In a Canadian study looking at the prevalence of undiagnosed diabetes and glucose intolerance, significantly greater proportions were found in rural than urban areas.[197] Higher obesity rates could contribute to the higher mortality and prevalence of diabetes in the most rural areas of Canada.[196, 239, 240]

The prevalence rate of diabetes among the First Nations people in Canada is at least twice that among the general population.[195, 198] Aboriginal People have been identified as deserving special attention in terms of screening and more aggressive management of high blood pressure, as well as blood glucose and cholesterol levels.[193] Type 2 diabetes is of particular concern to Aboriginal People because of the earlier onset and higher rates of complications, comorbidities and diabetes-related death seen in this population.[196] It was not possible to look at the prevalence of diabetes or mortality by ethnicity as part of this study, and therefore the contribution of the Aboriginal population living either on- or off-reserve to these differences is unknown. However, a study of diabetes prevalence in a remote community of British Columbia reported an increased prevalence of diabetes in the Aboriginal population compared with the non-Aboriginal residents of the community.[196]

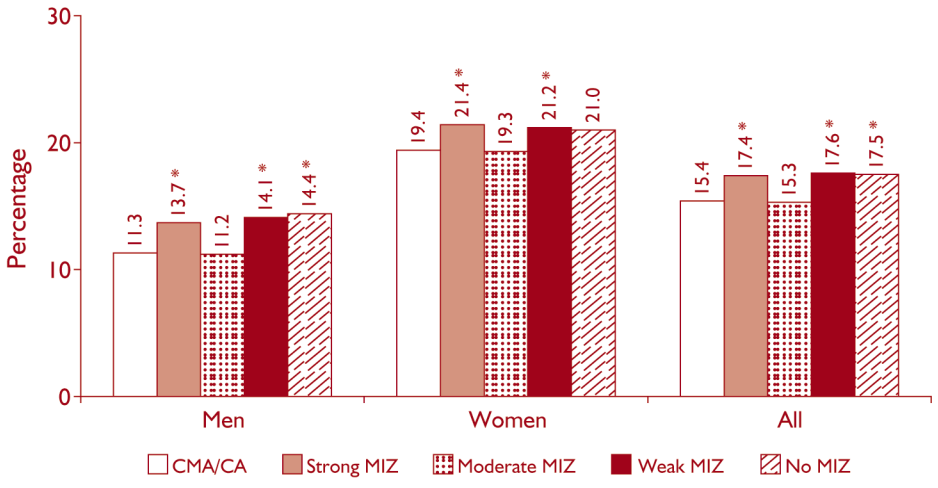
The Canadian Diabetes Association (CDA) recommended in its last clinical practice guideline that screening every three years for the presence of diabetes should be performed in individuals over the age of 40 and more frequently in other individuals at increased risk.[193] The CDA's previous recommendations on routine screening for diabetes had created controversy in the scientific community, some supporting the recommendations and other arguing that there is no evidence that such screening would decrease morbidity or mortality.[197] However, the higher prevalence of undiagnosed diabetes in rural areas found by Letter et al. (2001)[197] supports the CDA's recommendation to screen high-risk individuals. In addition, it was reported that after accounting for variation in physician service use, diabetic individuals living in rural areas or Aboriginal communities were nearly twice as likely to have an acute complication, and those living in remote areas were nearly three times as likely to experience such an event.[199] In this context, the CDA's guidelines could have particularly important clinical and public health implications for rural areas.

4.4.5 Arthritis/Rheumatism

Canadians living in rural areas reported a significantly higher prevalence of arthritis/rheumatism compared to their urban counterparts (CMA/CA: 15.4%; No MIZ: 17.5%) (Figure 44). An exception to this observation for both men and women is that the prevalence reported by Canadians living in Moderate MIZ areas (men: 11.2%; women: 19.3%) was not significantly different from the prevalence reported by Canadians living in CMA/CA areas (men: 11.3%; women: 19.4%). The prevalence of arthritis was higher among rural women than rural men.

Figure 44

Age-Standardized Prevalence of Arthritis/Rheumatism, by Place of Residence and Sex, 12 Years of Age and Over, Canada, 2000–2001



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Discussion

According to a report published by Health Canada, arthritis/rheumatism is among the top three most prevalent chronic conditions in Canadian men and women.[200] Arthritis and rheumatism was the chronic condition that showed the greatest and strongest differences between urban and rural areas. Its prevalence was significantly higher in rural areas, particularly among women. These results are consistent with another Canadian study.[89] Obesity, physical inactivity and joint stress at work or when practising high-intensity sports are the three principal modifiable arthritis risk factors.[201, 202] Higher obesity rates and higher (paid or unpaid) work-related injury rates are consistent with the higher prevalence of arthritis and rheumatism among rural Canadians. Agricultural occupations,§§§ such as farming, have been found to be associated with higher prevalence of musculoskeletal conditions, particularly osteoarthritis of the hip and knee.[202–204] Ethnicity may also play a role in the increased prevalence rates in rural areas. Arthritis and rheumatism is the most prevalent chronic condition in Canadians of Aboriginal origin living off-reserve.[200] As well, Canadian Aboriginal People living on-reserve reported arthritis as one of the five most important health problems in their communities.[205] While some studies have examined the occurrence of musculoskeletal problems of individuals working in primary industries,[241] it is important to note that very few studies have been undertaken in this area, particularly in Canada. As well, the prevalence of arthritis among Aboriginal People living on-reserve (either urban or rural) has not been examined as part of this study. Therefore, their contribution to the higher prevalence of arthritis in rural areas is unknown.

4.4.6 Multivariate Analysis

This section presents the results of our multivariate regression analysis of the association between place of residence and the odds of reporting one or more chronic diseases. The methodology for this analysis is described in Sub-Section 3.2.3.

There was no independent effect of place of residence on the odds of reporting any chronic condition except in Moderate MIZ areas (men and women) and Weak MIZ areas (women only), where the rate of any chronic disease was lower than in urban areas. The predictors that were associated with an increased risk of reporting any chronic disease included being quite a bit/extremely stressed, being of Aboriginal origin, smoking, increasing age, being overweight or obese and having a low income. Regular alcohol consumption was associated with a reduction in the odds of reporting having been diagnosed with a chronic condition.

Place of residence was associated with a decreased risk of reporting two or more chronic diseases in rural men compared to urban men. In women, the effect was seen only in Moderate and Weak MIZ areas (Table 22). The predictors associated with an increased risk of reporting at least two chronic diseases included being of Aboriginal origin, increasing age, being overweight or obese, high stress levels and low income. Again, regular alcohol consumption was the only predictor associated with a decreased risk of reporting at least two chronic diseases.

---

§§§ Of census-farm operators (as defined by Statistics Canada), 80% live in "rural and small town areas" and 20% live in larger urban centres (CMAs and CAs).[227]

Table 22

Adjusted Odds Ratios (OR) Estimates for the Association Between Place and Chronic Diseases in Men and Women[i, ii]

Variable Referent Group = 1.0	Men		Women	
	Any Chronic Disease	Two or More Chronic Diseases	Any Chronic Disease	Two or More Chronic Diseases
Place of residence[iii]				
Strong MIZ	0.96 (0.86–1.07)	0.94 (0.84–1.04)	1.03 (0.94–1.13)	0.99 (0.90–1.09)
Moderate MIZ	0.86 (0.79–0.93)*	0.80 (0.72–0.86)*	0.88 (0.81–0.95)*	0.86 (0.80–0.93)*
Weak MIZ	1.01 (0.93–1.09)	0.90 (0.83–0.97)*	0.90 (0.84–0.97)*	0.87 (0.82–0.93)*
No MIZ	0.84 (0.66–1.08)	0.72 (0.57–0.91)*	1.01 (0.86–1.19)	1.03 (0.86–1.24)
Age[iv]	1.06 (1.06–1.06)*	1.04 (1.04–1.04)*	1.06 (1.06–1.06)*	1.04 (1.03–1.04)*
Body mass index[v]				
25–30 (overweight)	1.32 (1.24–1.41)*	1.12 (1.06–1.19)*	1.44 (1.35–1.53)*	1.29 (1.21–1.37)*
>30 (obese)	2.15 (1.98–2.34)*	1.63 (1.50–1.76)*	2.70 (2.50–2.91)*	2.10 (1.95–2.26)*
Aboriginal status—yes	1.49 (1.19–1.85)*	1.53 (1.21–1.93)*	1.62 (1.35–1.94)*	1.42 (1.19–1.68)*
Race—non-white	0.78 (0.67–0.89)*	0.60 (0.53–0.69)*	0.74 (0.66–0.83)*	0.59 (0.53–0.65)*
Income[vi]				
Middle-high	1.10 (1.02–1.20)*	1.10 (1.02–1.19)*	1.18 (1.09–1.27)*	1.10 (1.03–1.18)*
Middle-low	1.29 (1.17–1.41)*	1.29 (1.19–1.39)*	1.25 (1.14–1.36)*	1.17 (1.08–1.26)*
Low	1.50 (1.33–1.69)*	1.56 (1.40–1.74)*	1.33 (1.21–1.46)*	1.33 (1.20–1.46)*
Education[vii]				
Secondary degree/ no postsecondary degree	1.11 (1.04–1.20)*	---	1.11 (1.04–1.19)*	---
Less than secondary degree	1.19 (1.10–1.29)*	---	1.40 (1.30–1.51)*	1.08 (1.02–1.16)*
Smoking—yes	1.10 (1.02–1.18)*	---	1.10 (1.03–1.18)*	1.16 (1.09–1.23)*
Alcohol consumption—regular	0.86 (0.80–0.92)*	0.83 (0.78–0.89)*	0.85 (0.80–0.90)*	0.86 (0.81–0.91)*
Stress level[viii]				
A bit stressful	---	1.18 (1.10–1.27)*	1.24 (1.16–1.32)*	1.31 (1.23–1.39)*
Quite a bit/ extremely stressful	1.38 (1.28–1.48)*	1.77 (1.63–1.91)*	1.53 (1.42–1.65)*	1.84 (1.76–1.97)*
Eating ≥5 servings of fruit/vegetables—no	n/a	---	---	0.94 (0.89–0.99)*

i. Confidence intervals were determined using 500 bootstrap weights to account for the complex survey design.
ii. --- Excluded during modelling; n/a: not included in modelling.
* Statistically significant at $p < 0.05$.
iii. Referent group is CMA/CA.
iv. Age variable is continuous for modelling.
v. Referent group is BMI 18.5–24.9.
vi. Referent group is high income.
vii. Referent group is postsecondary degree.
viii. Referent group is not very/not at all stressful.

Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

4.5 Injuries and Poisonings

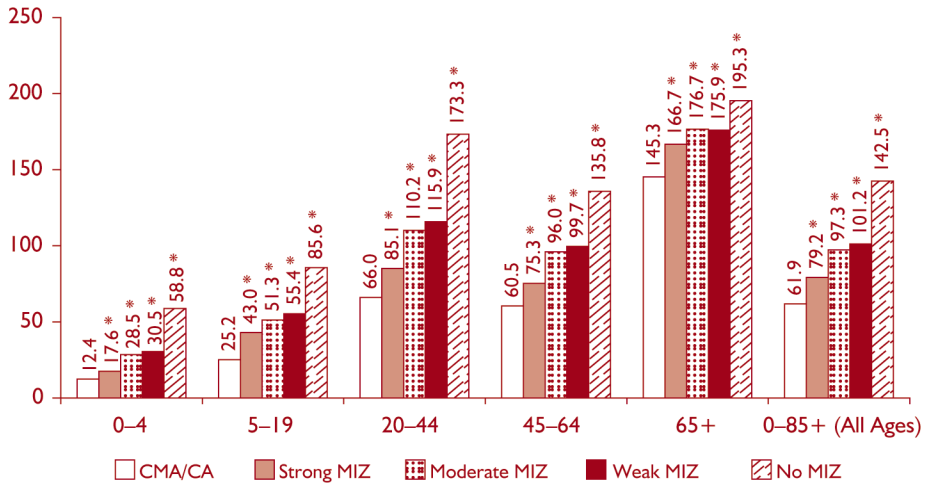
This section reports the results of our mortality analysis of the broad category of injury and poisoning (ICD-9, Chapter 17, codes 800 to 999). It then provides further analysis of three specific categories of injury: motor vehicle accidents (E810 to 825), suicide (E950 to 959) and other injuries and poisoning (E800 to 809, 826 to 949, 960 to 999).

Overall Injury and Poisoning Mortality Rates

The overall mortality of Canadians due to all injuries and poisonings is higher as rurality increases. Mortality rates from all injuries and poisonings were higher among men than women and increased with increasing age. There were significant differences between urban and rural areas for all age groups and sexes. The rates were significantly higher in all rural MIZ categories, and particularly high in No MIZ areas (Figures 45 and 46). Mortality risks (standardized mortality ratio) were higher in all rural categories, except among women aged 65 years and over living in the most remote areas (Weak and No MIZ). Standardized mortality ratios were also particularly high among children aged 0 to 4 living in No MIZ areas, with risks being more than three times higher than in urban areas (Table 23).

Figure 45

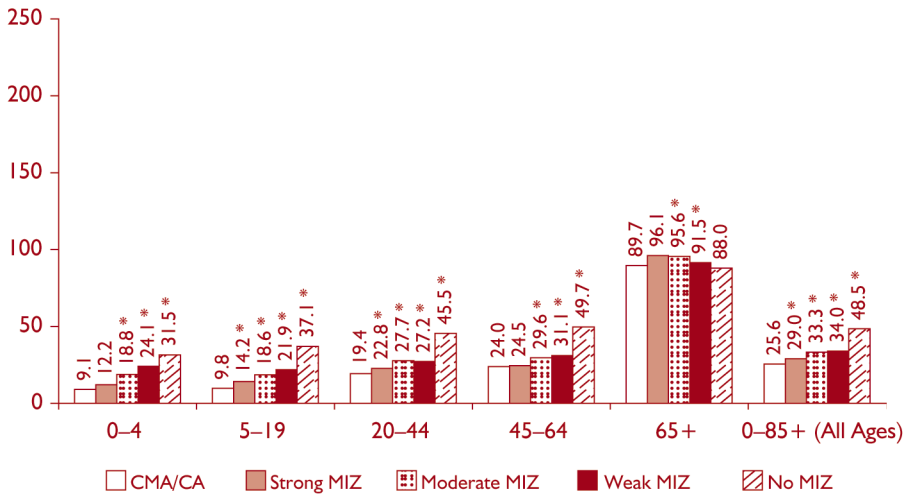
Age-Standardized Mortality Rates Due to Injury and Poisoning (per 100,000) Among Men, by Age Group and Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 46

Age-Standardized Mortality Rates Due to Injury and Poisoning (per 100,000) Among Women, by Age Group and Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 23

Standardized Accidents and Poisonings Mortality Ratios (Standardized Mortality Ratio), by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	1.42 (1.17–1.71)*	2.33 (2.06–2.64)*	2.47 (2.19–2.78)*	4.76 (3.91–5.75)*
5–19	1.71 (1.6–1.83)*	2.03 (1.93–2.14)*	2.20 (2.09–2.31)*	3.40 (3.09–3.73)*
20–44	1.27 (1.23–1.32)*	1.67 (1.62–1.71)*	1.76 (1.71–1.80)*	2.66 (2.52–2.81)*
45–64	1.25 (1.18–1.31)*	1.59 (1.53–1.65)*	1.65 (1.58–1.72)*	2.23 (2.04–2.45)*
65+	1.16 (1.10–1.23)*	1.24 (1.19–1.28)*	1.22 (1.17–1.27)*	1.36 (1.23–1.50)*
Total	1.29 (1.26–1.32)*	1.58 (1.55–1.60)*	1.65 (1.62–1.68)*	2.36 (2.28–2.45)*
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	1.36 (1.07–1.71)*	2.09 (1.78–2.44)*	2.65 (2.3–3.04)*	3.46 (2.60–4.52)*
5–19	1.45 (1.28–1.65)*	1.90 (1.74–2.07)*	2.24 (2.06–2.42)*	3.77 (3.25–4.37)*
20–44	1.18 (1.09–1.27)*	1.43 (1.35–1.51)*	1.41 (1.33–1.49)*	2.37 (2.11–2.66)*
45–64	1.02 (0.92–1.13)	1.23 (1.15–1.32)*	1.30 (1.20–1.40)*	2.08 (1.77–2.43)*
65+	1.07 (1.01–1.14)*	1.07 (1.02–1.11)*	1.01 (0.97–1.07)	0.97 (0.85–1.11)
Total	1.13 (1.09–1.18)*	1.26 (1.22–1.30)*	1.30 (1.26–1.34)*	1.85 (1.73–1.97)*

(table continued on next page)

Table 23 (cont'd)

Age Group	All			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	1.40 (1.20–1.62)*	2.23 (2.02–2.46)*	2.55 (2.33–2.78)*	4.24 (3.61–4.94)*
5–19	1.66 (1.56–1.76)*	2.01 (1.93–2.10)*	2.22 (2.13–2.32)*	3.53 (3.26–3.81)*
20–44	1.27 (1.23–1.32)*	1.64 (1.60–1.68)*	1.71 (1.67–1.75)*	2.67 (2.54–2.81)*
45–64	1.21 (1.15–1.27)*	1.50 (1.45–1.55)*	1.57 (1.52–1.63)*	2.24 (2.07–2.42)*
65+	1.16 (1.11–1.21)*	1.19 (1.15–1.22)*	1.16 (1.12–1.19)*	1.24 (1.15–1.34)*
Total	1.27 (1.24–1.29)*	1.50 (1.48–1.52)*	1.57 (1.55–1.60)*	2.27 (2.20–2.34)*

Reference group is CMA/CA = 1.0.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Motor Vehicle Accidents

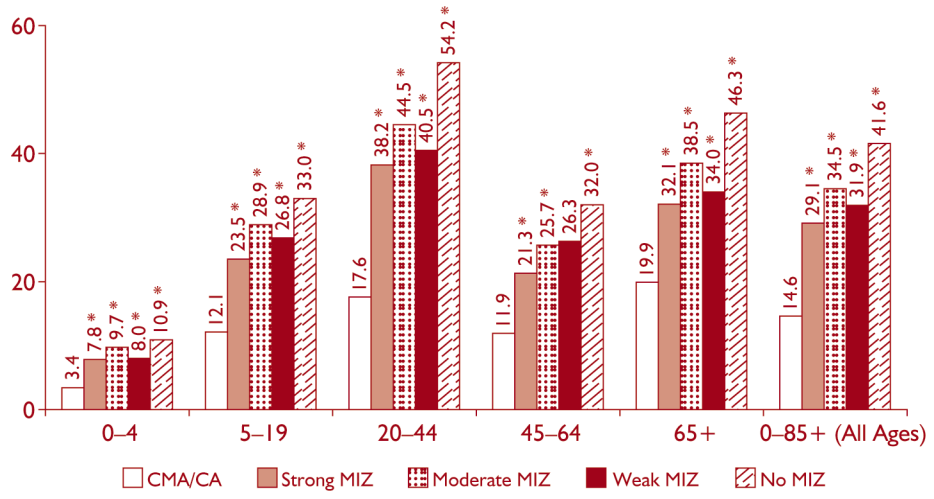
Motor vehicle accidents (MVAs) include accidents that occur on public roads and involve a motor vehicle. Off-road accidents, which typically occur on farms, have also been included under this category. Close to 40% of all MVAs occurred in rural areas and small towns, representing the most important cause of injury mortality in these areas.

Mortality Rates

Mortality due to MVAs was two to three times higher among men than women and tended to be lower for age groups 45 years and older, but remained stable in women in all other age groups. Rates generally increased with increasing rurality in all age groups and sexes (Figures 47 and 48). Standardized mortality ratios were all significantly higher in rural areas of Canada, in all age groups and sexes (Table 24). The highest risks were found among those living in No MIZ areas, with standardized mortality ratios over twice as high as among those living in urban areas. The risks were particularly high in the youngest age groups (0 to 4 and 5 to 19).

Figure 47

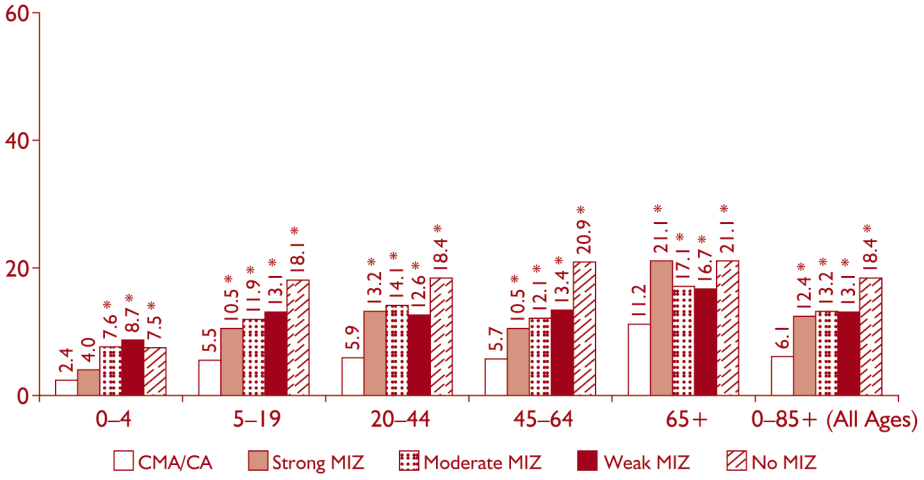
Age-Standardized Mortality Rates Due to Motor Vehicle Accidents (per 100,000) Among Men, by Age Group and Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 48

Age-Standardized Mortality Rates Due to Motor Vehicle Accidents (per 100,000) Among Women, by Age Group and Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 24

Standardized Motor Vehicle Accident Mortality Ratios, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	2.30 (1.70–3.05)*	2.88 (2.3–3.54)*	2.40 (1.88–3.01)*	3.23 (1.97–4.99)*
5–19	1.96 (1.78–2.15)*	2.40 (2.25–2.57)*	2.23 (2.08–2.40)*	2.75 (2.36–3.20)*
20–44	2.15 (2.03–2.28)*	2.53 (2.42–2.64)*	2.30 (2.19–2.40)*	3.08 (2.79–3.40)*
45–64	1.80 (1.62–1.99)*	2.16 (2.00–2.33)*	2.22 (2.04–2.40)*	2.67 (2.19–3.22)*
65+	1.62 (1.43–1.82)*	1.94 (1.79–2.10)*	1.70 (1.55–1.87)*	2.34 (1.91–2.84)*
Total	1.98 (1.90–2.06)*	2.35 (2.28–2.42)*	2.18 (2.12–2.26)*	2.84 (2.64–3.04)*
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	1.72 (1.10–2.55)*	3.24 (2.51–4.12)*	3.71 (2.93–4.63)*	3.18 (1.70–5.43)*
5–19	1.91 (1.65–2.20)*	2.16 (1.93–2.40)*	2.39 (2.14–2.65)*	3.28 (2.63–4.04)*
20–44	2.25 (2.04–2.49)*	2.40 (2.22–2.60)*	2.15 (1.97–2.34)*	3.09 (2.57–3.70)*
45–64	1.85 (1.58–2.15)*	2.13 (1.90–2.37)*	2.34 (2.09–2.64)*	3.72 (2.89–4.71)*
65+	1.90 (1.64–2.18)*	1.52 (1.36–1.69)*	1.49 (1.31–1.68)*	1.90 (1.41–2.49)*
Total	2.01 (1.89–2.14)*	2.09 (1.99–2.19)*	2.12 (2.01–2.23)*	2.96 (2.65–3.29)*
Age Group	**All**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	2.07 (1.62–2.60)*	3.02 (2.56–3.54)*	2.92 (2.48–3.43)*	3.22 (2.22–4.52)*
5–19	1.97 (1.82–2.13)*	2.35 (2.22–2.49)*	2.29 (2.16–2.43)*	2.93 (2.58–3.30)*
20–44	2.21 (2.10–2.32)*	2.54 (2.45–2.64)*	2.30 (2.20–2.39)*	3.15 (2.89–3.43)*
45–64	1.84 (1.69–2.01)*	2.17 (2.04–2.31)*	2.29 (2.14–2.44)*	3.05 (2.62–3.53)*
65+	1.79 (1.63–1.97)*	1.83 (1.71–1.95)*	1.67 (1.55–1.80)*	2.28 (1.94–2.68)*
Total	2.03 (1.96–2.10)*	2.31 (2.25–2.36)*	2.20 (2.14–2.26)*	2.94 (2.77–3.11)*

Reference group is CMA/CA = 1.0.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Multivariate Regression Analysis

Multivariate regression analyses of the association between MVA mortality and place of residence were performed for three different age groups: 0 to 44 years, 45 to 64 years and 65+ years. The methodology for these analyses is described in Sub-Section 3.2.1.

Table 25 displays the results of the association of interest. Strong and significantly higher MVA mortality risks were found in all rural places of residence, as well as in all age groups under study. For both sex and all age groups, there was an independent effect of place of residence, after controlling for socio-economic and demographic determinants of health (education, percentage of immigrants in CSD, percentage of unemployment, income and percentage of Aboriginal People in CSD). While these covariates are important to control for, it was not possible to control for important predictors, such as distance driven or car ownership, as the data at the required geographic level were not available.

Table 25
Adjusted Relative Risk (RR) Estimates for the Association Between Place of Residence and Motor Vehicle Accident Mortality, by Sex and Age Group, Canada, 1986 to 1996

Place of Residence (MIZ)	Men 0–44 Years Old RR (95% CI)	Women 0–44 Years Old RR (95% CI)	Total 0–44 Years Old RR (95% CI)
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.80 (1.66, 1.97)	*1.91(1.67, 2.18)	*1.87 (1.72, 2.03)
Moderate MIZ	*2.01 (1.87, 2.16)	*1.99 (1.77, 2.19)	*2.04 (1.90, 2.19)
Weak MIZ	*1.87 (1.73, 2.02)	*1.94 (1.72, 2.19)	*1.92 (1.78, 2.06)
No MIZ	*1.85 (1.54, 2.23)	*2.15 (1.61, 2.89)	*1.96 (1.64, 2.35)
	Men 45–64 Years Old RR (95% CI)	**Women 45–64 Years Old RR (95% CI)**	**Total 45–64 Years Old RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.68 (1.46, 1.93)	*1.69 (1.40, 2.04)	*1.67 (1.49, 1.88)
Moderate MIZ	*1.89 (1.68, 2.12)	*1.94 (1.66, 2.27)	*1.82 (1.65, 2.01)
Weak MIZ	*1.90 (1.68, 2.17)	*2.12 (1.80, 2.50)	*1.89 (1.70, 2.11)
No MIZ	*1.61 (1.16, 2.24)	*2.98 (2.07, 4.28)	*1.91 (1.47, 2.50)
	Men 65 Years+ RR (95% CI)	**Women 65 Years+ RR (95% CI)**	**Total 65 Years+ RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.46 (1.26, 1.69)	*1.79 (1.51, 2.12)	*1.61 (1.43, 1.81)
Moderate MIZ	*1.71 (1.53, 1.91)	*1.44 (1.25, 1.67)	*1.62 (1.48, 1.78)
Weak MIZ	*1.52 (1.34, 1.73)	*1.44 (1.23, 1.69)	*1.49 (1.34, 1.66)
No MIZ	*1.72 (1.29, 2.28)	*1.78 (1.23, 2.58)	*1.70 (1.33, 2.17)

* RR estimate statistically different from reference (1.00) at $p < 0.05$.
Data sources: Canadian annual mortality data, 1986 to 1996, and 1996 Census, Statistics Canada.

Other Injuries and Poisonings

Overview

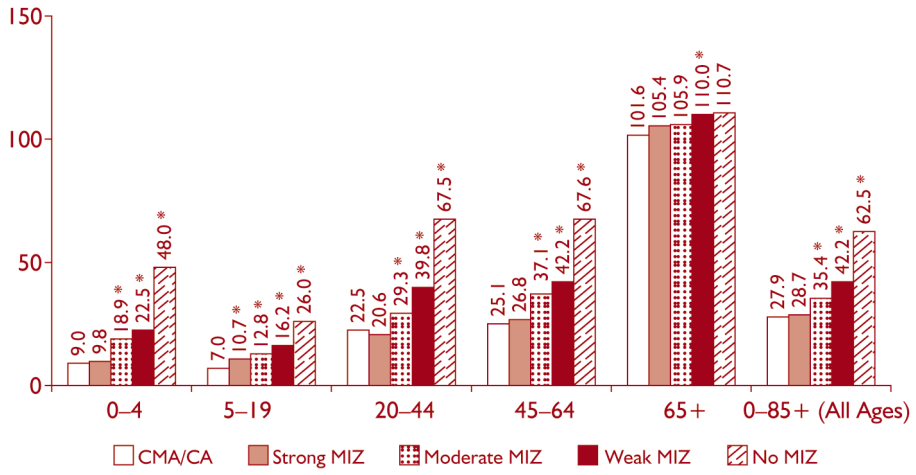
Other injuries and poisonings (ICD-9 codes E800 to 809, 826 to 949, 960 to 999) include drownings, falls, burns and accidental poisonings. As a group, they are responsible for a substantial proportion of deaths due to injury.

Mortality Rates

Mortality rates from other injuries and poisonings were higher among men than women. Men aged 0 to 64 years who were living in Moderate, Weak and No MIZ areas consistently had higher mortality rates than their urban counterparts (Figure 49). For men 65 years and older, only those living in Weak MIZ areas had mortality rates that were higher than those of men living in urban areas. For women aged 0 to 19 years, those living in Moderate, Weak and No MIZ areas had higher mortality rates than their urban counterparts (Figure 50). For those aged 20 to 44 years, women living in Strong MIZ areas had lower mortality rates compared to women living in urban areas, while the rates of women living in Weak and No MIZ areas continued to be higher. In the 45-to-64 age group, only women living in No MIZ areas had higher mortality rates than their urban counterparts. No significant differences in mortality rates were observed for women aged 65 years and older.

Figure 49

Age-Standardized Mortality Rates Due to Other Injuries (per 100,000) Among Men, by Age Group and Place of Residence, Canada, 1986 to 1996

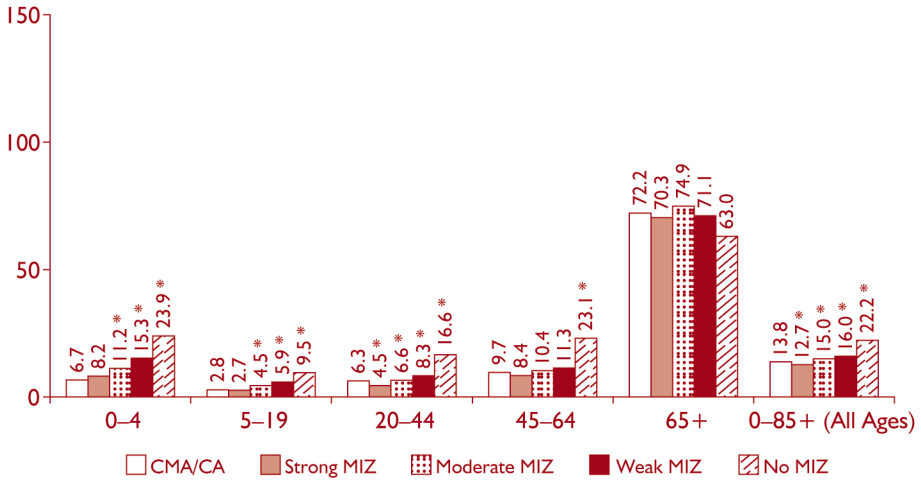


Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Overall, mortality risks were generally higher among both men and women living in rural areas, except for women living in Strong MIZ areas (Table 26). The higher mortality risks among men were largely influenced by the high risks among young males (0 to 4 and 5 to 19) living in rural areas. The highest standardized mortality ratio was found among boys aged 0 to 4 living in No MIZ areas, with a risk 5.34 times higher than those in urban areas. Women aged 65 years and over living in rural areas had lower mortality risks, but the differences were not statistically significant.

Figure 50

Age-Standardized Mortality Rates Due to Other Injuries (per 100,000) Among Women, by Age Group and Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 26

Standardized Mortality Ratios of Other Injuries, by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	1.09 (0.83–1.40)	2.13 (1.82–2.48)*	2.50 (2.17–2.87)*	5.34 (4.28–6.58)*
5–19	1.54 (1.33–1.76)*	1.83 (1.65–2.02)*	2.32 (2.11–2.54)*	3.73 (3.14–4.41)*
20–44	0.90 (0.84–0.98)*	1.30 (1.23–1.37)*	1.77 (1.69–1.85)*	3.04 (2.77–3.32)*
45–64	1.07 (0.97–1.17)	1.47 (1.39–1.57)*	1.68 (1.58–1.79)*	2.68 (2.34–3.05)*
65+	1.05 (0.97–1.12)	1.05 (1.00–1.10)	1.09 (1.03–1.15)*	1.10 (0.96–1.25)
Total	1.03 (0.99–1.08)	1.28 (1.24–1.32)*	1.54 (1.49–1.58)*	2.30 (2.17–2.44)*
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
0–4	1.24 (0.91–1.64)	1.68 (1.36–2.05)*	2.27 (1.90–2.70)*	3.56 (2.56–4.83)*
5–19	0.96 (0.71–1.27)	1.58 (1.31–1.88)*	2.06 (1.75–2.40)*	3.33 (2.45–4.43)*
20–44	0.72 (0.60–0.84)*	1.05 (0.94–1.18)	1.31 (1.18–1.45)*	2.65 (2.17–3.20)*
45–64	0.87 (0.73–1.02)	1.07 (0.95–1.20)	1.16 (1.02–1.31)*	2.36 (1.85–2.96)*
65+	0.98 (0.90–1.05)	1.04 (0.99–1.09)	0.98 (0.93–1.04)	0.87 (0.74–1.02)
Total	0.93 (0.87–0.98)*	1.08 (1.03–1.12)*	1.13 (1.09–1.18)*	1.52 (1.38–1.66)*

(table continued on next page)

Table 26 (cont'd)

Age Group	All			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–4	1.15 (0.94–1.39)	1.94 (1.71–2.19)*	2.41 (2.16–2.68)*	4.61 (3.85–5.48)*
5–19	1.39 (1.23–1.57)*	1.77 (1.62–1.93)*	2.26 (2.09–2.44)*	3.65 (3.14–4.21)*
20–44	0.88 (0.82–0.94)*	1.27 (1.21–1.33)*	1.70 (1.63–1.78)*	3.04 (2.80–3.30)*
45–64	1.03 (0.96–1.12)	1.38 (1.30–1.46)*	1.57 (1.48–1.66)*	2.66 (2.37–2.97)*
65+	1.03 (0.98–1.09)	1.07 (1.03–1.10)*	1.06 (1.02–1.09)*	1.02 (0.92–1.12)
Total	1.01 (0.98–1.05)	1.22 (1.19–1.25)*	1.41 (1.38–1.44)*	2.07 (1.97–2.17)*

Reference group is CMA/CA = 1.0.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Discussion

Injuries are a major public health problem in Canada. Injuries, excluding adverse events in medical care, are the leading cause of death for Canadians between the ages of 1 and 44 and the fourth leading cause of death for Canadians of all ages. They are a major cause of premature mortality and disability in Canada. Fatal and disabling injuries often strike down adolescents and young adults. In 1999, injury, excluding adverse events in medical care, was the leading cause of Potential Years of Life Lost (PYLL) in Canada before the age of 70 and, following cancer, the second leading cause of PYLL before the age of 75 (Health Canada, 1999).[4] The economic burden of unintentional and intentional injuries combined is estimated to be greater than $12.7 billion per year, or 8% of the total direct and indirect costs of illness, ranking fourth after cardiovascular disease, musculoskeletal conditions and cancer.[206]

Injuries and poisonings had the highest of all mortality rates in rural areas, making them the most important cause of mortality in these areas. It was not possible to look at the different types of injuries, aside from motor vehicle accidents, due to data limitations. However, given the results of this study and of other Canadian studies, it is likely that even a partial reduction in the death rates resulting from injury would have a profound effect on premature death rates and on the health of the general population, particularly rural populations.

Mortality due to motor vehicle accident (MVA) represented the most important cause of injury mortality in rural areas. It was an important cause of premature mortality, as the rates among children aged 5 to 19 years were almost as high as among those aged 45 to 64 years.**** These rates included mortality due to farm-related injury, which is known to be an important health problem in agricultural-intensive rural areas.[49, 207, 208] A Canadian study of farm-related fatal injuries showed that 10% of the deaths happened to the children of the owner of a farm.[207] The nature of farm work necessitates that a wide range of tasks be conducted over long periods. Weather conditions, mechanical breakdowns and financial factors can contribute to a high level of fatigue and uncertainty, and are among the factors that might predispose a farmer to injury.

Ethnicity may also play a role in these higher rural mortality rates associated with injury. In a study comparing the PYLL due to a variety of causes, in regions with a high Aboriginal population, the toll of PYLL due to injuries was considerable, accounting for the greatest loss of potential years of life, at 39% of PYLL. In health regions with a low Aboriginal population, injuries accounted for 22% of PYLL, the second greatest cause.[209] In their study, Allard et al.[209] mentioned that in addition to having high Aboriginal populations, these health regions were also sparsely populated, were far from major metropolitan areas and were characterized by high unemployment, as well as low income and educational attainment. SES and ethnicity could play a major role in explaining the higher rates of injuries in rural areas. While these factors were controlled for in our regression analysis, they did not explain away the effect of place of residence on the risks of mortality from an MVA.[207, 208]

Other factors that may contribute to the high rates of MVAs attributed to rural residents in this study include rural infrastructure (for example, poorer roads and greater distances driven) or more risky behaviours (for example, lower rates of seat belt and child safety seat use), as well as delays in discovery and extended emergency medical service response times.[49, 70, 210] It was not possible to control for car ownership and distance driven as part of this study, as the data were not available at the geographic level needed for this type of analysis. Prevention programs that promote the use of safety equipment may be less available in rural areas or, if they were designed mainly for urban environments, they may not translate well to rural populations.[208]

**** It is important to note that motor vehicle mortality rates calculated as part of this analysis attribute deaths to an individual's place of residence. Due to the limitations of the data sources used, we are unable to determine the location of the accident.

Suicide

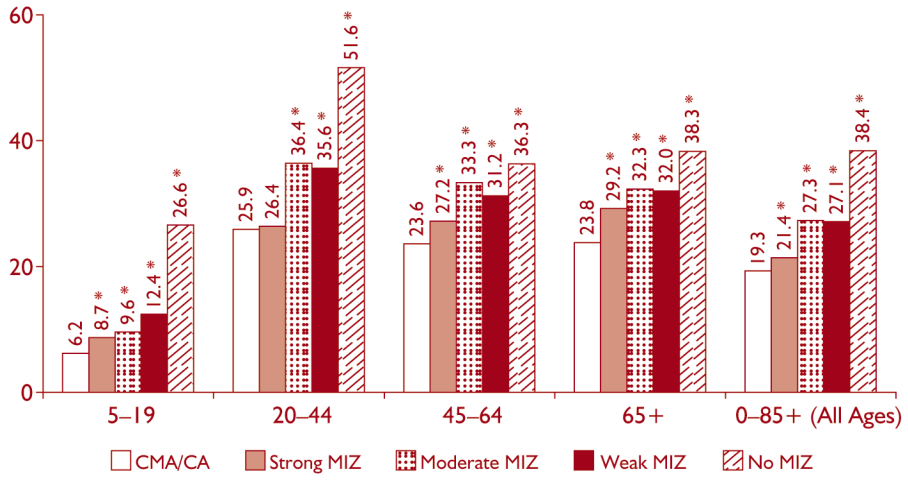
Mortality Rates

Suicide mortality rates were over four times higher among men than women. They were at their highest among men (age-standardized mortality rate: 51.6) and women (age-standardized mortality rate: 10.5) aged 20 to 44 years living in No MIZ areas (Figures 51 and 52). Significant differences between urban and rural communities were found in men of all age groups (Figure 51). In women, the pattern was less clear, with rates significantly lower in Strong MIZ areas in most age groups. While the suicide mortality rates were higher among females of the youngest age groups (5 to 19 and 20 to 44) living in No MIZ areas, older rural women had significantly lower mortality rates than their urban counterparts (Figure 52).

Overall, the standardized mortality ratios were lower among women living in rural than urban areas, but the differences were mostly non-significant (Table 27). The risks were statistically significant in young girls (5 to 19) living in rural areas, the highest standardized mortality ratio being found in No MIZ areas (SMR: 6.54). Standardized mortality ratios were all significantly higher among rural men, and young boys aged 5 to 19 living in No MIZ areas had the highest risk of dying from suicide (SMR: 4.29).

Figure 51

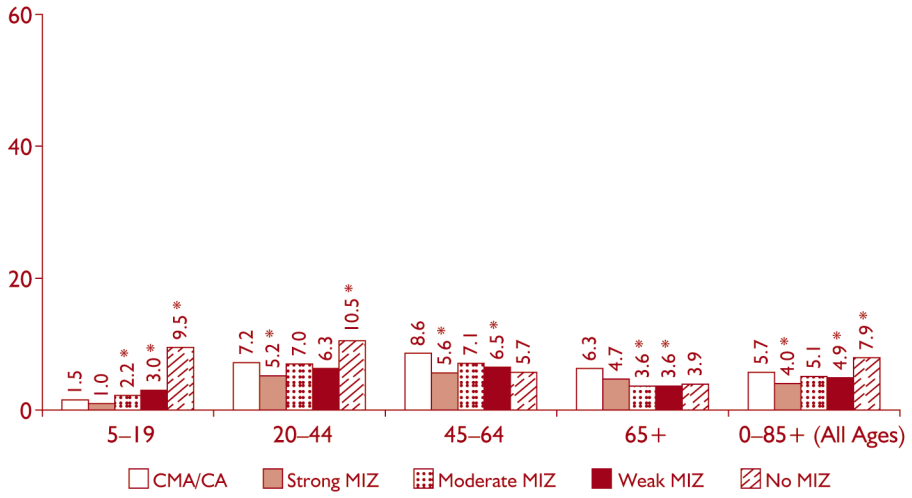
Age-Standardized Suicide Mortality Rates (per 100,000) Among Men, by Age Group and Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Figure 52

Age-Standardized Suicide Mortality Rates (per 100,000) Among Women, by Age Group and Place of Residence, Canada, 1986 to 1996



Reference group is CMA/CA.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table 27

Standardized Suicide Mortality Ratios (Standardized Mortality Ratio), by Sex, Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Men			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
5–19	1.40 (1.19–1.63)*	1.55 (1.38–1.74)*	2.00 (1.79–2.21)*	4.29 (3.60–5.07)*
20–44	1.02 (0.94–1.09)	1.41 (1.34–1.47)*	1.38 (1.31–1.45)*	2.05 (1.85–2.26)*
45–64	1.16 (1.05–1.27)*	1.41 (1.32–1.51)*	1.32 (1.23–1.42)*	1.53 (1.28–1.83)*
65+	1.22 (1.07–1.40)*	1.37 (1.25–1.48)*	1.35 (1.22–1.48)*	1.63 (1.30–2.01)*
Total	1.11 (1.06–1.16)*	1.41 (1.37–1.46)*	1.41 (1.36–1.46)*	2.07 (1.93–2.23)*
Age Group	**Women**			
	Strong MIZ	**Moderate MIZ**	**Weak MIZ**	**No MIZ**
5–19	0.71 (0.42–1.12)	1.53 (1.17–1.96)*	2.02 (1.60–2.51)*	6.54 (4.79–8.73)*
20–44	0.72 (0.61–0.84)*	0.97 (0.87–1.09)	0.88 (0.78–0.99)*	1.52 (1.19–1.92)*
45–64	0.65 (0.52–0.80)*	0.82 (0.71–0.95)*	0.76 (0.64–0.89)*	0.66 (0.39–1.04)
65+	0.76 (0.55–1.01)	0.57 (0.44–0.72)*	0.58 (0.43–0.75)*	0.61 (0.28–1.15)
Total	0.70 (0.63–0.79)*	0.89 (0.82–0.96)*	0.87 (0.80–0.95)*	1.50 (1.27–1.77)*

(table continued on next page)

Table 27 (cont'd)

Age Group	All			
	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
5–19	1.30 (1.12–1.50)*	1.56 (1.40–1.74)*	2.02 (1.83–2.21)*	4.75 (4.09–5.49)*
20–44	0.97 (0.91–1.03)	1.34 (1.28–1.40)*	1.30 (1.24–1.36)*	2.0 (1.82–2.20)*
45–64	1.05 (0.97–1.14)	1.27 (1.20–1.35)*	1.20 (1.12–1.28)*	1.35 (1.13–1.59)*
65+	1.21 (1.07–1.35)*	1.25 (1.15–1.36)*	1.25 (1.14–1.37)*	1.51 (1.25–1.89)*
Total	1.05 (1.00–1.09)	1.33 (1.28–1.37)*	1.32 (1.28–1.37)*	2.02 (1.89–2.16)*

Reference group is CMA/CA = 1.0.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Multivariate Analysis

Multivariate regression analyses of the association between suicide mortality and place of residence were performed for four different age groups: 15 to 24 years, 25 to 44 years, 45 to 64 years and 65+ years. The methodology for these analyses is described in Sub-Section 3.2.1. Table 28 presents the results of the Poisson regression analysis that examined the association between place of residence and suicide mortality. Different patterns by sex emerged from this analysis.

Table 28

Adjusted Relative Risk (RR) Estimates for the Association Between Place of Residence and Suicide Mortality, by Sex and Age Group, Canada, 1986 to 1996

Place of Residence (MIZ)	Men 15–24 Years Old RR (95% CI)	Women 15–24 Years Old RR (95% CI)	Total 15–24 Years Old RR (95% CI)
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.20 (1.05, 1.35)	0.84(0.59, 1.33)	*1.18 (1.05, 1.33)
Moderate MIZ	*1.32 (1.20, 1.46)	1.13 (0.90, 1.42)	*1.37 (1.26, 1.50)
Weak MIZ	*1.29 (1.17, 1.42)	1.11 (0.89, 1.38)	*1.34 (1.22, 1.46)
No MIZ	*1.58 (1.29, 1.94)	*2.18 (1.57, 3.02)	*1.71 (1.43, 2.06)
	Men 25–44 Years Old RR (95% CI)	**Women 25–44 Years Old RR (95% CI)**	**Total 25–44 Years Old RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	1.07 (0.97, 1.18)	*0.84 (0.71, 0.99)	1.04 (0.95, 1.14)
Moderate MIZ	*1.19 (1.10, 1.28)	0.95 (0.83, 1.08)	*1.15 (1.07, 1.24)
Weak MIZ	*1.13 (1.04, 1.23)	*0.79 (0.69, 0.92)	1.08 (1.00, 1.17)
No MIZ	1.07 (0.86, 1.33)	0.79 (0.54, 1.15)	1.03 (0.84, 1.28)
	Men 45–64 Years Old RR (95% CI)	**Women 45–64 Years Old RR (95% CI)**	**Total 45–64 Years Old RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.17 (1.06, 1.29)	*0.72 (0.59, 0.90)	1.07 (0.98, 1.17)
Moderate MIZ	*1.31 (1.21, 1.43)	*0.83 (0.70, 0.97)	*1.15 (1.07, 1.24)
Weak MIZ	*1.26 (1.15, 1.38)	*0.78 (0.65, 0.94)	*1.11 (1.03, 1.21)
No MIZ	*1.51 (1.22, 1.87)	0.60 (0.34, 1.05)	*1.23 (1.01, 1.51)

(table continued on next page)

Table 28 (cont'd)

	Men 65 Years + RR (95% CI)	Women 65 Years + RR (95% CI)	Total 65 Years + RR (95% CI)
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.28 (1.12, 1.47)	0.81 (0.59, 1.10)	*1.23 (1.09, 1.40)
Moderate MIZ	*1.45 (1.31, 1.60)	*0.66 (0.51, 0.85)	*1.30 (1.18, 1.43)
Weak MIZ	*1.45 (1.29, 1.62)	*0.67 (0.51, 0.90)	*1.31 (1.18, 1.45)
No MIZ	*1.67 (1.26, 2.17)	0.74 (0.35, 1.56)	*1.50 (1.17, 1.94)

* RR estimate statistically different from reference (1.00) at $p < 0.05$.
Data sources: Canadian annual mortality data, 1986 to 1996, and 1996 Census, Statistics Canada.

In men of all age groups, there was still an independent and significant association between place of residence and suicide mortality, even after controlling for important determinants of health. In men aged 15 to 24, those living in a rural area had an increased risk of committing suicide (from 20% to 58% higher) than young men living in urban areas. In men aged 25 to 44, the relationship was significantly higher only in moderate and weak MIZ areas, with relative risks at 1.19 and 1.13, respectively. Rural mid-aged and elderly men were also at higher risk of committing suicide compared to their urban counterparts, with risks 17% to 51% higher than in urban areas. Other predictors were associated with increased suicide mortality risks in men: marital status (less than 50% of the CSD population being married) and a low CSD median income (lower than $39,000) (data not shown). Men aged 15 to 24 living in CSDs located in the north were at higher risk of committing suicide than those living in the south (RR 1.73). However, after age 24, living in the north did not have a significant effect on the risk of committing suicide among men (data not shown). Excluding northern CSDs did not change the association between rural places of residence and suicide mortality (Appendix E).

Among women, the association disappeared or became statistically lower as they got older, except among adolescents and young women (aged 15 to 24 years) living in No MIZ areas, who were still at higher risk of committing suicide (RR: 2.18). Marital status (less than 50% of the CSD population being married) and a low CSD median income (lower than $39,000) were associated with increased suicide mortality risks (data not shown). Living in the north increased the risk of committing suicide among women aged 15 to 24 (RR: 1.90). After age 24, the association was not significant (data not shown). Excluding northern CSDs did not change the association between rural places of residence and suicide mortality (Appendix E).

Discussion

Suicide is an important public health concern. It is a leading cause of premature death, ranking third in potential years of life lost for men and tied for fourth for women.[211] When suicidal ideation, attempts and completed suicide are examined, the evidence suggests that the concern is for both men and women: whereas men are at higher risk of completed suicide, women are more likely to show suicide ideation and make suicide attempts than men.[212, 213] Populations that have higher rates of suicide compared with the general population include youth and elderly people, people who have previously attempted suicide and Aboriginal Peoples.[214] Risk factors that have been associated with suicide include mental illness, substance abuse, stressful life events, terminal illness and a family history of suicide.[116, 215]

Rural men of all ages, particularly those living in No MIZ areas, were at increased risk of committing suicide. While the risks are extremely high among rural girls aged 5 to 19 years, they decrease with increasing age among rural women. On the other hand, suicide mortality risks among men remain significantly higher in rural areas in all age groups compared with urban men. Our results are in agreement with other published U.S.[48] and Australian studies.[107, 216]

Similar to mental health issues, community factors may contribute to increased suicide mortality. Within the context of First Nations communities, a framework of how social capital can be conceptually linked to youth suicide has been developed. This takes into account several factors that can play a protective role, including psychobiology, life history, situation, SES and culture stress.[217] Significant variability in suicide rates among First Nations peoples of British Columbia has been observed. Chandler and Lalonde[218] examined the influence of social and cultural change on the individual's continuity of a sense of self, observing that First Nations communities that had taken active steps to preserve and rehabilitate their own cultures had dramatically lower rates of youth suicide. Structural changes within rural communities (economic deterioration, unemployment, isolation, etc.) could have a greater impact on men.[86] Other factors, such as marital status, religious faith and ethnic composition, have been shown to mediate the relation between a rural place of residence and suicide rates in both sexes.[48, 219] This is supported by the results of our regression analysis, where SES and socio-demographic factors were found to play a significant role in the suicide mortality risk. However, there were still independent effects of place of residence even after controlling for those important determinants.

Suicide negatively affects society, and there is a societal reluctance to talk openly about this issue.[215, 220] When interpreting the burden of suicide on society, it is important to note that mortality rates due to suicide may be underestimated, partially as a result of coding, issues relating to the timeliness of data in the mortality database (for example, when uncertain about a cause of death, the coroner may initially code the death as "undetermined" pending an investigation, and any subsequent change to the coding is not forwarded to the national mortality database) or the stigma in certain communities

that may influence a coroner's coding on the death certificate (that is, differences in cultural or religious attitudes towards suicide may play a role).[116, 221] The burden of suicide on society as a whole, and on rural communities in particular, may be greater than our results suggest.

Mental health disorders have been described as a strong risk factor for suicide,[116] but our data analyses do not show a parallel relation between the two. This may have occurred for several reasons. From a methodological standpoint, the data for these two conditions were obtained from two different data sources and for different periods: suicide mortality data were obtained for the 10-year period between 1986 and 1996, whereas mental health data were obtained from the self-reported CCHS that was conducted in 2001. Also, we look only at communities with a relatively high prevalence of mental illness and communities with a relatively high incidence of suicide—we do not look at whether mental illness of an individual leads to that person being suicidal. Though studies have indicated that more than 90% of suicide victims have a diagnosable psychiatric illness, not all individuals with psychiatric illness will be suicidal.[222] Experts suggest that suicide prevention strategies, while targeting mental illnesses as a whole with a clear emphasis on depression, alcohol use and schizophrenia, should give greater consideration to biological and psychological characteristics, as well as to factors pertaining to the cultural, social and physical environment.[219, 222, 223]

Chapter 5 General Discussion and Policy Implications

This report has presented many findings regarding population health in rural Canada. Rural population health has not received a lot of research attention to date. Although there are some studies on the health status of rural Canadians, they tend to single out a particular region or province, focus on one particular aspect of health or rely on a single data source. This study reflects a pan-Canadian scope, examines a wide range of health phenomena, uses data from a variety of sources and employs different analytical techniques. In addition to discussing the health status of rural Canadians, the study also attempts to understand the correlates of urban–rural health disparities.

"Rural" is distance and density. We examined rural communities with low population density—specifically, communities with a population of less than 10,000 inhabitants. These communities were classified according to their distance from larger urban centres (based on the share of residents who commute to work in larger urban centres). While some health measures did not show any pronounced rural–urban differences, and some adverse health measures were found to be higher in urban areas, rural areas generally showed a health disadvantage for many health-related measures examined in this study. For instance, rural areas tend to experience higher mortality among youth, higher mortality due to injury (including suicide and other accidental causes) and some chronic diseases and high prevalence of certain risk factors (such as obesity and smoking), to list just a few. For most of the outcomes examined through multivariate analysis, we found that the degree of rurality had an independent and negative impact on those health outcomes, after adjustments for social, demographic and economic factors.

However, it is important to consider the rural–urban health gap within the larger context of the social determinants of health. "Place," or where people live, work and play, is just shorthand for a host of interacting factors that take place in specific geographic locations, be they large cities, small towns, rural communities or remote areas. These factors could be occupation, income, education and social status, which have been recognized as important determinants of health. The relationship between low income and poor health has been well documented. For example, a study based on the Canada Health Survey 1978–1979 showed that low-income men who were employed had nearly double the number of health problems and more than three times the number of disability days compared to men in high-income categories.[250] A more recent survey, the Canadian Community Health Survey (CCHS) of 2000–2001, found that twice as many men and women in the highest income group rated their health as excellent, compared with those in the lowest income group.[224]

The relationship between place and health also manifests in other forms of regional variation in health. In particular, provincial/territorial differences in health status are commonly reported. For instance, mortality rates in Canada generally increase from west to east, and tend to be higher in the north. During the period of 1997 to 1999, all-cause mortality rates among women living in the Northwest Territories were 30% higher than women living in Newfoundland and Labrador, and 60% higher than those in British Columbia. Among men, the corresponding differences ranged from 5% to 30%.[225] The north/south dimension is important with respect to place and health. Although not the focus of this report, it was considered in some of the regression analyses presented.

Disparities within and between areas are also important aspects of the relationship between place and health. Research on urban health has shown that there are differences in health status within and between cities. For instance, significant variations in health status and health-related quality-of-life indicators have been observed among neighbourhoods in Montréal, over and above individual socio-demographic and behavioural differences.[226] As well, between-city variations are also important in Canada. For example, suicide is much higher in Québec than in other cities, especially among lower-income men.[25] Similarly, the assessment of the differences in health status within and between rural communities is another area of research that can contribute to the understanding of the health status of rural Canadians. While the main objective of this research program report is to compare the overall health status of rural and urban communities, a separate component of this research program was also carried out to describe the possible heterogeneity of rural communities. Given the multifaceted relationships between health determinants, health status and place, a multivariate methodology was used to classify rural communities based on their social, demographic and economic characteristics. This way of classifying rural communities demonstrated that intra-rural variations in health determinants and outcomes do exist. The analysis also showed that while most rural communities with "good" health determinants reported "good" health outcomes, "poor" health determinants did not always result in "poor" health outcomes for some rural communities. Together with the analyses presented in this report, the study of intra-rural variations highlights the complexity of the relationships between health and place. More detailed findings from the intra-rural variation analysis can be found in other reports and forthcoming publications.

It should be noted that some of the analyses in the present report use an ecological study approach, which means that the units of analysis are populations or groups of people, rather than individuals. Such an approach makes it difficult to attribute conclusions reached at the regional level to the individual level, because of the possibility of ecological fallacy. For instance, health status characteristics at the regional level are not necessarily shared by all individuals in the region. However, information at the regional level is important to our understanding of health variations, not as a substitute for individual-level analysis, but as a means of showing the effects of compositional and contextual influences on health.[17] There are important policy-related implications from these results. For example, would policies or programs aimed at changing socio-economic determinants at the regional, provincial or national level have any impact on individuals? How can public policies be shaped in such a way that they will have an impact not just on society as a whole, but also on individuals at risk? Conversely, would policies and programs that aim at changing individual behaviours have any long-term effect on population health status?

As this report has shown, rural residents in Canada are more likely to be in poorer socio-economic conditions, to have lower educational attainment, to be involved in economic activities with higher health risks (for example, farming, fishing, mining and logging) and to exhibit less desirable health behaviours. These factors may be compounded by less access to prevention, early detection, treatment or support services to make good health status even more difficult to achieve in rural or remote areas. In an upcoming second

report of this research program, the patterns of access to and utilization of health services in rural Canada will be examined with a view to further supporting health-related decision-making for Canadian rural communities.

So, what can be done to eliminate or at least reduce urban–rural disparities in health status? While some determinants of health (such as demographic characteristics and socio-economic structure of rural communities) are difficult to modify, other possible avenues for addressing rural–urban health disparities could be explored. The following are just a few examples:††††

- Population health research has shown that socio-economic factors are often as important as health services in determining the health status of a population. Rural Canadians tend to have lower income and less secure employment than their urban counterparts. Although many regional economic development programs or projects have yielded mixed results, there are some success stories that may serve as models for community interventions.[242, 244, 248] Innovative and multi-sectoral approaches could play an important role in assisting communities to adjust to and address micro- and macro-level changes such as boom-and-bust economic cycles (which tend to hit rural communities particularly hard) or a community's dependence on one industry for economic sustainability.
- Overall mortality due to injury and poisoning is considerably higher in rural areas than in urban areas. Certain rural-based industries, such as farming, fishing and logging, tend to have high levels of occupational hazard.[207, 208, 210] One area of attention could be occupational health and safety issues in the rural setting, as rural workers may have special needs and may require different solutions.
- People living in rural communities generally need to travel longer distances, and often on more dangerous roads, for work, shopping and other reasons. Not surprisingly, injuries and death due to traffic accidents are much more common in rural areas. Improving rural road conditions and raising road safety awareness may be an avenue to explore.
- The importance of disease prevention and health promotion is well recognized in public health and clinical settings. What is less clear is whether conventional strategies, mostly developed by urban program planners for urban residents, are equally effective in rural settings. Findings reported in this study concerning health-related factors and influences, such as higher proportions of smokers, lower consumption of fruit and vegetables and higher proportion of individuals who are overweight and obese among rural residents, suggest that there may be potential in rural-friendly approaches to disease prevention and health promotion.

†††† Please note that the recommendations presented in this report do not necessarily reflect those of the Canadian Institute for Health Information, the Public Health Agency of Canada, the Centre for Rural and Northern Health Research or Laurentian University.

- Early detection programs aimed at secondary prevention of chronic diseases such as cancer, cardiovascular disease and diabetes are key to population health. The concentration of health resources, expertise, technologies and services in larger urban centres, together with the challenges of rural transportation, may have made such services less accessible to those living in smaller or more remote communities.

"Place" is a complex concept. It not only denotes the geographic location, but also embodies the demographic, social, economic, cultural and behavioural dimensions of a community and its residents, as well as unique features of its physical environment. Thus, multiple perspectives and methodologies are needed when one examines the relationships between place and health. Place may have an independent effect on population health, or it may interact with other determinants to form a complex causal web, involving multiple direct and indirect effects. As the body of knowledge on the relationship between place and health increases, the need to consider place as a key factor in the development of health policies and programs becomes more obvious, particularly for community-level interventions. Studies such as this research program may provide much-needed information to support community-specific or regional-level interventions that are tailored to the unique needs of the residents or that take the place-related characteristics, such as distance and population density, into consideration.

References

1. Organisation for Economic Co-operation and Development, *Education at a Glance 2002: Table A11.2* (Paris: OECD, 2002), [online], cited February 24, 2005, from <http://www.oecd.org/document/42/0,2340,en_2649_34515_1939690_1_1_1_1,00.html>.

2. Organisation for Economic Co-operation and Development, *Health at a Glance—OECD Indicators* (Paris: OECD, 2003).

3. R. W. Pong, *The Health Transition Fund Synthesis Series: Rural Health/Telehealth* (Ottawa: Health Canada, 2002), [online], cited December 8, 2003, from <http://www.hc-sc.gc.ca/htf-fass/english/rural_en.pdf>.

4. Health Canada, *A Statistical Profile on the Health of First Nations in Canada* (Ottawa: Health Canada, 2003).

5. J. E. Stuff et al., "High Prevalence of Food Insecurity and Hunger in Households in the Rural Lower Mississippi Delta," *Journal of Rural Health* 20, 2 (2004): pp. 173–180.

6. C. M. Guy and G. David, "Measuring Physical Access to 'Healthy Foods' in Areas of Social Deprivation: A Case Study in Cardiff," *International Journal of Consumer Studies* 28, 3 (2004): pp. 222–234.

7. S. Furey, H. Farley and C. Strugnell, "An Investigation Into the Availability and Economic Accessibility of Food Items in Rural and Urban Areas of Northern Ireland," *International Journal of Consumer Studies* 26, 4 (2002): pp. 313–321.

8. Federal/Provincial/Territorial Advisory Committee on Population Health, *Towards a Healthy Future: Second Report on the Health of Canadians* (Ottawa: Ministry of Public Works and Government Services Canada, 1999).

9. M. Watanabe and A. Casebeer, *Rural, Remote and Northern Health Research: The Quest for Equitable Health Status for All Canadians* (Prince George, B.C.: University of Northern British Columbia, 2000), [online], from <http://www.unbc.ca/ruralhealth/summit.html>.

10. R. F. Badgley, "Social and Economic Disparities Under Canadian Health Care," *International Journal of Health Services* 21, 4 (1991): pp. 659–671.

11. C. J. Mansfield et al., "Premature Mortality in the United States: The Roles of Geographic Area, Socioeconomic Status, Household Type, and Availability of Medical Care," *American Journal of Public Health* 89, 6 (1999): pp. 893–898.

12. R. Pampalon, "Health Discrepancies in Rural Areas in Quebec," *Social Science and Medicine* 33, 4 (1991): pp. 355–360.

13. R. J. Pitblado, R. W. Pong and J. Jacono, "Regional Differences in Contacts With Health Care Providers in Ontario," in *Redressing the Imbalance: Health Human Resources in Rural and Northern Communities*, eds. B. Minore and C. Hartviksen (Thunder Bay, Ont.: Lakehead University, 1995).

14. V. Goel et al., *Patterns of Health Care in Ontario: The ICES Practice Atlas*, 2nd Edition (Toronto: Institute for Clinical Evaluative Sciences, 1996).

15. Research Sub-Committee of the Interdepartmental Committee on Rural and Remote Canada, *Rural Canada: A Profile* (Ottawa: Government of Canada, 1995), catalogue no. LM-347-02-95E.

16. S. MacIntyre, A. Ellaway and S. Cummins, "Place Effects on Health: How Can We Conceptualise, Operationalise and Measure Them?," *Social Science and Medicine* 55 (2002): pp. 125–139.

17. S. Curtis and I. Jones, "Is There a Place for Geography in the Analysis of Health Inequality?," *Sociology of Health and Illness* 20 (1998): pp. 645–672.

18. C. Duncan, K. Jones and G. Moon, "Do Places Matter? A Multi-Level Analysis of Regional Variation in Health Related Behaviour in Britain," *Social Science and Medicine* 37 (1993): pp. 725–733.

19. A. Forbes and S. P. Wainwright, "On the Methodological, Theoretical and Philosophical Context of Health Inequalities Research: A Critique," *Social Science and Medicine* 53 (2001): pp. 801–816.

20. R. T. Goins and J. Mitchell, "Health-Related Quality of Life: Does Rurality Matter?," *The Journal of Rural Health* 15, 2 (1999): pp. 147–156.

21. R. A. Kearns and W. M. Gesler, *Putting Health Into Place: Landscape, Identity, and Well-Being* (Syracuse, New York: Syracuse University Press, 1998).

22. S. MacIntyre, S. Maciver and A. Soomans, "Area, Class and Health: Should We Be Focusing on Places or People?," *International Social Policy* 22 (1993): pp. 213–234.

23. M. Stafford et al., "Characteristics of Individuals and Characteristics of Areas: Investigating Their Influence on Health in the Whitehall II Study," *Health and Place* 7 (2001): pp. 117–129.

24. D. Hartley, "Rural Health Disparities, Population Health, and Rural Culture," *American Journal of Public Health* 94, 10 (2004): pp. 1675–1678.

25. N. A. Ross et al., *Unpacking the Socioeconomic Health Gradient: A Canadian Intra-Metropolitan Research Program* (Montréal, Que.: McGill University, 2005).

26. V. du Plessis et al., *Definitions of "Rural"* (Ottawa: Statistics Canada, Agricultural Division, 2002), [online], from <www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>, working paper no. 61.

27. R. W. Pong and J. R. Pitblado, "Don't Take 'Geography' for Granted! Some Methodological Issues in Measuring Geographic Distribution of Physicians," *Canadian Journal of Rural Medicine* 6, 2 (2001): pp. 103–112.

28. Statistics Canada, *Urban and Rural Population Counts, for Provinces and Territories, 1996 Census* (Ottawa: Statistics Canada, 2001), [online], from <http://www.statcan.ca/english/census96/table15.htm>, catalogue no. 93-357-XPB.

29. Ministerial Advisory Council on Rural Health, *Rural Health in Rural Hands: Strategic Directions for Rural, Remote, Northern and Aboriginal Communities* (Ottawa: Health Canada, 2002), [online], from <http://www.hc-sc.gc.ca/english/pdf/rural_health/rural_hands.pdf>.

30. Statistics Canada, *Statistical Area Classification: Highlight Tables for Canada, Provinces, Territories, 2001 Census* (Ottawa: Statistics Canada, 2004), catalogue no. 97F0024XIE2001016.

31. N. Rothwell, *Employment in Rural and Small Town Canada: An Update to 2000* (Ottawa: Statistics Canada, 2001), catalogue no. 3.

32. R. Beshiri and E. Alfred, *Immigrants in Rural Canada* (Ottawa: Statistics Canada, 2002), catalogue no. 4.

33. Statistics Canada, *Aboriginal Peoples of Canada: A Demographic Profile* (Ottawa: Statistics Canada, 2003), catalogue no. 96F0030XIE2001007.

34. Australian Institute of Health and Welfare, *Rural, Regional and Remote Health: A Study on Mortality* (Canberra: Australian Institute of Health and Welfare, 2003), catalogue no. PHE 45.

35. M. S. Eberhart et al., *Urban and Rural Health Chartbook. Health, United States, 2001* (Hyattsville, Maryland: National Center for Health Statistics, 2001).

36. I. S. Watt, A. J. Franks and T.A. Sheldon, "Health and Health Care of Rural Populations in the UK: Is It Better or Worse?," *Journal of Epidemiology and Community Health* 48 (1994): pp. 16–21.

37. J. Wood, *Rural Health and Healthcare: A North West Perspective* (Lancaster, UK: Institute for Health Research, Lancaster University, 2004), [online], from <http://www.nwpho.org.uk/reports/ruralhealth.pdf>.

38. H. H. Smith et al., "Rural and Urban Differences in Mortality Among Americans 55 Years and Older: Analysis of the National Longitudinal Mortality Study," *The Journal of Rural Health* 11, 4 (1995): pp. 274–285.

39. Australian Institute of Health and Welfare, *Health of Rural and Remote Australia* (Canberra: Australian Institute of Health and Welfare, 1998), catalogue no. PHE-6.

40. Institut national de santé publique du Québec, *Vivre dans une collectivité rurale plutôt qu'en ville fait-il vraiment une différence en matière de santé et de bien-être?* (Québec, Que.: Institut national de santé publique du Québec, 2004).

41. I. R. Hall et al., "Breast and Cervical Carcinoma Mortality Among Women in the Appalachian Region of the U.S., 1976–1996," *Cancer* 89, 7 (2000): pp. 1593–1602.

42. E. D. O'Brien, R. S. Bailie and P. L. Jelfs, "Cervical Cancer Mortality in Australia: Contrasting Risk by Aboriginality, Age and Rurality," *International Journal of Epidemiology* 29 (2000): pp. 813–816.

43. W. Brown, A. F. Young and J. E. Byles, "Tyranny of Distance? The Health of Mid-Age Women Living in Five Geographical Areas of Australia," *Australian Journal of Rural Health* 7 (1999): pp. 148–154.

44. M. W. Rosenberg and K. Wilson, "Gender, Poverty and Location: How Much Difference Do They Make in the Geography of Health Inequalities?," *Social Science and Medicine* 51, 2 (2000): pp. 275–287.

45. O. P. Alho et al., "Lip Cancer in Northern Finland: Changing Incidence and Clinical Characteristics," *Journal of Oral Pathology and Medicine* 29, 7 (2000): pp. 299–302.

46. D. Wilkinson and K. Cameron, "Cancer and Cancer Risk in South Australia: What Evidence for a Rural–Urban Health Differential?," *Australian Journal of Rural Health* 12, 2 (2004): pp. 61–66.

47. N. Middleton et al., "Urban–Rural Differences in Suicide Trends in Young Adults: England and Wales, 1981–1998," *Social Science and Medicine* 57, 7 (2003): pp. 1183–1194.

48. G. K. Singh and M. Siahpush, "Increasing Rural–Urban Gradients in U.S. Suicide Mortality, 1970–1997," *American Journal of Public Health* 92, 7 (2002): pp. 1161–1167.

49. R. J. Mitchell et al., "Farm-Related Fatal Injury of Young and Older Adults in Australia, 1989–1992," *Australian Journal of Rural Health* 10, 4 (2002): pp. 209–219.

50. P. J. Martens and S. Derksen, "A Matter of Life and Death for Manitoba's Children: An Overview of Birth Rates and Mortality Rates," *Canadian Journal of Public Health* 92, suppl. 2 (2002): pp. S21–S26.

51. R. Taylor et al., "Socio-Economic, Migrant and Geographic Differentials in Coronary Heart Disease Occurrence in New South Wales," *Australian and New Zealand Journal of Public Health* 23, 1 (1999): pp. 20–26.

52. M. Senior, H. Williams and G. Higgs, "Urban–Rural Differentials: Controlling for Material Deprivation," *Social Science and Medicine* 51, 2 (2000): pp. 289–305.

53. M. D. Hayward, A. M. Pienta and D. K. McLaughlin, "Inequality in Men's Mortality: The Socioeconomic Status Gradient and Geographic Context," *Journal of Health and Social Behavior* 38, 4 (1997): pp. 313–330.

54. R. Slifkin, L. Goldsmith and T. Ricketts, *Race and Place: Urban–Rural Differences in Health for Racial and Ethnic Minorities* (Chapel Hill, N.C.: North Carolina Rural Health Research Program, 2000).

55. J. Reading, *The Tobacco Report: First Nations and Inuit Health Survey* (Ottawa: First Nations and Inuit Regional Health Survey National Steering Committee, 1999).

56. T. K. Young et al., *Chronic Diseases: First Nations and Inuit Regional Health Survey* (Ottawa: First Nations and Inuit Regional Health Survey National Steering Committee, 1999).

57. T. K. Young et al., "Type 2 Diabetes Mellitus in Canada's First Nations: Status of an Epidemic in Progress," *Canadian Medical Association Journal* 163, 5 (2000): pp. 561–566.

58. B. Diverty and C. Pérez, "The Health of Northern Residents," *Health Report* 9, 4 (1998): pp. 49–55.

59. H. G. Peach, D. C. Pearce and S. J. Farish, "Age-Standardized Mortality and Proportional Mortality Analyses of Aboriginal and Non-Aboriginal Deaths in Metropolitan, Rural and Remote Areas," *Australian Journal of Rural Health* 6, 1 (1998): pp. 36–41.

60. Y. Mao et al., "Mortality on Canadian Indian Reserves, 1977–1982," *Canadian Journal of Public Health* 77, 4 (1986): pp. 263–268.

61. Y. Mao et al., "Indian Reserves and Registered Indian Mortality in Canada," *Canadian Journal of Public Health* 83, 5 (1992): pp. 350–353.

62. President of the Treasury Board, "The Canadian Environment," in *Canada's Performance 2004: Annual Report to Parliament* (Ottawa: Government of Canada, 2004), pp. 110–124.

63. C. Furgal and P. Gosselin, "Challenges and Directions for Environmental Public Health Indicators and Surveillance," *Canadian Journal of Public Health* 93, suppl. 1 (2002): pp. S5–S8.

64. R. W. Pong, J. R. Pitblado and A. Irvine, "A Strategy for Developing Environmental Health Indicators for Rural Canada," *Canadian Journal of Public Health* 93, suppl. 1 (2002): pp. S52–S56.

65. T. Hancock, "Indicators of Environmental Health in the Urban Setting," *Canadian Journal of Public Health* 93, suppl. 1 (2002): pp. S45–S51.

66. S. E. Parks, R. A. Housemann and R. C. Brownson, "Differential Correlates of Physical Activity in Urban and Rural Adults of Various Socioeconomic Backgrounds in the United States," *Journal of Epidemiology and Community Health* 57, 1 (2003): pp. 29–35.

67. V. Mitura and R. D. Bollman, *Health Status and Behaviours of Canada's Youth: A Rural–Urban Comparison* (Ottawa: Statistics Canada, 2004), catalogue no. 5.

68. P. W. Ramsey and L. L. Glenn, "Obesity and Health Status in Rural, Urban and Suburban Southern Women," *Southern Medical Journal* 95, 7 (2002): pp. 666–671.

69. B. A. Reeder et al., "Regional and Rural–Urban Differences in Obesity in Canada. Canadian Heart Health Survey Research Group," *Canadian Medical Association Journal* 157, suppl. 1 (1997): pp. S10–S16.

70. J. Dixon and N. Welch, "Researching the Rural-Metropolitan Health Differential Using the Social Determinants of Health," *Australian Journal of Rural Health* 8, 5 (2000): pp. 254–260.

71. M. Fitzgerald, A. Pearson and H. McCutcheon, "Impact of Rural Living on the Experience of Chronic Illness," *Australian Journal of Rural Health* 9, 5 (2001): pp. 235–240.

72. J. S. Humphreys, S. Mathews-Cowey and H. C. Weinand, "Factors in Accessibility of General Practice in Rural Australia," *Medical Journal of Australia* 166, 11 (1997): pp. 557–580.

73. S. L. Albrecht, L. L. Clarke and M. K. Miller, "Community, Family, and Race/Ethnic Differences in Health Status in Rural Areas," *Rural Sociology* 63, 2 (1998): pp. 235–252.

74. F. Baum, *Social Capital and Health: Implications for Health in Rural Australia* (Adelaide, Australia: National Rural Health Alliance, 1999).

75. D. Brown and J. Kulig, "The Concept of Resiliency: Theoretical Lessons From Community Research," *Health and Canadian Society* 4, 1 (1997): pp. 29–50.

76. G. Halseth and A. Williams, "Guthrie House: A Rural Community Organizing for Wellness," *Health and Place* 5, 1 (1999): pp. 7–44.

77. T. Hancock, "People, Partnerships and Human Progress: Building Community Capital," *Health Promotion International* 116, 3 (2001): pp. 275–280.

78. I. Kawachi et al., "Social Capital, Income Inequality and Mortality," *American Journal of Public Health* 87, 9 (1997): pp. 1491–1498.

79. J. Kulig, "Community Resiliency: The Potential for Community Health Nursing Theory Development," *Public Health Nursing* 17, 5 (2000): pp. 375–385.

80. R. Putnam, "Bowling Alone: America's Declining Social Capital," *Journal of Democracy* 6, 1 (1995): pp. 65–78.

81. R. Putnam, *The Collapse and Revival of American Community* (New York: Simon & Shuster, 2000).

82. N. Welch, *Toward an Understanding of the Determinants of Rural Health* (Deakin, Australia: National Rural Health Alliance, 2000).

83. C. Molinari, M. Ahern and M. Hendryx, "The Relationship of Community Quality to the Health of Women and Men," *Social Science and Medicine* 47, 8 (1998): pp. 1113–1120.

84. N. A. Christakis, "Social Networks and Collateral Health Effects," *British Medical Journal* 329, 7459 (2004): pp. 184–185.

85. S. van Kemenade, *Social Capital as a Health Determinant: How Is It Defined?* (Ottawa: Health Canada Policy Research Communications Unit, 2003), [online], from <http://www.hc-sc.gc.ca/arad-draa>, Working Paper 02–07.

86. C. Fraser et al., "Does One Size Really Fit All? Why the Mental Health of Rural Australians Requires Further Research," *Australian Journal of Rural Health* 10, 6 (2002): pp. 288–295.

87. J. Wainer and J. Chesters, "Rural Mental Health: Neither Romanticism Nor Despair," *Australian Journal of Rural Health* 8, 3 (2000): pp. 141–147.

88. E. Rosenfeld, *Social Support and Health Status: A Literature Review* (Adelaide, Australia: South Australian Community Health Research Unit, 1997).

89. V. Mitura and R. D. Bollman, *The Health of Rural Canadians: A Rural–Urban Comparison of Health Indicators* (Ottawa: Statistics Canada, 2003), catalogue no. 4.

90. P. J. Veugelers and S. Hornibrook, "Small Area Comparisons of Health: Applications for Policy Makers and Challenges for Researchers," *Chronic Diseases in Canada* 23, 3 (2002): pp. 100–110.

91. Commission on the Future of Health Care in Canada, *Building on Values: The Future of Health Care in Canada*, Commissioner: Roy J. Romanow (Ottawa: Government of Canada, 2002), catalogue no. CP32-85/2002E.

92. C. McNiven, H. Puderer and D. Janes, *Census Metropolitan Area and Census Agglomeration Influenced Zones (MIZ): A Description of the Methodology* (Ottawa: Statistics Canada, 2000), [online], from <http://collection.nlc-bnc.ca/100/200/301/statcan/geography_working_92f0138-e/2000/no02/92F0138MIE00002.pdf>, catalogue no. 92F0138MIE2000002.

93. S. Rambeau and K. Todd, *Census Metropolitan Area and Census Agglomeration Influenced Zones (MIZ) With Census Data* (Ottawa: Statistics Canada, 2000), [online], from <http://www.statcan.ca/english/research/92F0138MIE/02001/cma2001.pdf>, catalogue no. 2000-1.

94. N. E. Breslow and N. E. Day, "Design Considerations," in *Statistical Methods in Cancer Research. Volume II—The Design and Analysis of Cohort Studies*, eds. E. Heseltine (Lyons, France: Oxford University Press, 1989).

95. C. L. Chiang, *The Life Tables and Its Applications* (Malabar, Florida: Robert E. Krieger Publ. Co., 1984).

96. D. Manuel, V. Goel and J. Williams, "The Derivation of Life Expectancy for Local Areas," *Chronic Diseases in Canada* 19, 2 (1998): pp. 52–56.

97. D. G. Manuel et al., "Health-Adjusted Life Expectancy at the Local Level in Ontario," *Chronic Diseases in Canada* 21, 2 (2000): pp. 73–80.

98. D. Sullivan, "A Single Index of Mortality and Morbidity," *HSMHA Health Reports* 86, 4 (1971): pp. 347–354.

99. D. Manuel, S. Schultz and J. Kopec, "Measuring the Health Burden of Chronic Disease and Injury Using Health-Adjusted Life Expectancy and the Health Utilities Index," *Journal of Epidemiology and Community Health* 56, 11 (2002): pp. 843–850.

100. A. C. Bebbington, "Expectation of Life Without Disability Measured From the OCPS Disability Surveys. (REVES)," in *Health Expectancy: First Workshop of the International Health Life Expectancy Network*, eds. J.-M. Robine, M. Blanchet and J. Dowd (London: HMSO, 1992), pp. 23–24.

101. R. McMillen, W. Freese and A. Cosby, *The National Social Climate of Tobacco Control, 2000–2001* (Starkville, Mississippi: Social Science Research Centre, Mississippi State University, 2001).

102. G. Bentham, "Migration and Morbidity: Implications for Geographical Studies of Disease," *Social Science and Medicine* 26, 1 (1988): pp. 49–54.

103. A. Larson, M. Bell and A. F. Young, "Clarifying the Relationships Between Health and Residential Mobility," *Social Science and Medicine* 59 (2004): pp. 2149–2160.

104. N. Rothwell et al., *Migration to and From Rural and Small Town Canada* (Ottawa: Statistics Canada, 2002), catalogue no. 3.

105. A. Belanger et al., "Gender Differences in Disability-Free Life Expectancy for Selected Risk Factors and Chronic Conditions in Canada," *Journal of Women and Aging* 14, 1 and 2 (2002): pp. 61–83.

106. P. D. St-John et al., "Rural–Urban Differences in Health Status of Elderly Manitobans," *Canadian Journal of Rural Medicine* 7, 2 (2002): pp. 89–93.

107. T. M. Caldwell, A. F. Jorm and K. B. G. Dear, "Suicide and Mental Health in Rural, Remote and Metropolitan Areas in Australia," *Medical Journal of Australia* 181, 7, suppl. (2004): pp. S10–S14.

108. S. M. Petterson, "Metropolitan-Nonmetropolitan Differences in Amount and Type of Mental Health Treatment," *Archives of Psychiatric Nursing* 17, 1 (2003): pp. 12–19.

109. M. O. Wagenfeld, "Delivering Mental Health Services to the Persistently and Seriously Mentally Ill in Frontier Areas," *The Journal of Rural Health* 16, 1 (2000): pp. 91–96.

110. L. D. Gamm, "Mental Health and Substance Abuse Services Among Rural Minorities," *The Journal of Rural Health* 20, 3 (2004): pp. 206–209.

111. M. O. Calloway et al., "Characterization of Rural Mental Health Service Systems," *The Journal of Rural Health* 15, 3 (1999): pp. 296–307.

112. C. Fraser et al., "Changing Places: The Impact of Rural Restructuring on Mental Health in Australia," *Health and Place* 11 (2005): pp. 157–171.

113. G. E. Evans et al., "Housing Quality and Mental Health," *Journal of Consulting and Clinical Psychology* 68, 3 (2000): pp. 526–530.

114. M. J. Gorgievski-Duijvesteijn, C. W. M. Giesen and A. B. Bakker, "Financial Problems and Health Complaints Among Farm Couples: Results of a 10-Year Follow-Up Study," *Journal of Occupational Health Psychology* 5, 3 (2000): pp. 359–373.

115. M. C. Johnsen et al., "Rural Mental Health Leaders' Perceptions of Stigma and Community Issues," *The Journal of Rural Health* 13, 1 (1997): pp. 59–70.

116. Health Canada, *A Report on Mental Illnesses in Canada* (Ottawa: Health Canada, 2002).

117. A. Gregoire, "The Mental Health of Farmers," *Occupational Medicine* 52, 8 (2002): pp. 471–476.

118. K. M. Chimonides and D. I. Frank, "Rural and Urban Adolescents' Perceptions of Mental Health," *Adolescence* 33, 132 (1998): pp. 823–833.

119. P. A. Keller, J. D. Murray and D. S. Hargrove, "A Rural Mental Health Research Agenda: Defining Context and Setting Priorities," *The Journal of Rural Health* 15, 3 (1999): pp. 316–325.

120. G. A. Kaplan and J. E. Keil, "Socioeconomic Factors and Cardiovascular Disease: A Review of the Literature," *Circulation* 88 (1993): pp. 1973–1998.

121. H. Johansen, "Living With Heart Disease—The Working-Age Population," *Health Report* 10, 4 (1999): pp. 33–45.

122. K. Steenland et al., "Individual- and Area-Level Socioeconomic Status Variables as Predictors of Mortality in a Cohort of 179,383 Persons," *American Journal of Epidemiology* 159, 11 (2004): pp. 1047–1056.

123. C. McCarthy et al., "A Comparison of Cardiovascular Disease Risk Factors in Farm and Non-Farm Residents: The Wisconsin Rural Women's Health Study," *Wisconsin Medical Journal* 101, 7 (2002): pp. 34–39.

124. H. G. Peach and N. Bath, "Prevalence and Sociodemographic Determinants of Cardiovascular Risk in a Rural Area," *Australian Journal of Rural Health* 7 (1999): pp. 23–27.

125. D. A. Alter et al., "Community Factors, Hospital Characteristics and Inter-Regional Outcome Variations Following Acute Myocardial Infarction in Canada," *Canadian Journal of Cardiology* 21, 3 (2005): pp. 247–255.

126. P. D. Sorlie et al., "Factors Associated With Out-of-Hospital Coronary Heart Disease Death: The National Longitudinal Mortality Study," *Annals of Epidemiology* 14, 7 (2004): pp. 447–452.

127. L. Shi et al., "Primary Care, Social Inequalities and All-Cause, Heart Disease and Cancer Mortality in US Counties: A Comparison Between Urban and Non-Urban Areas," *Public Health* 119, 8 (2005): pp. 699–710.

128. S. S. Anand, S. Yusuf and R. Jacobs, "Risk Factors, Atherosclerosis, and Cardiovascular Disease Among Aboriginal People in Canada: The Study of Health Assessment and Risk Evaluation in Aboriginal Peoples," *The Lancet* 358 (2001): pp. 1147–1153.

129. B. R. Shah, J. E. Hux and B. Zinman, "Increasing Rates of Ischemic Heart Disease in the Native Population of Ontario, Canada," *Archives of Internal Medicine* 160 (2000): pp. 1862–1866.

130. S. R. Moore et al., "Lip Cancer in South Australia, 1977–1996," *Pathology* 33 (2001): pp. 167–171.

131. R. E. Howell, B. A. Wright and R. Dewar, "Trends in the Incidence of Oral Cancer in Nova Scotia From 1983 to 1997," *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology* 95, 2 (2003): pp. 205–212.

132. K. Luna-Ortiz et al., "Lip Cancer Experience in Mexico. An 11-Year Retrospective Study," *Oral Oncology* 40 (2004): pp. 992–999.

133. E. Perea-Milla López et al., "Lifestyles, Environmental and Phenotypic Factors Associated With Lip Cancer: A Case-Control Study in Southern Spain," *British Journal of Cancer* 88 (2003): pp. 1702–1707.

134. E. Pukkala and V. Notkola, "Cancer Incidence Among Finnish Farmers, 1979–93," *Cancer Causes and Control* 8 (1997): pp. 25–33.

135. K. C. Nordby, A. Andersen and P. Kristensen, "Incidence of Lip Cancer in the Male Norwegian Agricultural Population," *Cancer Causes and Control* 15 (2004): pp. 619–626.

136. J. Acquavella et al., "Cancer Among Farmers: A Meta-Analysis," *Annals of Epidemiology* 8, 1 (1998): pp. 64–74.

137. National Cancer Institute of Canada, *Canadian Cancer Statistics 2004* (Toronto: National Cancer Institute of Canada, 2004), [online], from <www.ncic.cancer.ca>.

138. G. Bepler, "Lung Cancer Epidemiology and Genetics," *Journal of Thoracic Imaging* 14 (1999): pp. 228–234.

139. Y. Mao et al., "Socioeconomic Status and Lung Cancer Risk in Canada," *International Journal of Epidemiology* 30 (2001): pp. 809–817.

140. K. Katsouyanni and G. Pershagen, "Ambient Air Pollution Exposure and Cancer," *Cancer Causes and Control* 8 (1997): pp. 284–291.

141. K. C. Johnson et al., "Lifetime Residential and Workplace Exposure to Environmental Tobacco Smoke and Lung Cancer in Never-Smoking Women, Canada 1994–97," *International Journal of Cancer* 93 (2001): pp. 902–906.

142. J. Hu et al., "Risk Factors for Lung Cancer Among Canadian Women Who Have Never Smoked," *Cancer Detection and Prevention* 26 (2002): pp. 129–138.

143. Y. Mao et al., "Physicial Activity and the Risk of Lung Cancer in Canada," *American Journal of Epidemiology* 158, 6 (2003): pp. 564–575.

144. S. Kirkland, L. Greaves and P. Devichand, "Gender Differences in Smoking and Self Reported Indicators of Health," in *Women's Health Surveillance Report* (Ottawa: Canadian Institute for Health Information, 2003).

145. F. C. Pampel, "Declining Sex Differences in Mortality From Lung Cancer in High-Income Nations," *Demography* 40, 1 (2003): pp. 45–65.

146. Health Canada. Canadian Tobacco Use Monitoring Survey—Health Canada Tobacco Control Programme #2001, [online], cited July 4, 2005, from <http://www.hc-sc.gc.ca/hecs-sesc/tobacco/research/ctums/#2001>.

147. W. Weiss, "Cigarette Smoking and Lung Cancer Trends: A Light at the End of the Tunnel?," *Chest* 111 (1997): pp. 1414–1416.

148. L. F. Ellison and L. Gibbons, "Leading Cancers—Changes in Five-Year Relative Survival," *Health Reports* 15, 2 (2004): pp. 19–32.

149. B. Mackay, "Butting Out in Canada: Five Down, Eight to Go," *Canadian Medical Association Journal* 171, 6 (2004): pp. 558.

150. T. E. Read and I. J. Kodner, "Colorectal Cancer: Risk Factors and Recommendations for Early Detection," *American Family Physician* 59, 11 (1999): pp. 3083–3092.

151. K. Saliangas, "Screening for Colorectal Cancer," *Techniques in Coloproctology* 8, suppl. 1 (2004): pp. S10–S13.

152. M. J. Solomon and R. S. McLeod, "Screening for Colorectal Cancer" in *Canadian Task Force on the Periodic Health Examination* (Ottawa: Health Canada, 1994), pp. 798–809.

153. M. M. Casey, K. T. Call and J. M. Klingner, "Are Rural Residents Less Likely to Obtain Recommended Preventive Healthcare Services?," *American Journal of Preventive Medicine* 21, 3 (2001): pp. 182–188.

154. W. M. Flanagan et al., "Potential Impact of Population-Based Colorectal Cancer Screening in Canada," *Chronic Diseases in Canada* 24, 4 (2003): pp. 81–88.

155. K. A. Greiner et al., "Barriers to Colorectal Cancer Screening in Rural Primary Care," *Preventive Medicine* 38 (2004): pp. 269–275.

156. E. F. Ellerbeck et al., "Direct Observation of Counseling on Colorectal Cancer in Rural Primary Care Practices," *Journal of General Internal Medicine* 16 (2001): pp. 697–700.

157. T. K. Asano et al., "Current Awareness in Canada of Clinical Practice Guidelines for Colorectal Cancer Screening," *Canadian Journal of Surgery* 47, 2 (2004): pp. 104–108.

158. L. A. Mack, H. Stuart and W. J. Temple, "Survey of Colorectal Cancer Screening Practices in a Large Canadian Urban Centre," *Canadian Journal of Surgery* 47, 3 (2004): pp. 189–194.

159. R. Robertson et al., "Factors Influencing Time From Presentation to Treatment of Colorectal and Breast Cancer in Urban and Rural Areas," *British Journal of Cancer* 90 (2004): pp. 1479–1485.

160. K. C. Johnson et al., "Passive and Active Smoking and Breast Cancer Risk in Canada, 1994–97," *Cancer Causes and Control* 11, 3 (2000): pp. 211–221.

161. V. Kirsh and N. Kreiger, "Estrogen and Estrogen-Progestin Replacement Therapy and Risk of Postmenopausal Breast Cancer in Canada," *Cancer Causes and Control* 13, 6 (2002): pp. 583–590.

162. T. E. Rohan et al., "Alcohol Consumption and Risk of Breast Cancer: A Cohort Study," *Cancer Causes and Control* 11, 3 (2000): pp. 239–247.

163. C. M. Friedenreich, K. S. Courneya and H. E. Bryant, "Influence of Physical Activity in Different Age and Life Period on the Risk of Breast Cancer," *Epidemiology* 12 (2001): pp. 604–612.

164. H. E. Bryant, *Breast Cancer in Canadian Women* (Ottawa: Health Canada, 2003).

165. J. Barry and N. Breen, "The Importance of Place of Residence in Predicting Late-Stage Diagnosis of Breast or Cervical Cancer," *Health and Place* 11 (2005): pp. 15–29.

166. Canadian Breast Cancer Network. National Strategy and Action Plan: Rural, Remote and Northern Women and Men with Breast Cancer, April 10, 2003, [online], cited May 24, 2005, from <http://www.cbcn.ca/english/publications.php?display&en&31>.

167. R. E. Gray et al., "A Consultation With Canadian Rural Women With Breast Cancer," *Health Expectations* 7 (2004): pp. 40–50.

168. B. J. Morrison, "Screening for Breast Cancer (1998 Rewording)" in *Canadian Task Force on the Periodic Health Examination* (Ottawa: Health Canada, 1998).

169. J. Ringash, "Preventive Health Care, 2001 Update: Screening Mammography Among Women Aged 40-49 Years at Average Risk of Breast Cancer" in *Canadian Task Force on the Periodic Health Examination* (Ottawa: Health Canada, 2001).

170. E. L. Franco, E. Duarte-Franco and A. Ferenczy, "Cervical Cancer: Epidemiology, Prevention and the Role of Human Papillomavirus Infection," *Canadian Medical Association Journal* 164, 7 (2001): pp. 1017–1025.

171. B. J. Morrison, "Screening for Cervical Cancer" in *Canadian Task Force on the Periodic Health Examination* (Ottawa: Health Canada, 1994), pp. 884–889.

172. S. Liu et al., "Cervical Cancer in Canada: Changing Patterns in Incidence and Mortality," *International Journal of Gynecological Cancer* 11 (2001): pp. 24–31.

173. L. Van Til, C. MacQuarrie and R. Herbert, "Understanding the Barriers to Cervical Cancer Screening Among Older Women," *Qualitative Health Research* 13, 8 (2003): pp. 1116–1131.

174. C. J. Maxwell et al., "Factors Important in Promoting Cervical Cancer Screening Among Canadian Women: Findings From the 1996–97 National Population Health Survey (NPHS)," *Canadian Journal of Public Health* 92, 2 (2001): pp. 127–133.

175. M. S. Cookson, "Prostate Cancer: Screening and Early Detection," *Cancer Control* 8, 2 (2001): pp. 133–140.

176. P. S. Bunting, "Screening for Prostate Cancer With Prostate-Specific Antigen: Beware the Biases," *Clinica Chimica Acta* 315 (2002): pp. 71–97.

177. C. P. Cooper et al., "To Screen or Not to Screen, When Clinical Guidelines Disagree: Primary Care Physicians' Use of the PSA Test," *Preventive Medicine* 38 (2004): pp. 182–191.

178. H.-P. Schmid, W. Riesen and L. Prikler, "Update on Screening for Prostate Cancer With Prostate-Specific Antigen," *Critical Reviews in Oncology/Hematology* 50 (2004): pp. 71–78.

179. F. Meyer and Y. Fradet, "Prostate Cancer: 4. Screening," *Canadian Medical Association Journal* 159 (1998): pp. 968–972.

180. J. W. Feightner, "Screening for Prostate Cancer," in *Canadian Task Force on the Periodic Health Examination* (Ottawa: Health Canada, 1994), pp. 812–823.

181. E. C. Y. Chan et al., "Informed Consent for Cancer Screening With Prostate-Specific Antigen: How Well Are Men Getting the Message?," *American Journal of Public Health* 93, 5 (2003): pp. 779–785.

182. R. E. Gray and A. Philbrook, "Prostate Cancer: 13. Whose Prostate Is It Anyway?," *Canadian Medical Association Journal* 160 (1999): pp. 833–836.

183. S. E. McGregor et al., "Prevalence of PSA Testing and Effect of Clinical Indications on Patterns of PSA Testing in a Population-Based Sample of Alberta Men," *Chronic Diseases in Canada* 23, 3 (2002): pp. 111.

184. Health Canada, *Respiratory Disease in Canada* (Ottawa: Health Canada, 2001).

185. D. M. Mannino, "COPD: Epidemiology, Prevalence, Morbidity and Mortality, and Disease Heterogeneity," *Chest* 121, 5, suppl. (2002): pp. 121S–126S.

186. K. Chapman, J. Bourbeau and L. Rance, "The Burden of COPD in Canada: Results From the Confronting COPD Survey," *Respiratory Medicine* 97, suppl. C (2003): pp. S23–S31.

187. E. Weir, "COPD Death Rates: Projecting a Female Trajectory," *Canadian Medical Association Journal* 170, 3 (2004) p. 334.

188. Beshiri R., *Employment Structure in Rural and Small Town Canada: The Primary Sector* (Ottawa: Statistics Canada, 2001), catalogue no. 2.

189. C. Linaker and J. Smedley, "Respiratory Illness in Agricultural Workers," *Occupational Medicine* 52, 8 (2002): pp. 451–459.

190. G. Mastrangelo et al., "Ascertaining the Risk of Chronic Obstructive Pulmonary Disease in Relation to Occupation Using a Case-Control Design," *Occupational Medicine* 53, 3 (2003): pp. 165–172.

191. R. W. Watts, "Asthma Management in Rural Australia," *Australian Journal of Rural Health* 7 (1999): pp. 249–252.

192. S. Tong and P. Drake, "Hospital Admission and Mortality Differentials of Asthma Between Urban and Rural Populations in New South Wales," *Australian Journal of Rural Health* 7 (1999): pp. 18–22.

193. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, "Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada," *Canadian Journal of Diabetes* 27, suppl. 2 (2003): pp. S1–S152.

194. Health Canada, *Responding to the Challenge of Diabetes in Canada: First Report of the National Diabetes Surveillance System (NDSS)* (Ottawa: Health Canada, 2003), catalogue no. H49-121/2002E.

195. Health Canada, *Diabetes in Canada: Second Edition* (Ottawa: Health Canada, 2003), catalogue no. H49-121/2002E.

196. H. V. Thommasen et al., "Differences in Diabetic Co-Morbidity Between Aboriginal and Non-Aboriginal People Living in Bella Coola, Canada," *Rural and Remote Health* 4, 4 (2004): pp. 1–13.

197. L. A. Letter et al., "Diabetes Screening in Canada (DIASCAN) Study: Prevalence of Undiagnosed Diabetes and Glucose Intolerance in Family Physician Offices," *Diabetes Care* 24, 6 (2001): pp. 1038–1043.

198. First Nations and Inuit Regional Health Survey National Steering Committee, *First Nations and Inuit Regional Health Survey National Report* (Ottawa: Health Canada, 1999).

199. G. L. Booth et al., "Time Trends and Geographic Disparities in Acute Complications of Diabetes in Ontario, Canada," *Diabetes Care* 28, 5 (2005): pp. 1045–1050.

200. Health Canada, *Arthritis in Canada: An Ongoing Challenge* (Ottawa: Health Canada, 2003), catalogue no. H39-4/14-2003E.

201. M. Rossignol et al., *Osteoarthritis. A New Challenge for Physicians* (Montréal, Que.: Direction de la santé publique de Montréal, 2004), [online], from <http://www.santepub-mtl.qc.ca/Publication/telecharg_ppm.html>.

202. S. Kirkhorn, R. T. Greenlee and J. C. Reeser, "The Epidemiology of Agriculture-Related Osteoarthritis and Its Impact on Occupational Disability," *Wisconsin Medical Journal* 102, 7 (2003): pp. 38–44.

203. S. Holmberg et al., "Musculoskeletal Symptoms Among Farmers and Non-Farmers: A Population-Based Study," *International Journal of Occupational and Environmental Health* 8 (2002): pp. 339–354.

204. K. Walker-Bone and K. T. Palmer, "Musculoskeletal Disorders in Farmers and Farm Workers," *Occupational Medicine* 52, 8 (2002): pp. 441–450.

205. K. B. Newbold, "Problems in Search of Solutions: Health and Canadian Aboriginals," *Journal of Epidemiology and Community Health* 23, 1 (1998): pp. 59–73.

206. Health Canada, *Economic Burden of Illnesses in Canada, 1998* (Ottawa: Health Canada, 2002).

207. H. Dimich-Ward et al., "Gender Differences in the Occurrence of Farm Related Injuries," *Occupational and Environmental Medicine* 61 (2004): pp. 52–56.

208. C. Peek-Asa, C. Zwerling and L. Stallones, "Acute Traumatic Injuries in Rural Populations," *American Journal of Epidemiology* 94, 10 (2004): pp. 1689–1693.

209. Y. E. Allard, R. Wilkins and J. M. Berthelot, "Premature Mortality in Health Regions With High Aboriginal Populations," *Health Reports* 15, 1 (2004): pp. 51–60.

210. M. Brownell, D. Friesen and T. Mayer, "Childhood Injury Rates in Manitoba," *Canadian Journal of Public Health* 93, suppl. 2 (2002): pp. S50–S55.

211. Statistics Canada, "Death—Shifting Trends," *Health Reports* 12, 3 (2000): pp. 41–46.

212. S. Langlois and P. Morrison, "Suicide Deaths and Suicide Attempts," *Health Reports* 13, 2 (2002): pp. 9–22.

213. A. L. Beautrais, "Gender Issues in Youth Suicidal Behaviour," *Emergency Medicine* 14 (2002): pp. 35–42.

214. Health Canada, *Suicide in Canada: Update of the Report of the Task Force on Suicide in Canada* (Ottawa: Health Canada, 1994).

215. E. Weir and T. Wallington, "Suicide: The Hidden Epidemic," *Canadian Medical Association Journal* 165, 5 (2001) p. 634.

216. D. Wilkinson and D. Gunnell, "Youth Suicide Trends in Australian Metropolitan and Non-Metropolitan Areas, 1988–1997," *Australian and New Zealand Journal of Psychiatry* 34 (2000): pp. 822–828.

217. J. Mignone and J. O'Neil, "Social Capital and Youth Suicide Risk Factors in First Nations Communities," *Canadian Journal of Public Health* 96, suppl. 1 (2005): pp. S51–S54.

218. M. J. Chandler and C. Lalonde, "Cultural Continuity as a Hedge Against Suicide in Canada's First Nations," *Transcultural Psychiatry* 35 (1998): pp. 191–219.

219. R. D. Goldney, "A Global View of Suicidal Behaviour," *Emergency Medicine* 14 (2002): pp. 24–34.

220. M. A. Moskos, J. Achilles and D. Gray, "Adolescent Suicide Myths in the United States," *Crisis* 25, 4 (2004): pp. 176–182.

221. E. Hunter and D. Harvey, "Indigenous Suicide in Australia, New Zealand, Canada and the United States," *Emergency Medicine* 14 (2002): pp. 14–23.

222. J. J. Mann, "A Current Perspective of Suicide and Attempted Suicide," *Annals of Internal Medicine* 136, 4 (2002): pp. 302–311.

223. J. M. Bertolote et al., "Psychiatric Diagnoses and Suicide: Revisiting the Evidence," *Crisis* 25, 4 (2004): pp. 147–155.

224. Canadian Institute for Health Information, *Improving the Health of Canadians* (Ottawa: Canadian Institute for Health Information, 2004).

225. M. DesMeules, D. Manuel and R. Cho, "Mortality: Life and Health Expectancy of Canadian Women," *BMC Women's Health* 4, suppl. 1 (2004): p. S9.

226. N. A. Ross, S. Tremblay and K. Graham, "Neighbourhood Influences on Health in Montreal, Canada," *Social Science and Medicine* 59 (2004): pp. 1485–1494.

227. C. Lonmo, "Cattle, Crops and City Living" in *Canadian Agriculture at a Glance* (Ottawa: Statistics Canada, 1999), pp. 245–250.

228. Centers for Disease Control and Prevention, *Environmental Public Health Tracking Program: Closing America's Environmental Public Health Gap* (Atlanta, GA: Centers for Disease Control and Prevention, 2003).

229. F. Valent, D. A. Little, G. Tamburlini and F. Barbone, *Burden of Disease Attributable to Selected Environmental Factors and Injuries Among Europe's Children and Adolescents* (Geneva: World Health Organization, 2003).

230. T. Schettler, "Changing Patterns of Disease: Human Health and the Environment," *San Francisco Medicine* 75 (2004): pp. 10–13.

231. J. Dwyer, "Starting Down the Right Path: Nutrition Connections With Chronic Diseases of Later Life," *American Journal of Clinical Nutrition* 83 (2006): pp. 415S–420S.

232. M. A. Flynn et al., "Reducing Obesity and Related Chronic Disease Risk in Children and Youth: A Synthesis of Evidence With 'Best Practice' Recommendations," *Obesity Review,* 83 (2006), suppl. 1: pp. 7–66.

233. S. G. Aldana et al., "The Effects of a Worksite Chronic Disease Prevention Program," *Journal of Occupational Environmental Medicine* 47 (2005): pp. 558–564.

234. T. K. Harrell et al., "Effectiveness of a School-Based Intervention to Increase Health Knowledge of Cardiovascular Disease Risk Factors Among Rural Mississippi Middle School Children," *Southern Medical Journal* 98 (2005): pp.1173–1180.

235. I. Huot, G. Paradis and M. Ledoux, Quebec Heart Health Demonstration Project Research Group, "Effects of the Quebec Heart Health Demonstration Project on Adults Dietary Behaviours," *Preventive Medicine* 38 (2004): pp. 137–148.

236. A. Girgis et al., "Self-Reported Cervical Screening Practices and Beliefs of Women From Urban, Rural and Remote Regions," *Journal of Obstetrical Gynaecology* 19 (1999): pp. 172–179.

237. A. Jemal et al., "Geograpic Patterns of Prostate Cancer Mortality and Variations in Access to Medical Care in the United States," *Cancer Epidemiology Biomarkers Prevention* 14 (2005): pp. 590–595.

238. M. J. Coory and P. D. Baade, "Urban–Rural Differeces in Prostate Cancer Mortality, Radical Prostatectomy and Prostate-Specific Antigen Testing in Australia," *Medical Journal of Australia* 182 (2005): pp. 112–115.

239. A. Must et al.,"The Disease Burden Associated With Overweight and Obesity," *Journal of American Medical Association* 282 (1999): pp. 1523–1529.

240. M. H. Tam and D. R. MacLean, "Epidemiology of Diabetes Mellitus in Canada," *Clinical and Investigate Medicine* 18 (1995): pp. 240–246.

241. S. Holmberg et al., "The Impact of Physical Work Exposure on Musculoskeletal Symptoms Among Farmers and Rural Non-Farmers," *Annals of Agriculture and Environmental Medicine* 10 (2003): pp. 179–184.

242. M. Page, R. Beshiri, "Rural Economic Diversification: A Community and Regional Approach," *Rural and Small Town Canada Analysis Bulletin* 4 (Ottawa: Statistics Canada, 2003), catalogue no. 21-006-XIE2002007.

243. T. Jennissen, *Health Issues in Rural Canada*, (Political and Social Affairs Division, Government of Canada), 1992, [online}, from <http://dsp-psd.communication.gc.ca/Collection-R/LoPBdP/BP/bp325-e.htm#INTRODUCTIONtxt>.

244. R. D. Bollman, "Factors Associated With Local Economic Growth," *Rural and Small Town Canada Analysis Bulletin* 4, 7 (2003), catalogue no. 21-006-XIE1998006.

245. Society of Rural Physicians of Canada, *The Future of Rural Healthcare*, (SRPC Submission to the Commission on the Future of Health Care in Canada), (2002), [online], from <http://www.srpc.ca/librarydocs/Romanow_SRPC.htm>.

246. College of Family Physicians of Canada, Society of Rural Physicians of Canada and Society of Obstetricians and Gynaecologists of Canada, *Training for Rural Family Practitioners in Advanced Maternity Skills and Cesarean Section*, (joint position paper), (2003), [online], from http://www.cfpc.ca/English/cfpc/programs/patient%20care/maternity/joint%20position%20paper/default.asp?s=1.

247. D. L. Hoyert et al., "Deaths: Final Data for 2003, *National Vital Statistics Reports* 54, (Hyattsville, MD: National Center for Health Statistics) (forthcoming).

248. Agriculture and Agri-Food Canada, *Promising Practices in Community Partnerships: Lessons Learned From the Canadian Rural Partnership* (Ottawa: Research and Analysis Unit, Rural Secretariat, 2005), publication no. 10113E.

249. C. McNiven and H. Puderer, "Delineation of Canada's North: An Examination of the North–South Relationship in Canada (Ottawa: Statistics Canada, 2000), catalogue no. 92F0138MIE2000003.

250. D. I. Hay, "Socioeconomic Status and Health Status: A Study of Males in the Canada Health Survey," *Social Science and Medicine* 27, 12 (1998): pp. 1317–1325.

Appendix A

Examples of Census Subdivisions Classified to Each Degree of Rurality (MIZ Zone)

A census metropolitan area (CMA) has an urban core of 100,000 or more and includes all neighbouring census subdivisions (CSDs) (that is, incorporated towns and municipalities) where 50% or more of the workforce commutes to the urban core.

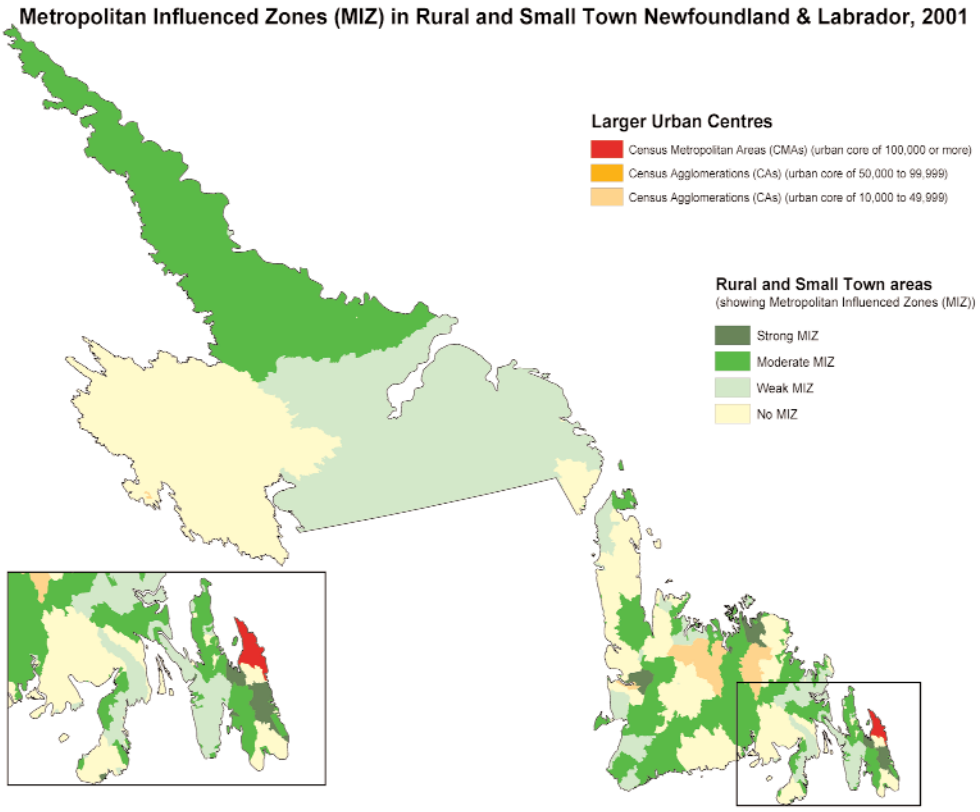
A census agglomeration (CA) has an urban core of 10,000 to 99,999 and includes neighbouring CSDs with the same community rule. Note that a number of small CSDs are classified within CMAs and CAs.

Province	Larger Urban Centres		Rural and Small Town Areas			
	Largest CMA	Smallest CA	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Newfoundland and Labrador	St. John's	Division No. 6, Subd. E	Avondale	Harbour Grace	Twillingate	Greenspond
Prince Edward Island	n/a	Rocky Point 3	Kensington	Murray Harbour	Tignish	Miminegash
Nova Scotia	Halifax	Merigomish Harbour 31	East Hants	Wolfville	Yarmouth	Bear River 6B
New Brunswick	Saint John	Saint-Hilaire	Shediac	Meductic	Woodstock	Madawaska
Quebec	Montréal	Cloutier	Rigaud	Mont-Tremblant	Chibougamau	Piopolis
Ontario	Toronto	Moravian 47	Aylmer	Gananoque	Sioux Lookout	Wawakapewin (Long Dog Lake)
Manitoba	Winnipeg	Dakota Plains 6A	Rockwood	Gimli	Churchill	Pauingassi First Nation
Saskatchewan	Saskatoon	Willowbrook	Rouleau	Pennant	Muenster	Yarbo
Alberta	Calgary	Redcliff	Nobleford	Vermilion	Kananaskis	Beaver Lake 131
British Columbia	Vancouver	Isidore's Ranch 4	Summerland	Whistler	Revelstoke	Inklyuhkinatko 2
Yukon Territory	n/a	Lake Laberge 1	Dawson			
Northwest Territories	n/a	Yellowknife	Tuktoyaktuk			
Nunavut	n/a	n/a	Resolute			

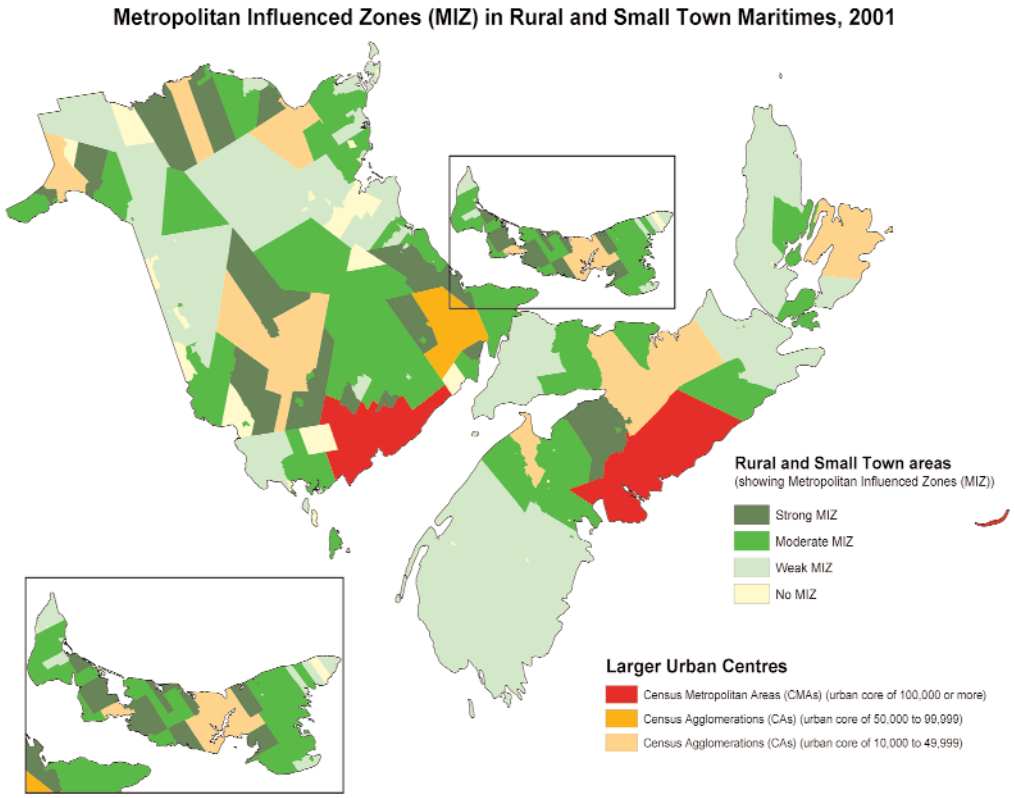
Notes: Classifications for all analyses in this report use 1996 CSD boundaries.
Using the 2001 boundaries, the MIZ classification groups all three territories together as a unique category that is not further broken down into MIZ categories.

n/a Not applicable.

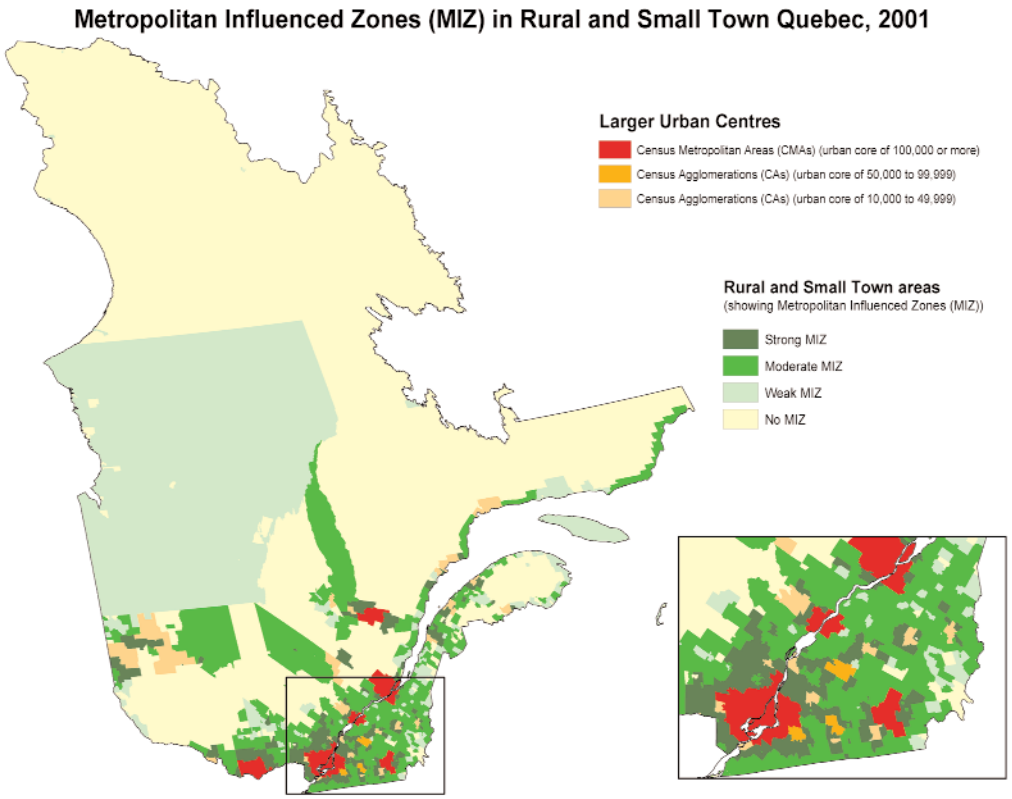
.



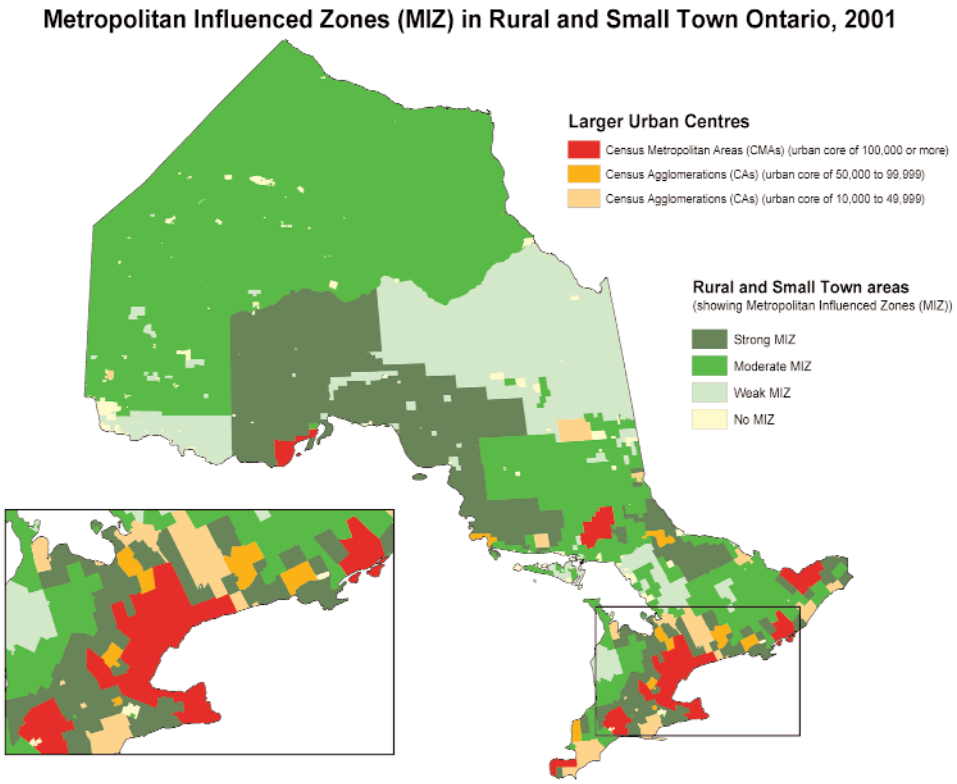
Source: Adapted from Statistics Canada; custom maps developed by Spatial Analysis and Geomatics Applications, Agriculture Division, 2004. Based on the Statistics Canada Census of Population, 2001.



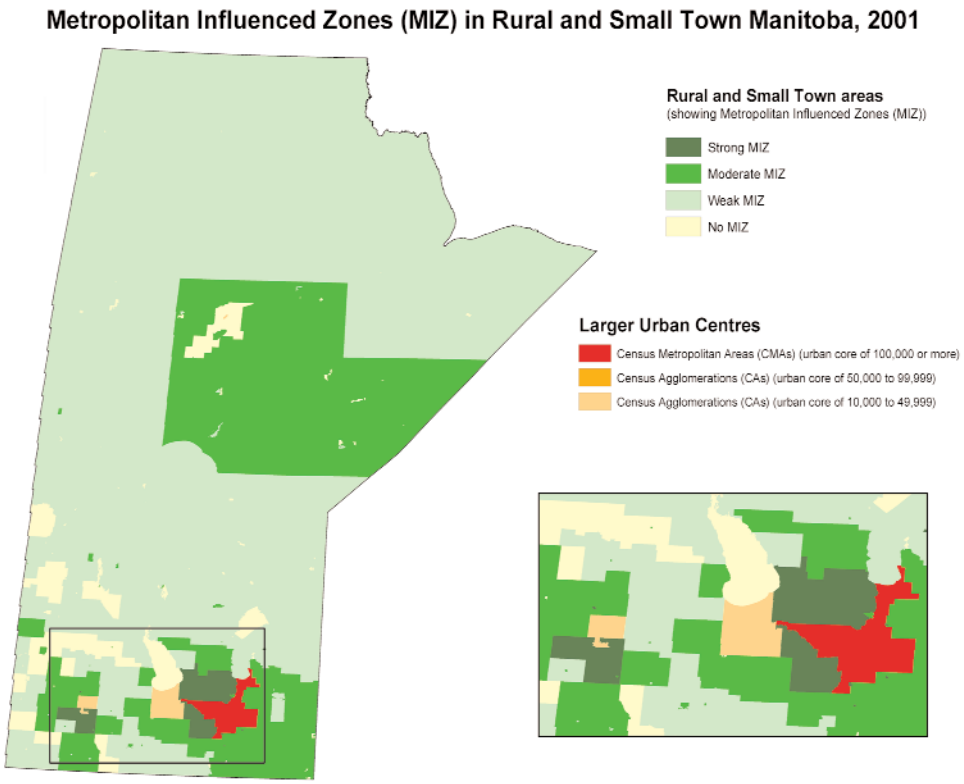
Source: Adapted from Statistics Canada; custom maps developed by Spatial Analysis and Geomatics Applications, Agriculture Division, 2004. Based on the Statistics Canada Census of Population, 2001.



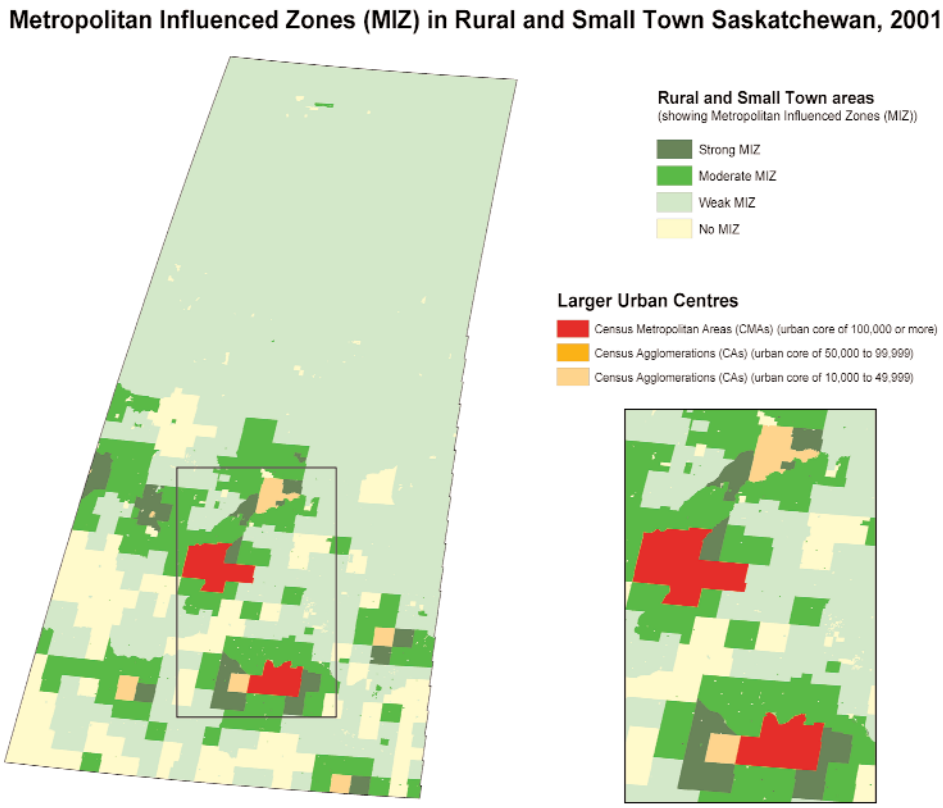
Source: Adapted from Statistics Canada; custom maps developed by Spatial Analysis and Geomatics Applications, Agriculture Division, 2004. Based on the Statistics Canada Census of Population, 2001.



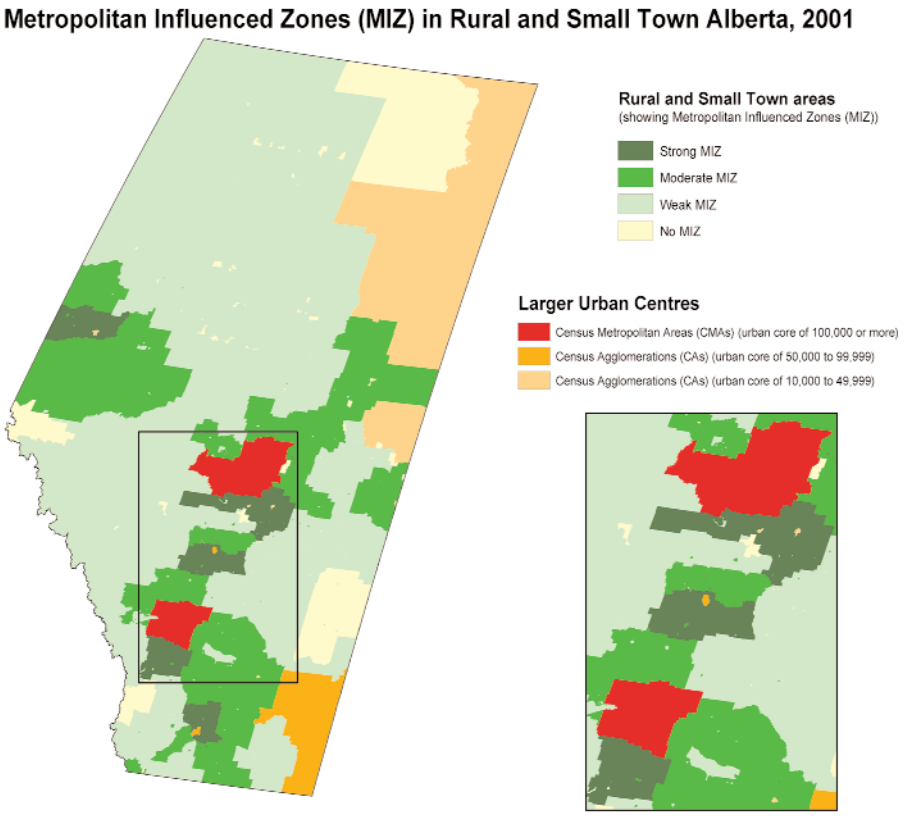
Source: Adapted from Statistics Canada; custom maps developed by Spatial Analysis and Geomatics Applications, Agriculture Division, 2004. Based on the Statistics Canada Census of Population, 2001.



Source: Adapted from Statistics Canada; custom maps developed by Spatial Analysis and Geomatics Applications, Agriculture Division, 2004. Based on the Statistics Canada Census of Population, 2001.

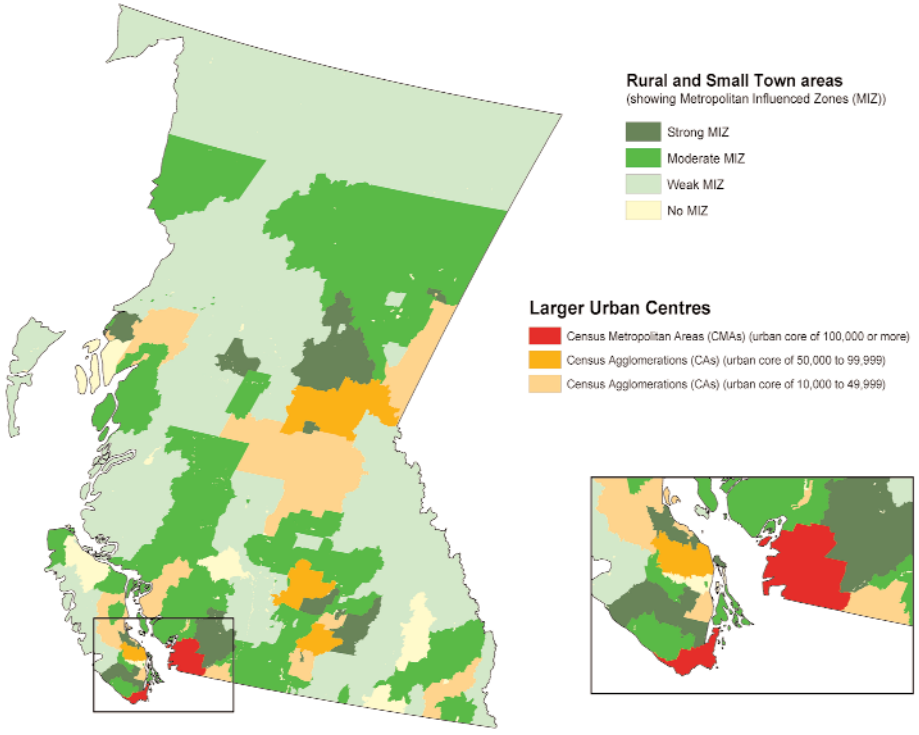


Source: Adapted from Statistics Canada; custom maps developed by Spatial Analysis and Geomatics Applications, Agriculture Division, 2004. Based on the Statistics Canada Census of Population, 2001.



Source: Adapted from Statistics Canada; custom maps developed by Spatial Analysis and Geomatics Applications, Agriculture Division, 2004. Based on the Statistics Canada Census of Population, 2001.

Metropolitan Influenced Zones (MIZ) in Rural and Small Town British Columbia, 2001



Source: Adapted from Statistics Canada; custom maps developed by Spatial Analysis and Geomatics Applications, Agriculture Division, 2004. Based on the Statistics Canada Census of Population, 2001.

Appendix B

Statistics Canada, Canadian Community Health Survey: Methodology and Analysis

Canadian Community Health Survey, Cycle 1.1, 2000–2001

The Canadian Community Health Survey (CCHS) is a cross-sectional survey that collects information related to health status, health care utilization and health determinants for the Canadian population. The CCHS operates on a two-year collection cycle. The first year of the survey cycle (Cycle 1.1, and the one used in the data analysis for this study) is a large-sample, general population health survey designed to provide reliable estimates down to the health region level. From here on, "CCHS" will refer to the CCHS Cycle 1.1. While a brief description of the survey is presented below, a more detailed version is available through Statistics Canada.[1]

Target Population

Information covering all provinces and territories was collected between September 2000 and November 2001. The CCHS targets persons aged 12 years or older who are living in private dwellings in the 10 provinces and the three territories. Persons living on Indian reserves or Crown lands, the clientele of institutions, full-time members of the Canadian Armed Forces and residents of certain remote regions are excluded from this survey. The CCHS covered approximately 98% of the Canadian population aged 12 years and older.

Questionnaire Design and Data Collection Method

The CCHS questionnaire was administered using computer-assisted interviewing. Proxy interviews were allowed only if it was confirmed that the selected respondent would not be present for the entire collection period, in cases of mental or physical incapacity preventing an interview from taking place or because of language barriers. At the end of data collection, 6.3% of all interviews had been completed by proxy. Consequently, important information was missing for the individuals represented in those interviews. To fill in these missing responses, values were imputed using the "nearest neighbour" imputation method.[2] This method was used only to fill in the proxy interviews; it was not used for cases of total or partial non-responses obtained in non-proxy interviews. Data from a non-proxy respondent with similar characteristics was used as a donor, and information from that record was copied to the record with missing data. This method was applied within defined imputation classes. The nearest neighbour was found on the basis of a specific distance function, which used relevant information available for both proxy and non-proxy respondents. For cases in which data quality could not be improved through imputation, responses were left coded as missing.

Weighting

All analyses performed on the CCHS data were weighted in order to ensure that derived estimates were meaningful or representative of the entire targeted Canadian population 12 years of age and older. The principle behind estimation in a sample such as the CCHS is that each person in the sample "represents," besides himself or herself, several other persons not in the sample.

Response Rates

In total, 136,937 households were selected to participate in the CCHS. Out of these selected households, a response was obtained for 125,159, which resulted in an overall household-level response rate of 91.4%. Among these responding households, 142,421 individuals were selected to participate in the CCHS, of whom 130,827 responded; this resulted in an overall person-level response rate of 91.9%. At the Canada level, this would yield a combined response rate of 84.7% for the CCHS.

Exact Variances

In order to estimate measures of precision, the bootstrap method was the one recommended by Statistics Canada[1, 3] and used for analysis of the CCHS data. This method was employed to determine the statistical significance of differences between ratios (that is, differences in proportions between CMA/CA and the four MIZ categories).

Variable Definitions

Activity Limitations

This variable was based on a positive response to any of the following questions: "Because of a long-term physical or mental condition or a health problem, are you limited in the kind or amount of activity you can do: at home? at school? at work? in other activities? (yes/no)."

Alcohol Consumption

This variable represents the average number of drinks the respondent consumed per day and is calculated by taking the weekly total alcohol consumption and dividing it by 7. This derived variable is calculated only for those respondents who had had at least one drink in the previous 12 months. For the purpose of this study, we compared those who consumed less than two drinks per day to those who consumed over two drinks per day. This cut-off was chosen based on the literature. Studies have found that moderate alcohol consumption (one to two drinks per day) could potentially have health benefits.

Breastfeeding

Whether a woman breastfed her last baby.

Body Mass Index (BMI)

The body mass index is calculated as follows: weight in kilograms divided by height in metres squared.

The Canadian index classifies BMI score as follows: under 20 (underweight), 20 to 24.9 (acceptable weight), 25 to 26.9 (some excess weight) and 27 or higher (overweight). The index is calculated for those aged 20 to 64, excluding pregnant women and persons less than 3 feet (0.914 metres) tall or greater than 6 feet 11 inches (2.108 metres). The weight and height measures are self-reported by each of the respondents.

Chronic Conditions

The respondents were asked about specified chronic conditions‡‡‡‡ that they may have. Chronic conditions were defined as "long-term conditions" that had lasted or were expected to last six months or more and that had been diagnosed by a health professional.

Depression

The CCHS also assesses the respondent's state of depression. The items used to measure depression are based on the work of Kessler et al.[4] They selected a subset of items from the Composite International Diagnostic Interview (CIDI) that measure major depressive episodes (MDEs). The CIDI is a structured diagnostic instrument that was designed to produce diagnoses according to the definitions and the criteria of both the Diagnostic and Statistical Manual of Mental Disorders, third edition, revised (DSM-lll-R), and the Diagnostic Criteria for the Research of the ICD-10. A score equal to or greater than 0.25 is considered to be indicative of a case of depression.

Diet

This variable classifies the respondent according to frequency of daily fruit and vegetable intake. For this study, we compared those who were eating less than five servings with those eating more than five servings of fruit or vegetables per day.

Disability Days

The variable "disability days" is defined as either spending all or part of the day in bed or having to cut down on activities normally performed during the day because of illness or injury in the previous 14 days. For the purpose of the analysis, three categories were formed: 1 to 5 days, 6 to 10 days and 11 to 14 days.

‡‡‡‡ Chronic conditions include asthma, arthritis or rheumatism (excluding fibromyalgia), high blood pressure, emphysema or chronic obstructive pulmonary disease (asked of those aged 30+), diabetes, heart disease, cancer, Alzheimer's disease or any other dementia (asked of those aged 18+).

Education

Highest level of education, classified by Statistics Canada as less than secondary school graduation, secondary school graduation, some postsecondary or postsecondary graduation.

Exposure to Second-Hand Smoke

We compared people who were exposed to second-hand smoke on most days in the previous month with those who were not exposed to second-hand smoke.

Food Insecurity

This variable represents whether the respondent reported having any food insecurity in the previous 12 months.

Food Quality

This variable represents whether the respondent reported sometimes or never eating the desired quality or variety of food because of a lack of money.

Health Utilities Index (HUI)

A generic health status measure designed to assess both quantitative and qualitative aspects of life. It is based on the Comprehensive Health Status Measurement System (CHSMS). It provides a description of an individual's overall functional health, based on eight attributes: vision, hearing, speech, mobility (ability to get around), dexterity (use of hands and fingers), cognition (memory and thinking), emotion (feelings), pain and discomfort. The responses are weighted, and the derived score describes the individual's overall functional health status. The scores range from 0.0 (worst health state, death) to 1.0 (best state, full health). Kopec et al.[5] have explored various cut-offs for the HUI and their interpretation, and suggest that a score less than 0.830 be taken as indicative of disability.

Income

This variable classifies the total household income into four categories, as designated by Statistics Canada, based on total household income and the number of people living in the household. For the purpose of the bivariate analysis, income categories were grouped into two categories: lowest/lower middle/middle income and upper middle/highest income.

Lowest Income	Lower Middle Income	Middle Income	Upper Middle Income	Highest Income
<$10,000 if 1–4 people <$15,000 if 5+ people	$10,000–$14,999 if 1–2 $10,000–$19,999 if 3 or 4 $15,000–$29,999 if 5+	$15,000–$29,999 if 1–2 $20,000–$39,999 if 3 or 4 $30,000–$59,999 if 5+	$30,000–$59,999 if 1 or 2 $40,000–$79,999 if 3 or 4 $60,000–$79,999 if 5+	>$60,000 if 1 or 2 >$80,000 if 3+

Injuries

This variable represents whether the respondent reported being injured in the previous 12 months.

Pain

Participants were asked to indicate which of four categories best described their situation with respect to pain: no pain or discomfort, mild pain, moderate pain or severe pain.

Physical Activity Index

In order to derive a physical activity index (that is, active, moderately active or inactive), the energy expenditure (EE) of participants in their leisure activities[§§§§] was estimated. EE is calculated using the frequency and time per session of the physical activity as well as its MET value. The MET is a value of metabolic energy cost expressed as a multiple of the resting metabolic rate. Statistics Canada then categorizes the EE values as follows: EE ≥3.0 represents Active, EE ≥1.5 and <3.0 represents Moderate, EE ≥0 and <1.5 represents Inactive.

Self-Esteem

The self-esteem index reflects the amount of positive feelings an individual holds about himself or herself. Scores on the index are based on a subset of items from the self-esteem Rosenberg scale (1969). The six items have been factored into one dimension in the factor analysis done by Pearlin and Schooler (1978). Higher scores indicate greater self-esteem and are categorized as less than or equal to 17, and 18 and over. A score of 17 or less indicates a low self-esteem.

Self-Rated Health

The CCHS asked respondents to rate their health as either "excellent," "very good," "good," "fair" or "poor." For the purpose of the analysis, the first three and the last two categories were grouped together.

Sense of Community Belonging

This referred to whether the respondent reported having a somewhat strong to very strong sense of belonging to his or her local community. The categories used were "very strong" and "somewhat strong" together; and "somewhat weak" and "very weak."

---

§§§§ Leisure activities include walking for exercise, gardening or yardwork, swimming, bicycling, popular or social dance, home exercises, ice hockey, ice skating, in-line skating or rollerblading, jogging or running, golfing, exercise class or aerobics, downhill skiing or snowboarding, bowling, baseball or softball, tennis, weight-training, fishing, volleyball, basketball and other.

Smoking

Smoking status was categorized as "daily," "occasionally" and "never."

Stress

Stress was measured in the CCHS by asking respondents to classify the perceived amount of stress in their daily lives (not at all stressful, not very stressful, a bit stressful, quite a bit stressful and extremely stressful). The last two categories were combined for the purpose of this analysis.

Suicide

This variable referred to whether the respondent had seriously considered committing suicide in the previous 12 months.

Unemployment

This variable indicated the respondent's job status. Those considered unemployed were either not employed in the previous week or permanently unable to work.

References

1. Statistics Canada, *Canadian Community Health Survey (CCHS), Cycle 1.1, Public Use Microdata File Documentation* (Ottawa: Statistics Canada, Health Statistics Division, 2002).

2. M. St-Pierre and Y. Béland. "Imputation of Proxy Respondents in the Canadian Community Health Survey," in the *2002 Proceedings of the Survey Methods Section* (Ottawa: Statistical Society of Canada, 2002).

3. D. Yeo, H. Mantel and T. P. Liu, "Bootstrap Variance Estimation for the National Population Health Survey," presented at the 1999 Joint Statistical Meetings of the American Statistical Association in Baltimore, MD, 1999.

4. R. C. Kessler et al., "The World Health Organization Composite International Diagnostic Interview Short Form (CIDI-SF)," *International Journal of Methods in Psychiatric Research* 7 (1998): pp. 171–185.

5. J. A. Kopec et al., "Cross-Cultural Comparisons of Health Status in Canada Using the Health Utilities Index," *Ethnic Health* 6, 1 (2001): pp. 41–50.

Appendix C

Age-Standardized Mortality Rates: Data Tables

Table C–1

Age-Standardized All-Cause Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	694.6 (693.6–695.7)	667.8 (663.8–672.0)*	739.7 (736.6–742.8)*	735.9 (732.5–739.3)*	792.4 (783.6–801.3)*
	Men	908.0 (906.1–910.0)	838.9 (832.0–845.8)*	946.3 (941.0–951.5)*	940.7 (935.1–946.4)*	1010.4 (996.1–1025.0)*
	Women	542.4 (541.2–543.6)	515.2 (510.4–520.1)*	563.5 (559.9–567.1)*	557.7 (553.7–561.7)*	585.1 (574.7–595.7)*
0–4	All	156.7 (154.8–158.7)	139.8 (133.1–146.9)*	177.7 (171.3–184.2)*	203.3 (196.6–210.2)*	257.0 (240.7–274.5)*
	Men	173.4 (170.6–176.3)	157.6 (147.6–168.1)*	197.4 (188.1–207.2)*	224.0 (214.3–332.2)*	305.5 (280.9–332.2)*
	Women	139.2 (136.6–141.9)	121.1 (112.2–130.7)*	157.0 (148.6–165.9)*	181.5 (172.6–190.9)*	205.1 (184.5–228.0)*
5–19	All	29.2 (28.7–29.7)	40.9 (38.9–43.0)*	48.1 (46.3–49.9)*	51.6 (49.8–53.5)*	76.8 (71.6–82.4)*
	Men	38.0 (37.2–38.8)	56.5 (53.2–60.0)*	64.9 (62.0–67.8)*	69.8 (66.8–72.9)*	100.3 (92.1–109.2)*
	Women	20.0 (19.4–20.6)	23.8 (21.6–26.1)*	30.0 (28.0–32.1)*	32.1 (30.1–34.3)*	51.4 (45.4–58.1)*
20–44	All	101.7 (101.1–102.3)	103.3 (100.5–105.6)	129.4 (127.1–131.7)*	128.9 (126.0–130.7)*	185.6 (178.5–193.0)*
	Men	139.4 (138.4–140.4)	141.1 (137.1–145.3)	176.6 (172.9–180.4)*	178.7 (174.9–182.6)*	254.5 (243.1–266.4)*
	Women	63.9 (63.2–64.6)	62.3 (59.6–65.2)	78.7 (76.2–81.3)*	74.1 (71.6–76.7)*	109.3 (101.5–117.7)*
45–64	All	614.9 (612.7–617.2)	567.0 (559.0–575.1*	651.8 (645.1–658.6)*	656.0 (648.5–663.6)*	757.2 (733.9–775.1)*
	Men	794.1 (790.5–797.8)	717.6 (705.1–730.3)*	842.4 (831.6–853.3)*	838.5 (826.6–850.5)*	948.3 (916.7–980.9)*
	Women	444.5 (441.8–447.2)	406.6 (396.9–416.5)*	459.3 (451.3–467.4)*	467.7 (458.7–476.9)*	545.1 (520.4–571.0)*
65+	All	4,521.8 (4,513.7–4,529.9)	4,352.7 (4,321.5–4,384.2)*	4,705.9 (4,683.5–4,728.3)*	4,647.4 (4,622.8–4,672.0)*	4,688.3 (4,626.4–4,751.1)*
	Men	5,923.2 (5,907.7–5,938.7)	5,417.1 (5,363.6–5,471.0)*	5,977.2 (5,938.2–6,016.4)	5,902.9 (5,860.6–5,945.5)	5,945.8 (5,842.7–6,050.7)
	Women	3,642.9 (3,633.8–3,652.1)	3,478.6 (3,441.6–3,516.0)*	3,719.6 (3,693.5–3,745.8)*	3,652.2 (3,623.5–3,681.1)	3,583.5 (3,510.5–3,658.0)

† Reference group.

* Statistically significant at $p < 0.05$.

Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–2

Age-Standardized Circulatory Disease Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	273.4 (272.7–274.0)	274.8 (272.2–277.5)	292.2 (290.3–294.1)*	289.7 (287.6–291.8)*	301.7 (296.4–307.2)*
	Men	354.5 (353.2–355.8)	339.8 (335.4–344.3)*	368.6 (365.3–371.9)*	366.9 (363.3–370.5)*	377.7 (368.9–386.7)*
	Women	214.1 (213.3–214.8)	215.1 (212.0–218.3)	226.5 (224.3–228.7)*	221.9 (219.5–224.3)*	229.2 (222.9–235.7)*
0–4	All	2.6 (2.3–2.8)	2.5 (1.7–3.6)	2.5 (1.9–3.4)	3.8 (3.0–4.8)*	4.9 (3.0–7.9)*
		s	s	s	s	s
		s	s	s	s	s
5–19	All	1.0 (1.0–1.1)	0.9 (0.7–1.3)	1.2 (1.0–1.6)	1.1 (0.8–1.4)	1.4 (0.8–2.4)
		s	s	s	s	s
		s	s	s	s	s
20–44	All	11.4 (11.2–11.6)	11.3 (10.6–12.2)	15.0 (14.2–15.8)*	13.9 (13.1–14.7)*	18.2 (16.0–20.7)*
	Men	16.2 (15.9–16.6)	15.9 (14.6–17.3)	20.1 (18.9–21.4)*	19.4 (18.2–20.7)*	25.1 (21.6–29.1)*
	Women	6.5 (6.3–6.8)	6.5 (5.7–7.4)	9.5 (8.6–10.4)*	8.0 (7.2–8.8)*	10.5 (8.3–13.4)*
45–64	All	183.6 (182.4–184.9)	182.6 (178.0–187.2)	205.9 (202.2–209.8)*	206.5 (202.3–210.8)*	238.1 (226.8–249.9)*
	Men	275.3 (273.1–277.5)	263.2 (255.7–271.0)*	300.6 (294.2–307.1)*	300.5 (293.4–307.8)*	338.5 (319.9–358.2)*
	Women	96.3 (95.1–97.6)	96.6 (92.0–101.5)	110.4 (106.5–114.4)*	109.4 (105.1–113.9)*	129.8 (118.0–142.6)*
65+	All	2,037.8 (2,032.3–2,043.2)	2,052.8 (2,031.3–2,074.5)	2,151.5 (2,136.4–2,166.7)*	2,132.1 (2,115.6–2,148.8)*	2,167.1 (2,125.1–2,209.8)*
	Men	2,574.9 (2,564.7–2,585.2)	2,468.4 (2,432.2–2,505.1)*	2,641.2 (2,615.3–2,667.4)*	2,628.1 (2,599.9–2,656.6)*	2,636.7 (2,568.3–2,707.0)
	Women	1,684.6 (1,678.4–1,690.7)	1,694.0 (1,668.3–1,720.1)	1,757.9 (1,740.1–1,775.8)*	1,725.0 (1,705.5–1,744.8)*	1,743.5 (1,693.1–1,795.4)*

† Reference group.
* Statistically significant at $p < 0.05$.
s Data suppressed.
Circulatory diseases include all conditions forming ICD-9, Chapter 7, diagnostic codes 390 to 459.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–3

Age-Standardized All-Cancer Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA[†]	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	191.3 (190.7–191.9)	177.4 (175.3–179.5)*	193.4 (191.9–195.0)	189.4 (187.7–191.2)	197.0 (192.6–201.5)*
	Men	247.0 (246.0–248.0)	221.3 (217.8–224.7)*	245.4 (242.8–248.1)	238.7 (235.9–241.6)*	250.1 (243.0–257.3)
	Women	155.1 (154.5–155.8)	140.8 (138.3–143.4)*	152.2 (150.3–154.1)*	149.9 (147.8–152.0)*	150.1 (144.7–155.7)
0–4	All	3.5 (3.2–3.8)	3.1 (2.2–4.3)	3.3 (2.6–4.3)	3.0 (2.3–4.0)	4.2 (2.5–7.0)
	Men	s	s	s	s	s
	Women	s	s	s	s	s
5–19	All	3.6 (3.4–3.7)	4.3 (3.7–5.0)	3.8 (3.4–4.4)	3.4 (3.0–4.0)	2.7 (1.9–4.0)
	Men	s	s	s	s	s
	Women	s	s	s	s	s
20–44	All	20.3 (20.0–20.6)	19.4 (18.4–20.5)	22.0 (21.1–23.0)*	20.7 (19.8–21.7)	23.7 (21.2–26.5)*
	Men	17.8 (17.4–18.1)	17.5 (16.1–18.9)	18.7 (17.5–19.9)	17.5 (16.3–18.7)	20.1 (17.0–23.7)
	Women	22.8 (22.4–23.2)	21.5 (19.9–23.1)	25.6 (24.2–27.1)*	24.2 (22.7–25.7)	27.7 (23.9–32.2)*
45–64	All	266.9 (265.4–268.4)	240.8 (235.4–246.2)*	266.6 (262.3–271.0)	264.5 (259.8–269.3)	280.2 (267.9–293.0)
	Men	298.0 (295.7–300.2)	264.7 (257.1–272.5)*	300.8 (294.4–307.3)	292.3 (285.3–299.4)	309.6 (291.9–328.4)
	Women	238.1 (236.2–240.1)	215.8 (208.7–223.1)*	232.7 (227.0–238.5)	236.4 (230.0–242.9)	248.8 (232.3–266.5)
65+	All	1,140.3 (1,136.2–1,144.3)	1,064.6 (1,049.5–1,080.0)*	1,152.7 (1,141.7–1,163.9)	1,127.0 (1,114.9–1,139.3)	1,156.4 (1,125.7–1,187.8)
	Men	1,583.6 (1,575.9–1,591.5)	1,413.9 (1,387.5–1,440.7)*	1,561.4 (1,541.8–1,581.1)	1,521.4 (1,500.1–1,542.9)*	1,583.3 (1,531.0–1,637.5)
	Women	8,64.2 (8,59.7–868.8)	781.4 (763.8–799.3)*	837.4 (8,24.8–8,50.1)*	817.9 (804.0–832.1)*	785.4 (751.0–821.3)*

[†] Reference group.
* Statistically significant at $p < 0.05$.
s Data suppressed.
All cancers include all conditions forming ICD-9, Chapter 2, diagnostic codes 140 to 239.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–4

Age-Standardized Lung Cancer Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	50.0 (49.7–50.2)	45.9 (44.9–47.0)*	51.4 (50.6–52.2)*	48.8 (47.9–49.7)	52.0 (49.8–54.3)
	Men	78.1 (77.5–78.6)	69.4 (67.5–71.3)*	80.7 (79.3–82.2)*	74.5 (72.9–76.1)*	80.6 (76.6–84.8)
	Women	30.0 (29.7–30.3)	25.0 (23.9–26.0)*	26.4 (25.6–27.2)*	26.5 (25.6–27.4)*	25.2 (23.0–27.6)*
20–44	All	2.7 (2.6–2.8)	2.9 (2.5–3.3)	3.2 (2.9–3.6)*	2.6 (2.3–2.9)	2.8 (2.0–3.8)
	Men	2.7 (2.6–2.8)	2.9 (2.3–3.5)	3.2 (2.7–3.7)	2.7 (2.3–3.3)	3.5 (2.4–5.2)
	Women	2.7 (2.6–2.9)	2.9 (2.3–3.5)	3.3 (2.8–3.8)	2.4 (2.0–2.9)	1.9 (1.1–3.4)
45–64	All	81.2 (80.4–82.0)	78.7 (75.8–81.8)	87.7 (85.3–90.2)*	81.3 (78.7–84.0)	92.1 (85.2–99.5)*
	Men	109.3 (108.0–110.7)	103.1 (98.4–108.0)	122.8 (118.8–127.0)*	109.0 (104.8–113.4)	124.9 (113.9–137.0)*
	Women	54.7 (53.8–55.7)	53.0 (49.5–56.6)	52.4 (49.7–55.2)	53.0 (50.0–56.1)	56.8 (49.2–65.6)
65+	All	289.9 (287.9–292.0)	258.2 (250.9–265.8)*	289.7 (284.2–295.3)	279.7 (273.6–285.9)*	289.1 (273.9–305.1)
	Men	488.4 (484.1–492.7)	422.2 (408.3–436.6)*	487.1 (476.4–498.0)	457.2 (445.7–468.9)*	480.9 (452.6–511.0)
	Women	160.1 (158.1–162.1)	118.1 (111.4–125.2)*	130.6 (125.6–135.7)*	133.6 (128.0–139.5)*	117.2 (104.2–131.9)*

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–5

Age-Standardized Colorectal Cancer Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	21.2 (21.0–21.4)	20.0 (19.4–20.8)*	20.7 (20.2–21.2)	18.8 (18.2–19.3)*	20.5 (19.1–21.9)
	Men	26.6 (26.3–26.9)	23.2 (22.1–24.4)*	24.5 (23.7–25.4)*	22.5 (21.6–23.3)*	24.4 (22.2–26.7)
	Women	17.4 (17.2–17.6)	17.2 (16.3–18.1)	17.6 (17.0–18.2)	15.6 (15.0–16.3)*	16.9 (15.2–18.8)
20–44	All	1.29 (1.22–1.36)	1.07 (0.85–1.35)	1.66 (1.42–1.94)*	1.23 (1.02–1.49)	1.99 (1.34–2.93)
	Men	1.36 (1.26–1.47)	1.12 (0.82–1.53)	1.74 (1.41–2.15)	1.38 (1.08–1.77)	1.75 (0.99–3.08)
	Women	1.22 (1.13–1.32)	1.02 (0.73–1.44)	1.57 (1.25–1.97)	1.07 (0.80–1.43)	2.26 (1.34–3.82)*
45–64	All	25.7 (25.3–26.2)	24.2 (22.6–25.9)	25.2 (23.9–26.6)	24.0 (22.6–25.5)	25.4 (18.8–29.4)
	Men	31.1 (30.3–31.8)	27.7 (25.3–30.3)	28.4 (26.5–30.5)	27.2 (25.1–29.4)*	27.2 (22.3–33.2)
	Women	20.7 (20.2–21.3)	20.4 (18.3–22.8)	22.0 (20.3–23.8)	20.8 (18.9–22.8)	23.5 (18.8–29.4)
65+	All	137.4 (136.0–138.8)	130.6 (125.3–136.1)	132.8 (129.0–136.6)	119.0 (115.1–123.0)*	128.8 (118.8–139.5)
	Men	175.3 (172.7–178.0)	152.2 (143.7–161.3)*	160.2 (154.0–166.7)*	145.5 (139.0–152.2)*	161.0 (144.9–178.9)
	Women	112.7 (111.1–114.4)	112.1 (105.6–119.1)	111.0 (106.5–115.7)	97.5 (92.8–102.5)*	100.1 (88.4–113.4)

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–6

Age-Standardized Breast Cancer Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	Women	31.0 (30.7–31.3)	27.1 (26.0–28.2)*	28.9 (28.0–29.7)*	28.3 (27.4–29.2)*	27.4 (25.1–29.9)*
20–44	Women	7.5 (7.2–7.7)	6.7 (5.9–7.6)	7.7 (6.9–8.5)	6.7 (6.0–7.5)	8.5 (6.5–11.2)
45–64	Women	60.5 (59.5–61.5)	50.7 (47.3–54.3)*	53.9 (51.2–56.8)*	54.1 (51.2–56.8)*	53.8 (46.4–62.4)
65+	Women	141.3 (139.4–143.1)	126.8 (119.8–134.1)*	133.4 (128.4–138.6)*	131.6 (126.1–137.4)*	117.5 (104.6–131.9)*

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–7

Age-Standardized Cervical Cancer Mortality Rates (per 100,000), by Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	Women	2.7 (2.7–2.8)	2.6 (2.2–2.9)	2.8 (2.5–3.1)	3.2 (2.8–3.5)	3.7 (2.9–4.7)*
20–44	Women	1.5 (1.4–1.6)	1.5 (1.1–1.9)	1.8 (1.4–2.2)	2.2 (1.8–2.7)*	3.2 (2.1–4.9)*
45–64	Women	5.0 (4.7–5.3)	4.8 (3.8–6.0)	4.7 (3.9–5.6)	5.7 (4.8–6.8)	6.0 (3.8–9.3)
65+	Women	10.0 (9.6–10.5)	9.0 (7.3–11.1)	10.0 (8.7–11.5)	10.0 (8.6–11.8)	10.4 (7.0–15.5)

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–8

Age-Standardized Prostate Cancer Mortality Rates (per 100,000), by Age Group and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	Men	29.8 (29.4–30.2)	29.7 (28.4–31.1)	31.3 (30.4–32.3)*	32.8 (31.8–33.9)*	32.5 (30.0–35.2)
45–64	Men	11.2 (10.7–11.6)	10.2 (8.8–11.9)	11.7 (10.5–13.0)	12.9 (11.5–14.5)	15.1 (11.6–19.7)
65+	Men	241.8 (238.7–245.0)	242.8 (231.6–254.6)	254.2 (246.2–262.4)*	265.5 (256.7–274.7)*	258.0 (237.2–280.6)

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–9

Age-Standardized Respiratory Disease Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	59.2 (58.9–59.5)	55.8 (54.6–57.0)*	64.0 (63.1–64.9)*	65.1 (64.1–66.1)*	65.5 (63.1–68.1)*
	Men	88.8 (88.2–89.5)	79.8 (77.6–82.0)*	93.2 (91.5–94.9)*	92.1 (90.4–93.9)*	91.8 (87.5–96.3)
	Women	42.1 (41.7–42.4)	37.8 (36.5–39.1)*	42.6 (41.7–43.6)	44.8 (43.7–45.9)*	43.2 (40.5–46.1)
0–4	All	3.6 (3.3–3.9)	4.5 (3.5–5.9)	5.1 (4.1–6.3)*	9.0 (7.7–10.5)*	12.9 (9.6–17.3)*
		s	s	s	s	s
		s	s	s	s	s
5–19	All	0.8 (0.8–0.9)	0.9 (0.6–1.2)	0.9 (0.7–1.2)	1.0 (0.8–1.3)	0.8 (0.4–1.6)
		s	s	s	s	s
		s	s	s	s	s
20–44	All	2.1 (2.0–2.2)	1.8 (1.5–2.2)	2.2 (2.0–2.6)	2.3 (2.0–2.6)	3.1 (2.3–4.2)*
	Men	2.3 (2.2–2.5)	2.1 (1.6–2.6)	2.5 (2.1–3.0)	2.7 (2.2–3.2)	3.2 (2.1–4.9)
	Women	1.8 (1.7–1.9)	1.6 (1.2–2.1)	1.9 (1.5–2.4)	1.8 (1.4–2.3)	3.0 (1.9–4.7)
45–64	All	25.8 (25.3–26.3)	22.9 (21.3–24.6)*	28.5 (27.1–29.9)*	29.4 (27.8–31.0)*	38.5 (34.2–43.4)*
	Men	32.8 (32.0–33.6)	28.2 (25.8–30.8)*	36.3 (34.1–38.6)*	36.5 (34.1–39.1)*	46.8 (40.2–54.5)*
	Women	19.2 (18.7–19.8)	17.3 (15.4–19.5)	20.6 (19.0–22.4)	22.1 (20.2–24.1)*	29.6 (24.3–36.1)*
65+	All	463.4 (460.8–466.0)	438.7 (428.8–448.8)*	499.4 (492.1–506.7)*	504.8 (496.8–513.0)*	487.9 (468.2–508.4)*
	Men	709.9 (704.4–715.4)	638.6 (620.0–657.8)*	739.7 (725.9–753.8)*	727.1 (712.2–742.3)	702.7 (667.7–739.6)
	Women	325.7 (323.0–328.4)	291.9 (281.4–302.9)*	327.4 (319.8–335.1)	341.9 (333.3–350.7)*	309.0 (288.2–331.4)

† Reference group.
* Statistically significant at $p < 0.05$.
s Data suppressed.
Respiratory diseases include all conditions forming ICD-9, Chapter 8, diagnostic codes 460 to 519.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–10

Age-Standardized Injuries and Poisonings Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	43.0 (42.8–43.3)	54.5 (53.3–55.7)*	65.7 (64.7–66.7)*	68.1 (67.0–69.1)*	97.1 (94.0–100.4)*
	Men	61.9 (61.4–62.3)	79.2 (77.2–81.2)*	97.3 (95.6–99.0)*	101.2 (99.4–103.1)*	142.5 (137.2–148.1)*
	Women	25.6 (25.3–25.9)	29.0 (27.8–30.2)*	33.3 (32.4–34.3)*	34.0 (33.0–35.0)*	48.5 (45.4–51.8)*
0–4	All	10.8 (10.3–11.3)	15.0 (12.9–17.3)*	23.8 (21.6–26.2)*	27.4 (25.0–29.9)*	45.6 (39.1–53.2)*
	Men	12.4 (11.6–13.2)	17.6 (14.6–21.3)*	28.5 (25.3–32.3)*	30.5 (27.2–34.3)*	58.8 (48.7–71.1)*
	Women	9.1 (8.5–9.8)	12.2 (9.7–15.3)	18.8 (16.1–22.0)*	24.1 (21.0–27.5)*	31.5 (24.1–41.1)*
5–19	All	17.7 (17.3–18.0)	29.3 (27.6–31.1)*	35.6 (34.1–37.1)*	39.3 (37.7–41.0)*	62.3 (57.6–67.3)*
	Men	25.2 (24.6–25.8)	43.0 (40.1–46.0)*	51.3 (48.8–53.9)*	55.4 (52.8–58.2)*	85.6 (78.0–93.9)*
	Women	9.8 (9.4–10.2)	14.2 (12.6–16.1)*	18.6 (17.0–20.3)*	21.9 (20.2–23.8)*	37.1 (32.0–42.9)*
20–44	All	42.7 (42.3–43.1)	55.0 (53.2–56.9)*	70.5 (68.8–72.2)*	73.1 (71.3–74.9)*	112.6 (107.2–118.3)*
	Men	66.0 (65.3–66.7)	85.1 (81.9–88.4)*	110.2 (107.3–113.2)*	115.9 (112.8–119.0)*	173.3 (164.0–183.0)*
	Women	19.4 (19.0–19.7)	22.8 (21.2–24.6)*	27.7 (26.2–29.3)*	27.2 (25.7–28.8)*	45.5 (40.6–51.0)*
45–64	All	42.0 (41.4–42.6)	50.8 (48.5–53.3)*	63.2 (61.1–65.4)*	66.2 (63.8–68.6)*	94.5 (87.4–102.2)*
	Men	60.5 (59.5–61.5)	75.3 (71.4–79.6)*	96.0 (92.4–99.8)*	99.7 (95.6–103.9)*	135.8 (124.1–148.7)*
	Women	24.0 (23.4–24.6)	24.5 (22.2–27.0)	29.6 (27.6–31.7)*	31.1 (28.8–33.6)*	49.7 (42.6–58.1)*
65+	All	111.2 (109.9–112.5)	128.3 (123.0–133.8)*	131.9 (128.2–135.7)*	129.5 (125.5–133.7)*	139.0 (128.6–150.2)*
	Men	145.3 (142.9–147.8)	166.7 (157.6–176.4)*	176.7 (170.2–183.6)*	175.9 (168.7–183.4)*	195.3 (177.3–215.0)*
	Women	89.7 (88.2–91.1)	96.1 (90.1–102.4)	95.6 (91.5–99.9)*	91.5 (87.0–96.1)	88.0 (77.2–100.3)

† Reference group.
* Statistically significant at $p < 0.05$.
Injuries and poisonings include all conditions forming ICD-9, Chapter 17, diagnostic codes 800 to 999.
Data source: Canadian annual mortality data, 1986 to 1996. Statistics Canada.

Table C–11

Age-Standardized Motor Vehicle Accident Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence and Gender, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	10.3 (10.1–10.4)	20.9 (20.2–21.7)*	24.0 (23.4–24.6)*	22.7 (22.1–23.3)*	30.4 (28.7–32.2)*
	Men	14.6 (14.4–14.8)	29.1 (27.9–30.3)*	34.5 (33.5–35.6)*	31.9 (30.9–33.0)*	41.6 (38.8–44.6)*
	Women	6.1 (6.0–6.3)	12.4 (11.6–13.2)*	13.2 (12.5–13.8)*	13.1 (12.4–13.7)*	18.4 (16.5–20.5)*
0–4	All	2.9 (2.6–3.2)	6.0 (4.7–7.5)*	8.7 (7.4–10.2)*	8.4 (7.1–9.8)*	9.2 (6.6–13.0)*
	Men	3.4 (3.0–3.8)	7.8 (5.9–10.3)*	9.7 (7.8–11.9)*	8.0 (6.4–10.1)*	10.9 (7.0–16.8)*
	Women	2.4 (2.1–2.7)	4.0 (2.7–6.0)	7.6 (6.0–9.7)*	8.7 (7.0–10.9)*	7.5 (4.4–12.9)*
5–19	All	8.8 (8.6–9.1)	17.3 (16.0–18.7)*	20.7 (19.6–21.9)*	20.2 (19.1–21.4)*	25.8 (22.9–29.2)*
	Men	12.1 (11.6–12.4)	23.5 (21.5–25.8)*	28.9 (27.0–30.9)*	26.8 (25.0–28.8)*	33.0 (28.4–38.3)*
	Women	5.5 (5.2–5.8)	10.5 (9.1–12.1)*	11.9 (10.7–13.2)*	13.1 (11.8–14.6)*	18.1 (14.7–22.3)*
20–44	All	11.8 (11.6–12.0)	26.1 (24.9–27.4)*	29.9 (28.8–31.0)*	27.0 (26.0–28.1)*	37.2 (34.1–40.6)*
	Men	17.6 (17.2–18.0)	38.2 (36.0–40.4)*	44.5 (42.6–46.4)*	40.5 (38.7–42.3)*	54.2 (49.2–59.8)*
	Women	5.9 (5.7–6.1)	13.2 (11.9–14.5)*	14.1 (13.1–15.3)*	12.6 (11.6–13.7)*	18.4 (15.4–22.0)*
45–64	All	8.7 (8.5–9.0)	16.1 (14.8–17.5)*	19.0 (17.8–20.2)*	20.0 (18.7–21.3)*	26.7 (23.0–30.9)*
	Men	11.9 (11.4–12.3)	21.3 (19.3–23.6)*	25.7 (23.8–27.7)*	26.3 (24.3–28.5)*	32.0 (26.5–38.6)*
	Women	5.7 (5.4–6.0)	10.5 (9.0–12.2)*	12.1 (10.8–13.5)*	13.4 (11.9–15.0)*	20.9 (16.5–26.5)*
65+	All	14.5 (14.0–14.9)	25.9 (23.6–28.4)*	26.4 (24.8–28.1)*	24.3 (22.6–26.2)*	33.1 (28.2–38.8)*
	Men	19.9 (19.0–20.8)	32.1 (28.4–36.3)*	38.5 (35.6–41.7)*	34.0 (30.9–37.3)*	46.3 (38.1–56.3)*
	Women	11.2 (10.6–11.7)	21.1 (18.3–24.2)*	17.1 (15.3–19.0)*	16.7 (14.8–18.9)*	21.1 (16.1–27.8)*

† Reference group.
* Statistically significant at $p < 0.05$.
Motor vehicle accidents include all conditions forming ICD-9, Chapter 17, diagnostic codes E810 to 825.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–12

Age-Standardized Suicide Mortality Rates (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	12.3 (12.2–12.4)	12.8 (12.3–13.4)	16.3 (15.8–16.8)*	16.2 (15.6–16.7)*	23.7 (22.2–25.3)*
	Men	19.3 (19.1–19.6)	21.4 (20.4–22.4)*	27.3 (26.4–28.2)*	27.1 (26.1–28.0)*	38.4 (35.7–41.3)*
	Women	5.7 (5.5–5.8)	4.0 (3.6–4.5)*	5.1 (4.8–5.6)	4.9 (4.5–5.3)*	7.9 (6.7–9.3)*
0–4	All	s	s	s	s	s
		s	s	s	s	s
		s	s	s	s	s
5–19	All	3.9 (3.7–4.1)	5.0 (4.4–5.8)*	6.1 (5.5–6.8)*	7.8 (7.1–8.6)*	18.4 (16.0–21.3)*
	Men	6.2 (5.9–6.5)	8.7 (7.4–10.1)*	9.6 (8.6–10.8)*	12.4 (11.2–13.7)*	26.6 (22.5–31.4)*
	Women	1.5 (1.3–1.6)	1.0 (0.7–1.6)	2.2 (1.7–2.9)*	3.0 (2.4–3.7)*	9.5 (7.1–12.7)*
20–44	All	16.5 (16.3–16.8)	16.1 (15.1–17.1)	22.2 (21.3–23.2)*	21.5 (20.5–22.5)*	32.1 (29.3–35.2)*
	Men	25.9 (25.4–26.3)	26.4 (24.7–28.2)	36.4 (34.8–38.2)*	35.6 (33.9–37.4)*	51.6 (46.7–57.1)*
	Women	7.2 (6.9–7.4)	5.2 (4.4–6.0)*	7.0 (6.2–7.8)	6.3 (5.6–7.1)	10.5 (8.3–13.3)*
45–64	All	16.0 (15.6–16.3)	16.8 (15.5–18.3)	20.4 (19.2–21.6)*	19.1 (17.9–20.4)*	21.6 (18.4–25.5)*
	Men	23.6 (23.0–24.2)	27.2 (24.9–29.8)*	33.3 (31.1–35.5)*	31.2 (28.9–33.5)*	36.3 (30.4–43.3)*
	Women	8.6 (8.2–9.0)	5.6 (4.5–6.8)*	7.1 (6.2–8.2)	6.5 (5.5–7.7)*	5.7 (3.6–9.1)
65+	All	13.2 (12.8–13.6)	16.0 (14.2–17.9)*	16.5 (15.2–17.9)*	16.5 (15.1–18.1)*	20.4 (16.7–25.0)*
	Men	23.8 (22.9–24.8)	29.2 (25.7–33.1)*	32.3 (29.6–35.2)*	32.0 (29.1–35.2)*	38.3 (30.9–47.4)*
	Women	6.3 (5.9–6.7)	4.7 (3.5–6.3)	3.6 (2.8–4.5)*	3.6 (2.8–4.7)*	3.9 (2.0–7.5)

† Reference group.
* Statistically significant at $p < 0.05$.
s Data suppressed.
Suicides include all conditions forming ICD-9, Chapter 17, diagnostic codes E950 to 959.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–13

Age-Standardized Mortality Rates for Other Injuries (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	20.5 (20.3–20.7)	20.7 (20.0–21.4)	25.3 (24.7–25.9)*	29.2 (28.6–29.9)*	43.0 (40.9–45.2)*
	Men	27.9 (27.6–28.2)	28.7 (27.5–29.9)	35.4 (34.4–36.5)*	42.2 (41.0–43.4)*	62.5 (59.0–66.2)*
	Women	13.8 (13.6–14.0)	12.7 (11.9–13.4)*	15.0 (14.4–15.6)*	16.0 (15.3–16.7)*	22.2 (20.2–24.4)*
0–4	All	7.9 (7.5–8.4)	9.0 (7.5–10.9)	15.1 (13.4–17.1)*	19.0 (17.1–21.1)*	36.3 (30.6–43.2)*
	Men	9.0 (8.4–9.7)	9.8 (7.6–12.6)	18.9 (16.3–22.0)*	22.5 (19.6–25.8)*	48.0 (38.9–59.1)*
	Women	6.7 (6.2–7.3)	8.2 (6.1–10.8)	11.2 (9.1–13.6)*	15.3 (12.9–18.2)*	23.9 (17.6–32.5)*
5–19	All	5.0 (4.8–5.2)	6.9 (6.1–7.8)*	8.8 (8.0–9.6)*	11.2 (10.4–12.1)*	18.0 (15.6–20.8)*
	Men	7.0 (6.7–7.3)	10.7 (9.4–12.3)*	12.8 (11.6–14.1)*	16.2 (14.8–17.8)*	26.0 (22.0–30.7)*
	Women	2.8 (2.6–3.1)	2.7 (2.0–3.6)	4.5 (3.8–5.3)*	5.9 (5.0–6.8)*	9.5 (7.1–12.6)*
20–44	All	14.4 (14.2–14.7)	12.7 (11.9–13.7)*	18.4 (17.5–19.3)*	24.6 (23.6–25.6)*	43.3 (40.0–46.9)*
	Men	22.5 (22.1–22.9)	20.6 (19.0–22.2)	29.3 (27.8–30.9)*	39.8 (38.0–41.6)*	67.5 (61.7–73.7)*
	Women	6.3 (6.1–6.5)	4.5 (3.8–5.3)*	6.6 (5.9–7.4)	8.3 (7.5–9.2)*	16.6 (13.8–20.1)*
45–64	All	17.3 (16.9–17.7)	17.9 (16.5–19.4)	23.9 (22.6–25.2)*	27.1 (25.6–28.6)*	46.2 (41.3–51.7)*
	Men	25.1 (24.4–25.7)	26.8 (24.4–29.3)	37.1 (34.9–39.5)*	42.2 (39.6–44.9)*	67.6 (59.4–76.8)*
	Women	9.7 (9.34–10.1)	8.4 (7.1–9.9)	10.4 (9.2–11.7)	11.3 (9.9–12.8)	23.1 (18.4–29.0)*
65+	All	83.6 (82.5–84.7)	86.5 (82.1–91.0)	89.0 (86.0–92.2)*	88.7 (85.4–92.1)*	85.5 (77.5–94.3)
	Men	101.6 (99.6–103.7)	105.4 (98.0–113.4)	105.9 (100.8–111.4)	110.0 (104.3–115.9)*	110.7 (97.3–126.0)
	Women	72.2 (71.0–73.5)	70.3 (65.2–75.7)	74.9 (71.4–78.7)	71.1 (67.2–75.2)	63.0 (54.0–73.4)

† Reference group.

* Statistically significant at $p < 0.05$.

Other injuries and poisonings include all conditions forming ICD-9, Chapter 17, diagnostic codes E800 to 809, 826 to 949 and 960 to 999.

Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–14

Age-Standardized Mortality Rates for Diabetes (per 100,000), by Age Group, Sex and Place of Residence, Canada, 1986 to 1996

Age Group	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
0–85+ (All Ages)	All	15.7 (15.6–15.9)	14.3 (13.8–14.9)*	16.9 (16.5–17.4)*	16.8 (16.3–17.3)*	18.8 (17.5–20.2)*
	Men	18.8 (18.5–19.0)	15.4 (14.5–16.3)*	18.1 (17.4–18.8)	18.0 (17.3–18.8)	19.2 (17.3–21.3)
	Women	13.6 (13.4–13.8)	13.3 (12.6–14.1)	15.9 (15.3–16.5)*	15.8 (15.1–16.4)*	18.5 (16.7–20.4)*
20–44	All	1.09 (1.03–1.16)	0.68 (0.50–0.91)*	1.23 (1.02–1.47)	1.10 (0.91–1.34)	2.07 (1.39–2.97)*
	Men	1.41 (1.31–1.52)	0.88 (0.61–1.25)	1.45 (1.14–1.82)	1.47 (1.15–1.85)	2.30 (1.35–3.67)
	Women	0.78 (0.70–0.86)	0.47 (0.27–0.76)	1.00 (0.74–1.32)	0.72 (0.50–1.01)	1.80 (0.94–3.16)*
45–64	All	12.4 (12.1–12.8)	10.5 (9.4–11.6)*	14.1 (13.2–15.1)*	13.5 (12.5–14.7)	19.5 (16.4–23.0)*
	Men	15.4 (14.9–16.0)	12.9 (11.2–14.6)*	16.5 (15.1–18.1)	14.8 (13.3–16.4)	20.8 (16.4–26.0)*
	Women	9.6 (9.2–10.0)	7.9 (6.6–9.4)	11.7 (10.5–13.0)*	12.3 (10.9–13.8)*	18.1 (13.9–23.1)*
65+	All	112.7 (111.4–113.9)	105.4 (100.7–110.4)*	119.8 (116.3–123.5)*	120.1 (116.2–124.2)*	123.7 (114.0–134.3)*
	Men	132.8 (130.6–135.1)	109.5 (102.3–117.4)*	125.2 (119.6–130.9)	127.4 (121.2–133.7)	124.3 (110.2–140.3)
	Women	99.6 (98.1–101.2)	101.5 (95.3–108.1)	115.7 (111.2–120.5)*	114.4 (109.3–119.6)*	123.7 (110.6–138.3)*

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–15

Overall Number of Deaths, by Cause, Sex and Place of Residence, Canada, 1986 to 1996

Cause	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
All-cause	All	1,623,845	103,076	223,365	184,301	31,135
	Men	854,127	59,768	126,586	105,804	18,907
	Women	769,718	43,308	96,779	78,497	12,228
Circulatory diseases	All	636,968	41,754	90,528	73,829	11,988
	Men	320,718	23,492	49,422	40,900	6,978
	Women	316,250	18,262	41,106	32,929	5,010
Respiratory diseases	All	137,688	8,372	19,951	16,788	2,634
	Men	75,786	5,170	12,195	10,130	1,697
	Women	61,902	3,202	7,756	6,658	937
All cancers	All	447,910	28,272	58,584	46,577	7,627
	Men	239,620	16,536	34,013	27,091	4,687
	Women	208,290	11,736	24,571	19,486	2,940
Diabetes	All	36,691	2,206	5,220	4,248	738
	Men	17,377	1,086	2,447	2,019	355
	Women	19,314	1,120	2,773	2,229	383
Accidents, poisonings, violence	All	102,662	8,558	17,177	15,976	3,629
	Men	68,810	6,210	12,424	11,741	2,711
	Women	33,852	2,348	4,753	4,235	918
Motor vehicle accidents*	All	24,613	3,299	6,085	5,294	1,142
	Men	17,054	2,325	4,400	3,767	802
	Women	7,559	974	1,685	1,527	340
Suicide*	All	29,592	2,044	4,106	3,679	872
	Men	22,624	1,731	3,470	3,132	729
	Women	6,968	313	636	547	143
Other injuries and poisonings*	All	48,457	3,215	6,986	7,003	1,615
	Men	29,132	2,154	4,554	4,842	1,180
	Women	19,325	1,061	2,432	2,161	435

* Suicide, motor vehicle accidents and other injuries and poisonings are subcategories of the "accidents, poisonings and violence" category.

Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table C–16

Overall Number of Incident Cancer Cases Among Men, by Site and Place of Residence, Canada, 1986 to 1996

Cancer Site	Number of Cases				
	CMA/CA	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
All cancer sites	465,446	32,262	62,510	49,266	8,583
Lip	3,097	446	976	926	235
Tongue, gum, mouth, pharynx (ex. nasopharynx)	11,213	674	1,307	966	150
Esophagus	5,970	412	724	580	104
Stomach	14,993	971	2,163	1,763	302
Colon and rectum	61,914	4,412	8,415	6,451	1,126
Liver	5,041	210	470	342	63
Pancreas	11,084	781	1,510	1,321	190
Larynx	8,400	557	1,097	817	131
Trachea, bronchus, lung	91,192	6,286	13,151	9,827	1,745
Malignant melanoma	11,046	727	1,151	959	142
Prostate	103,189	7,383	14,546	11,617	2,030
Testis	5,610	336	442	449	71
Bladder	27,143	1,914	3,726	2,859	521
Kidney and other urinary	15,212	994	1,946	1,643	292
Brain and other nervous system	9,119	602	1,106	852	161
Ill-defined and unknown site	14,968	1,100	1,884	1,545	233
Hodgkin's disease	3,787	237	386	324	54
Non-Hodgkin's lymphoma	19,152	1,268	2,187	1,783	285
Multiple myeloma	5,829	441	853	582	120
Leukemia	14,194	1,061	1,919	1,489	255

Data source: Canadian Cancer Registry, 1986 to 1996, Statistics Canada.

Table C–17

Overall Number of Incident Cancer Cases Among Women, by Site and Place of Residence, Canada, 1986 to 1996

Cancer Site	Number of Cases				
	CMA/CA	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
All cancer sites	438,229	25,001	48,621	39,023	6,083
Lip	789	54	131	124	18
Tongue, gum, mouth, pharynx (ex. nasopharynx)	4,995	244	466	407	64
Stomach	9,127	452	1,147	864	145
Colon and rectum	58,183	3,593	7,369	5,546	881
Gallbladder	4,026	239	504	440	74
Pancreas	11,327	623	1,357	1,152	168
Trachea, bronchus, lung	50,173	2,677	5,170	4,187	619
Malignant melanoma	10,837	689	1,055	950	131
Breast	126,576	7,134	13,275	10,748	1,657
Cervix uteri	11,972	650	1,268	1,269	219
Uterus excluding cervix	24,868	1,423	2,896	2,182	349
Ovary	17,622	990	1,807	1,493	225
Bladder	9,826	505	1,147	770	107
Kidney and other urinary	9,541	626	1,260	1,024	159
Brain and other nervous system	7,365	470	791	635	107
Thyroid	8,142	402	661	605	92
Ill-defined and unknown site	14,144	750	1,764	1,434	225
Non-Hodgkin's lymphoma	16,217	963	1,884	1,452	230
Multiple myeloma	5,285	351	625	475	75
Leukemia	11,289	672	1,315	991	177

Data source: Canadian Cancer Registry, 1986 to 1996, Statistics Canada.

Appendix D

Canadian Community Health Survey, Cycle 1.1: Data Tables

Table D–1

Age-Standardized Proportions of Selected Socio-Demographic Characteristics, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Indicator	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Households that reported at least one person 5 years old or less	All	14.4 (14.1–14.7)	14.7 (13.7–15.6)	14.2 (13.5–15.0)	14.4 (13.8–15.0)	15.2 (13.1–17.2)
	Men	14.2 (13.7–14.7)	15.0 (13.6–16.4)	13.3 (12.3–14.3)	14.4 (13.5–15.3)	14.8 (12.0–17.6)
	Women	14.6 (14.2–15.0)	14.4 (13.2–15.6)	15.2 (14.2–16.2)	14.4 (13.6–15.2)	15.9 (13.2–18.6)
Households that reported at least one person between 6 and 11 years old	All	17.7 (17.3–18.0)	19.4 (18.4–20.3)*	20.3 (18.8–20.4)*	18.8 (18.2–19.5)*	20.6 (18.5–22.6)*
	Men	17.7 (17.2–18.2)	18.6 (17.3–20.0)	18.6 (17.4–19.7)	18.6 (17.6–19.6)	19.9 (17.1–22.7)
	Women	17.6 (17.2–18.1)	20.0 (18.7–21.4)*	20.5 (19.5–21.6)*	19.1 (18.2–19.9)*	21.4 (18.7–24.0)*
Less than secondary school graduation	All	27.8 (27.4–28.2)	35.1 (33.9–36.3)*	39.4 (38.4–40.3)*	37.3 (36.4–38.1)*	43.0 (40.5–45.5)*
	Men	27.5 (26.9–28.0)	36.6 (34.9–38.3)*	41.9 (40.4–43.3)*	38.1 (36.9–39.3)*	44.2 (40.9–47.4)*
	Women	28.1 (27.6–28.6)	33.4 (31.9–35.0)*	36.8 (35.6–38.1)*	36.3 (35.2–37.4)*	41.8 (38.5–45.2)*
Low/low-middle income	All	32.4 (31.9–32.8)	34.6 (33.2–35.9)*	45.0 (43.9–46.2)*	43.1 (42.1–44.1)*	49.9 (47.1–52.7)*
	Men	28.3 (27.7–29.0)	30.8 (29.0–32.7)	41.0 (39.3–42.6)*	39.0 (37.6–40.4)*	45.6 (41.6–49.7)*
	Women	36.3 (35.6–37.0)	38.9 (37.0–40.8)	49.1 (47.6–50.7)*	47.3 (45.9–48.6)*	54.9 (51.3–58.4)*
Being unemployed	All	33.4 (32.9–33.8)	32.3 (31.2–33.5)	36.6 (35.6–37.5)*	34.7 (33.8–35.5)	37.1 (34.6–39.6)*
	Men	27.3 (26.7–27.8)	24.9 (23.5–26.4)*	29.1 (27.9–30.4)*	27.5 (26.3–28.6)	28.5 (25.3–31.6)
	Women	39.3 (38.7–39.9)	40.3 (38.6–42.0)	44.1 (42.7–45.5)*	41.9 (40.7–43.0)*	46.7 (43.3–50.1)*
Somewhat/very strong sense of community belonging	All	56.2 (55.7–56.7)	60.1 (58.6–61.5)*	64.4 (63.3–65.5)*	70.8 (69.9–71.7)*	76.8 (74.3–79.3)*
	Men	56.0 (55.2–56.7)	60.0 (57.8–62.0)*	64.6 (63.0–66.3)*	70.9 (69.6–72.3)*	73.4 (69.6–77.3)*
	Women	56.4 (55.7–57.1)	60.1 (58.2–62.1)*	64.2 (62.8–65.7)*	70.7 (69.4–71.9)*	79.9 (77.1–82.8)*
Sometimes or never eating the desired quality or variety of food because of a lack of money	All	12.0 (11.7–12.3)	10.9 (10.0–11.7)	11.9 (11.2–12.6)	13.3 (12.6–13.9)*	12.6 (10.8–14.4)
	Men	10.9 (10.5–11.4)	9.3 (8.1–10.4)*	11.0 (10.0–11.9)	12.8 (11.8–13.7)*	10.0 (7.6–12.4)
	Women	13.1 (12.6–13.5)	12.6 (11.3–13.8)	12.8 (11.8–13.8)	13.8 (12.9–14.7)	15.0 (12.6–17.5)
Food insecurity in the past 12 months	All	14.5 (14.2–14.9)	13.1 (12.2–14.0)*	14.6 (13.9–15.4)	16.1 (15.4–16.8)*	15.0 (13.1–16.9)
	Men	13.3 (12.8–13.8)	11.3 (10.1–12.5)*	13.7 (12.6–14.7)	15.4 (14.4–16.4)*	12.4 (9.8–14.9)
	Women	15.7 (15.2–16.2)	15.0 (13.7–16.4)	15.6 (14.5–16.6)	16.7 (15.8–17.7)	17.4 (14.8–20.0)

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–2

Sample Size (and Estimated Population), for Socio-Demographic Characteristics, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Indicator	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Households that reported at least one person 5 years old or less	All	10,429 (3,022,786)	1,117 (183,967)	1,772 (246,422)	2,647 (233,302)	316 (29,563)
	Men	4,488 (1,456,629)	529 (96,179)	787 (115,405)	1,191 (115,577)	128 (14,255)
	Women	5,941 (1,566,156)	588 (87,788)	985 (131,017)	1,456 (117,726)	188 (15,307)
Households that reported at least one person between 6 and 11 years old	All	13,703 (3,6893,253)	1,626 (260,959)	2,540 (355,994)	3,564 (313,290)	496 (42,898)
	Men	6,090 (1,803,881)	764 (128,542)	1,165 (171,328)	1,631 (152,751)	216 (20,268)
	Women	7,613 (1,885,444)	862 (132,417)	1,375 (18,4667)	1,933 (160,539)	280 (22,630)
Less than secondary school graduation	All	23,747 (5,494,412)	3,152 (478,892)	6,210 (800,151)	7,664 (646,008)	1,228 (97,970)
	Men	10,866 (2,684,306)	1,623 (261,100)	3,057 (417,043)	3,751 (329,850)	618 (51,631)
	Women	12,881 (2,810,106)	1,529 (217,792)	3,153 (383,108)	3,913 (316,158)	610 (46,339)
Low/low-middle income	All	26,137 (5,834,360)	2,783 (404,530)	6,533 (797,132)	7,877 (648,698)	1,209 (95,149)
	Men	9,935 (2,536,671)	1,212 (194,113)	2,791 (365,272)	3,287 (299,008)	537 (45,351)
	Women	16,202 (3,297,689)	1,571 (210,418)	3,742 (431,860)	4,590 (349,690)	672 (49,799)
Being unemployed	All	23,772 (5,793,333)	2,493 (379,594)	5,083 (657,833)	6,005 (517,938)	895 (72,713)
	Men	9,006 (2,316,211)	985 (157,352)	1,952 (264,288)	2,266 (205,527)	348 (28,437)
	Women	14,766 (3,477,121)	1,508 (222,242)	3,131 (393,544)	3,739 (312,411)	547 (44,276)
Somewhat/very strong sense of community belonging	All	30,442 (8,268,827)	2,841 (499,978)	4,298 (629,784)	5,070 (460,296)	550 (46,015)
	Men	13,553 (3,954,891)	1,357 (252,129)	1,986 (299,097)	2,318 (218,585)	275 (26,091)
	Women	16,889 (4,313,937)	1,484 (247,849)	2,312 (330,687)	2,752 (241,712)	275 (19,924)
Sometimes or never eating the desired quality or variety of food because of a lack of money	All	10,715 (2,475,926)	960 (144,861)	1,758 (222,511)	2,677 (222,548)	332 (26,685)
	Men	4,280 (1,094,942)	389 (63,810)	772 (102,077)	1,123 (106,177)	132 (10,847)
	Women	6,535 (1,380,984)	571 (81,051)	986 (120,434)	1,554 (116,371)	200 (15,838)
Food insecurity in the past 12 months	All	12,688 (2,991,755)	1,136 (174,666)	2,125 (273,940)	3,180 (269,884)	394 (31,652)
	Men	5,108 (1,336,246)	471 (77,957)	938 (127,344)	1,337 (128,259)	162 (13,469)
	Women	7,580 (1,655,509)	665 (96,709)	1,187 (146,596)	1,843 (141,625)	232 (18,184)

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–3

Age-Standardized Proportions of Selected Health Status and Quality of Life Indicators, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Indicator	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Fair/poor self-reported health	All	12.0 (11.7–12.3)	11.9 (11.1–13.0)	12.4 (11.8–13.0)	13.6 (13.0–14.2)*	14.4 (12.6–16.1)*
	Men	11.0 (10.5–11.4)	11.3 (10.2–12.4)	12.6 (11.6–13.5)*	13.4 (12.5–14.2)*	12.0 (9.8–14.1)
	Women	12.9 (12.5–13.4)	12.4 (11.3–13.6)	12.3 (11.4–13.2)	13.8 (13.0–14.6)	16.7 (14.3–19.2)*
Being overweight	All	46.9 (46.3–47.5)	53.9 (52.2–55.6)*	53.2 (51.9–54.6)*	55.4 (54.3–56.6)*	57.2 (53.7–60.7)*
	Men	54.7 (53.7–55.6)	60.7 (58.4–63.1)*	60.1 (58.3–62.0)*	62.5 (60.9–64.1)*	64.5 (59.8–69.1)*
	Women	38.8 (38.0–39.6)	46.2 (43.9–48.5)*	45.5 (43.6–47.4)*	47.9 (46.2–49.5)*	48.7 (44.0–53.4)*
Low self-esteem	All	14.2 (13.5–14.9)	10.7 (8.3–13.1)*	12.5 (11.1–13.9)	11.7 (10.7–12.8)*	9.6 (7.7–11.5)*
	Men	12.7 (11.8–13.6)	7.6 (4.6–10.6)*	10.0 (8.1–11.8)	10.8 (9.3–12.2)	7.8 (5.4–10.2)*
	Women	15.5 (14.6–16.4)	14.1 (10.4–17.7)	14.7 (12.7–16.8)	12.6 (11.2–14.1)*	11.6 (8.7–14.4)*
Quite to extremely stressful life	All	26.1 (25.6–26.5)	24.7 (23.4–25.9)	23.1 (22.1–24.1)*	23.2 (22.3–24.1)*	22.8 (20.2–25.4)*
	Men	25.0 (24.3–25.6)	24.1 (22.3–26.0)	22.5 (21.1–23.9)*	23.1 (21.8–24.3)	22.9 (19.1–26.7)
	Women	27.1 (26.5–27.7)	25.3 (23.5–27.1)	23.6 (22.4–25.1)*	23.3 (22.1–24.5)*	22.3 (19.1–25.4)*
Case depression	All	10.1 (9.8–10.4)	9.6 (8.8–10.4)	8.8 (8.2–9.5)*	8.9 (8.4–9.5)*	9.7 (8.1–11.3)
	Men	7.6 (7.2–7.9)	7.1 (6.1–8.2)	6.7 (5.9–7.5)	6.6 (5.9–7.4)	7.1 (4.9–9.3)
	Women	12.4 (12.0–12.9)	12.2 (11.0–13.4)	11.0 (10.0–12.0)	11.1 (10.4–11.9)*	12.7 (10.3–15.2)
Criteria for any of the selected mental disorders or substance dependence in the past 12 months (Source: Canadian Community Health Survey 2002–2003, Statistics Canada.)	All	11.2 (10.6–11.7)	11.1 (9.4–12.9)	9.7 (8.3–11.2)	9.8 (8.5–11.1)	8.8 (5.2–12.4)
	Men	10.5 (9.8–11.3)	10.0 (7.7–12.2)	9.1 (6.9–11.3)	9.5 (7.6–11.5)	12.6 (6.3–18.8)
	Women	11.8 (10.6–11.7)	12.5 (9.6–15.4)	10.4 (8.4–12.5)	10.1 (8.4–11.8)	7.9 (3.4–12.5)
Injured in the past year	All	13.3 (13.0–13.6)	15.5 (14.5–16.5)*	13.1 (12.4–13.9)	14.2 (13.6–14.9)	14.0 (12.2–15.7)
	Men	15.3 (14.8–15.8)	18.4 (16.9–19.9)*	15.4 (14.2–16.6)	17.4 (16.3–18.4)*	17.4 (14.6–20.2)
	Women	11.4 (11.0–11.8)	12.6 (11.4–13.8)	10.9 (10.0–11.9)	11.2 (10.4–12.0)	10.6 (8.6–12.5)
Getting repetitive strain while working at job or business	All	43.5 (42.1–44.8)	48.4 (44.8–51.9)	49.7 (46.5–52.8)*	46.1 (43.3–48.8)	53.8 (45.2–62.3)*
	Men	45.6 (43.6–47.7)	53.5 (48.0–58.9)*	56.2 (51.8–60.7)*	52.0 (48.2–55.8)*	56.3 (46.3–66.4)
	Women	42.5 (40.7–44.3)	50.3 (45.3–55.4)*	49.4 (44.6–54.1)*	42.5 (38.9–46.1)	51.2 (39.9–62.5)

(table continued on next page)

Table D–3 (cont'd)

Indicator	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Getting repetitive strain while doing household chores or other unpaid work or education	All	14.6 (13.4–15.8)	19.8 (16.4–23.3)*	16.5 (13.8–19.2)	19.2 (16.7–21.7)*	18.7 (12.1–25.3)
	Men	10.2 (8.6–11.7)	14.9 (10.7–19.1)	8.9 (6.3–11.6)	13.1 (10.2–16.0)	s
	Women	18.8 (17.1–20.5)	24.1 (18.9–29.3)	22.6 (18.5–26.7)	25.6 (22.0–29.2)*	25.8 (16.9–34.6)
Having no difficulties with daily activities	All	75.4 (75.0–75.8)	72.5 (71.4–73.6)*	75.6 (75.0–76.4)	73.0 (72.2–73.8)*	74.7 (74.7–76.4)
	Men	77.2 (76.7–77.8)	72.6 (71.0–74.2)*	76.3 (75.0–77.6)	72.5 (71.4–73.7)*	76.0 (73.0–79.1)
	Women	73.7 (73.1–74.2)	72.6 (71.0–74.2)	74.9 (73.7–76.1)	73.4 (72.4–74.5)	73.0 (70.0–76.0)
Moderate to severe pain	All	66.3 (65.0–67.6)	66.5 (62.7–70.3)	70.2 (67.5–73.0)	68.2 (65.8–70.7)	62.5 (55.0–70.0)
	Men	62.3 (60.3–64.4)	63 (57.5–68.5)	70.1 (65.9–74.4)*	64.7 (61.0–68.4)	66.7 (57.0–76.5)
	Women	68.9 (67.2–70.6)	69.5 (59.6–74.7)	70.6 (67.0–74.1)	70.6 (67.5–73.7)	67.1 (59.7–74.7)
6 or more disability days in the past 14 days	All	6.3 (6.0–6.5)	6.8 (6.1–7.5)	6.2 (5.7–6.7)	6.2 (5.7–6.7)	6.7 (5.4–8.0)
	Men	5.4 (5.0–5.7)	5.9 (5.0–6.8)	5.3 (4.7–6.0)	5.6 (4.9–6.3)	5.9 (4.2–7.7)
	Women	7.1 (6.8–7.5)	7.7 (6.7–8.7)	7.0 (6.3–7.8)	6.8 (6.2–7.5)	7.3 (5.6–9.1)
HUI indicative of disability	All	21.6 (21.2–22.0)	20.4 (16.4–21.4)	20.5 (19.7–21.3)	22.2 (21.5–23.0)	20.9 (19.0–22.8)
	Men	19.7 (19.2–20.3)	19.6 (18.1–21.0)	19.3 (18.1–20.4)	21.4 (20.3–22.5)	19.2 (16.6–21.9)
	Women	23.4 (22.8–23.9)	21.1 (19.6–22.5)*	21.8 (20.6–22.9)	23.1 (22.1–24.1)	22.9 (20.2–25.7)
Seriously considered committing suicide in the past 12 months	All	24.1 (22.2–26.0)	24.3 (18.5–30.2)	27.5 (23.3–31.8)	23.2 (19.8–26.6)	s
	Men	25.8 (22.8–28.8)	28.5 (18.8–38.2)	25.2 (19.5–30.9)	27.3 (21.7–32.9)	s
	Women	22.7 (20.3–25.2)	24.9 (17.6–32.2)	29.9 (23.9–35.9)	20.8 (16.7–24.8)	s
Seriously ever considered committing suicide	All	9.4 (9.0–9.8)	10.1 (8.8–11.4)	11.0 (10.0–11.9)*	9.2 (8.5–9.9)	10.6 (8.1–13.0)
	Men	8.4 (7.8–8.9)	8.6 (7.0–10.3)	9.7 (8.4–11.0)	8.1 (7.1–9.0)	7.9 (4.8–10.9)
	Women	10.4 (9.8–11.0)	11.7 (9.7–13.7)	12.2 (10.8–13.6)	10.4 (9.4–11.3)	14.2 (9.0–19.4)

† Reference group.
* Statistically significant at $p < 0.05$.
s Data suppressed.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–4

Sample Size (and Estimated Population) for Health Status and Quality of Life Indicators, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Indicator	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Fair/poor self-reported health	All	10,645 (2,381,702)	1,090 (159,657)	2,246 (262,741)	2,997 (233,454)	433 (33,315)
	Men	4,538 (1,072,400)	520 (81,393)	1,088 (134,029)	1,396 (115,876)	190 (15,216)
	Women	6,107 (1,309,302)	570 (78,264)	1,158 (128,713)	1,601 (117,580)	243 (18,099)
Being overweight	All	26,241 (6,918,349)	3,032 (513,606)	5,152 (715,999)	7,242 (645,812)	956 (85,600)
	Men	14,706 (4,096,095)	1,733 (308,598)	2,853 (422,185)	4,018 (375,035)	516 (51,828)
	Women	11,535 (2,822,254)	1,299 (205,009)	2,299 (293,813)	3,224 (270,778)	440 (33,772)
Low self-esteem	All	2,714 (481,880)	98 (11,158)	505 (44,378)	762 (50,561)	148 (8,382.1)
	Men	1,057 (202,151)	35 (4,108.7)	192 (16,595)	324 (2,332)	62 (3,291.3)
	Women	1,657 (279,729)	63 (7,049)	313 (27,783)	438 (28,228)	86 (5,090.8)
Quite to extremely stressful life	All	18,380 (4,979,014)	1,814 (303,785)	2,979 (406,174)	3,946 (353,246)	487 (46,121)
	Men	7,880 (2,341,100)	869 (154,794)	1,379 (200,282)	1,782 (174,503)	224 (24,616)
	Women	10,500 (2,637,914)	945 (148,991)	1,600 (205,892)	2,164 (178,742)	263 (21,505)
Case depression	All	8,666 (2,060,672)	780 (127,420)	1,311 (166,953)	1,801 (147,439)	220 (20,691)
	Men	2,942 (754,578)	255 (48,974)	479 (63,261)	610 (54,743)	79 (7,978.2)
	Women	5,724 (1,306,093)	525 (78,446)	832 (103,692)	1,191 (92,695)	141 (12,713)
Criteria for any of the selected mental disorders or substance dependence in the past 12 months (Source: Canadian Community Health Survey 2002–2003, Statistics Canada.)	All	2,978 (2,192,306)	226 (146,597)	293 (166,749)	376 (147,137)	42 (15,497)
	Men	1,293 (997,954)	99 (64,779)	121 (78,068)	161 (73,771)	20 (8,896.7)
	Women	1,685 (1,194,352)	127 (81,818)	172 (88,681)	215 (73,366)	22 (6,600.2)
Injured in the past year	All	10,968 (2,737,292)	1,272 (209,853)	1,878 (251,825)	2,699 (244,086)	348 (29,923)
	Men	5,715 (1,548,048)	717 (128,652)	1,012 (144,830)	1,505 (147,158)	190 (18,444)
	Women	5,253 (1,189,244)	555 (81,201)	866 (106,995)	1,194 (96,929)	158 (11,479)
Getting repetitive strain while working at job or business	All	4,005 (990,220)	501 (80,328)	738 (103,203)	1,003 (88,844)	125 (11,817)
	Men	1,868 (494,691)	242 (40,248)	368 (54,916)	511 (47,804)	56 (6,033.6)
	Women	2,137 (495,529)	259 (40,080)	370 (48,288)	492 (41,040)	69 (5,783.3)

(table continued on next page)

Table D–4 (cont'd)

Indicator	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Getting repetitive strain while doing household chores or other unpaid work or education	All	1,069 (239,135)	163 (24,759)	248 (27,651)	324 (29,186)	50 (3,796.1)
	Men	294 (72,667)	57 (9,177.8)	56 (6,575.2)	93 (9,178.8)	s
	Women	775 (166,468)	106 (15,582)	192 (21,076)	231 (20,007)	37 (2,846)
Having no difficulties with daily activities	All	57,660 (15,640,000)	5,951 (978,035)	10,540 (1,462,818)	13,653 (1,242,539)	1,856 (160,954)
	Men	26,834 (7,814,486)	2,916 (505,604)	5,000 (734,578)	6,395 (612,378)	884 (83,452)
	Women	30,826 (7,822,458)	3,035 (472,432)	5,540 (728,240)	7,258 (630,161)	972 (77,502)
Moderate to severe pain	All	9,770 (2,249,834)	1,040 (156,478)	1,984 (243,159)	2,430 (209,734)	311 (25,523)
	Men	3,531 (887,366)	458 (77,713)	792 (105,574)	941 (89,813)	122 (10,933)
	Women	6,239 (1,362,469)	582 (78,766)	1,192 (137,584)	1,489 (119,921)	189 (14,590)
6 or more disability days in the past 14 days	All	5,393 (1,274,287)	571 (91,029)	960 (124,379)	1,224 (105,116)	181 (14,995)
	Men	2,081 (533,256)	240 (41,698)	404 (53,529)	503 (47,256)	76 (7,055.8)
	Women	3,312 (741,031)	331 (49,331)	556 (70,850)	721 (57,860)	105 (7,938.7)
HUI indicative of disability	All	18,580 (4,336,318)	1,846 (270,262)	3,529 (412,835)	4,702 (378,831)	638 (47,666)
	Men	7,771 (1,949,439)	865 (138,413)	1,553 (194,214)	2,134 (183,613)	297 (23,278)
	Women	10,809 (2,386,878)	981 (131,849)	1,976 (218,621)	2,568 (195,218)	341 (24,388)
Seriously considered committing suicide in the past 12 months	All	986 (261,787)	79 (15,857)	210 (34,015)	283 (23,884)	s
	Men	426 (117,561)	35 (7,978.7)	80 (14,198)	125 (11,841)	s
	Women	560 (144,226)	44 (7,877.9)	130 (19,817)	158 (12,042)	s
Seriously ever considered committing suicide	All	4,115 (1,065,852)	344 (60,910)	802 (123,587)	1,226 (101,387)	125 (10,305)
	Men	1,633 (461,621)	143 (27,097)	334 (56,361)	489 (43,729)	49 (3,888.6)
	Women	2,482 (604,231)	201 (33,813)	468 (67,226)	737 (57,658)	76 (6,416.8)

s Data suppressed due to small numbers.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–5

Age-Standardized Proportions of Selected Health Behaviours, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Indicator	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Being a smoker	All	24.9 (24.5–25.3)	28.1 (26.8–29.3)*	29.8 (28.8–30.8)*	28.2 (27.4–29.1)*	32.4 (29.8–34.9)*
	Men	27.1 (26.4–27.7)	30.5 (28.6–32.3)*	32.8 (31.3–34.3)*	30.5 (29.3–31.8)*	33.7 (30.1–37.3)*
	Women	22.8 (22.3–23.3)	25.5 (23.8–27.2)*	26.8 (25.4–28.1)*	26.0 (24.9–27.1)*	30.6 (27.2–34.1)*
Exposure to second-hand smoke on most days	All	27.0 (26.5–27.5)	31.6 (30.0–33.1)*	31.8 (30.6–33.0)*	34.1 (33.0–35.2)*	34.2 (31.1–37.2)*
	Men	29.6 (28.8–30.4)	33.8 (31.5–36.1)*	34.9 (33.0–36.8)*	38.0 (36.3–39.7)*	36.1 (31.7–40.5)*
	Women	24.7 (24.1–25.4)	29.5 (27.5–31.6)*	28.9 (27.4–30.5)*	30.5 (29.1–32.0)*	32.8 (28.7–36.9)*
Eating more than 5 servings of fruit and vegetables	All	38.2 (37.7–38.7)	36.5 (35.2–37.9)	35.7 (34.6–36.7)*	34.2 (33.3–35.2)*	31.1 (28.6–33.5)*
	Men	32.7 (32.0–33.4)	30.1 (28.2–31.9)*	29.8 (28.3–31.2)*	28.1 (26.9–29.5)*	26.1 (22.6–29.5)*
	Women	43.4 (42.7–44.1)	43.5 (41.6–45.4)	41.6 (40.2–43.1)	40.2 (38.9–41.5)*	35.8 (32.4–39.3)*
Being a regular drinker	All	57.3 (56.8–57.8)	59.4 (58.1–60.6)*	54.8 (53.8–55.8)*	53.4 (52.9–54.8)*	53.0 (50.3–55.7)*
	Men	66.0 (65.3–66.7)	67.5 (65.8–69.2)	64.6 (63.2–66.0)	64.2 (63.0–65.5)	62.3 (58.5–66.1)
	Women	49.0 (48.4–49.7)	50.5 (48.6–52.3)	44.9 (43.5–46.4)*	43.6 (42.4–44.8)*	42.9 (39.5–46.4)*
Average daily alcohol consumption of more than 2 drinks per day	All	4.1 (3.9–4.3)	5.2 (4.4–6.0)*	3.6 (3.1–4.0)	4.1 (3.7–4.6)	4.8 (3.5–6.1)
	Men	7.1 (6.7–7.5)	8.5 (7.2–9.8)	6.3 (5.5–7.2)	6.7 (5.9–7.4)	7.3 (5.1–9.5)
	Women	1.1 (0.9–1.2)	1.5 (0.9–2.1)	0.8 (0.5–1.1)	1.6 (1.2–2.0)	s
Being physically active	All	23.1 (22.7–23.5)	23.6 (22.5–24.8)	20.7 (19.9–21.6)*	24.1 (23.3–25.0)	22.4 (20.2–24.6)
	Men	27.3 (26.7–28.0)	25.3 (23.5–27.0)	22.2 (20.9–23.6)*	27.0 (25.7–28.2)	23.6 (20.2–27.0)
	Women	19.3 (18.7–19.8)	21.9 (20.4–23.4)*	19.4 (18.2–20.6)	21.5 (20.5–22.6)*	21.2 (18.5–24.0)
Women who breastfed their last baby	Women	77.4 (69.7–85.2)	86.4 (81.8–91.0)	71.0 (65.5–76.5)	78.6 (74.5–82.7)	85.4 (78.9–92.0)

† Reference group.

* Statistically significant at $p < 0.05$.

Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–6

Sample Size (and Estimated Population) for Health Behaviours, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Indicator	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Being a regular or occasional smoker	All	21,278 (5,196,607)	2,225 (374,773)	4,095 (564,300)	5,633 (475,674)	774 (67,807)
	Men	10,299 (2,752,615)	1,156 (209,787)	2,133 (311,241)	2,843 (254,064)	387 (36,701)
	Women	10,979 (2,443,993)	1,069 (164,986)	1,962 (253,058)	2,790 (221,610)	387 (31,106)
Exposure to second-hand smoke on most days	All	15,813 (4,111,571)	1,815 (304,079)	3,154 (422,683)	4,632 (409,658)	596 (49,577)
	Men	7,909 (2,135,546)	969 (163,466)	1,582 (219,827)	2,364 (218,854)	306 (25,793)
	Women	7,904 (1,976,025)	846 (140,613)	1,572 (202,855)	2,268 (190,803)	290 (23,783)
Eating more than 5 servings of fruit and vegetables	All	29,239 (7,906,897)	2,988 (499,579)	5,088 (731,176)	6,491 (605,732)	826 (72,302)
	Men	11,051 (3,334,162)	1,187 (219,150)	1,923 (307,063)	2,486 (252,619)	326 (32,243)
	Women	18,188 (4,572,734)	1,801 (280,429)	3,165 (424,113)	4,005 (353,113)	500 (40,059)
Being a regular drinker	All	44,806 (11,850,000)	4,699 (792,178)	7,553 (1,055,726)	10,085 (904,814)	1,290 (112,603)
	Men	23,668 (6,645,509)	2,677 (466,493)	4,300 (623,102)	5,711 (535,890)	753 (68,313)
	Women	21,138 (5,206,882)	2,022 (325,685)	3,253 (432,623)	4,374 (368,924)	537 (44,290)
Average daily alcohol consumption of more than 2 drinks per day	All	2,541 (650,852)	290 (53,416)	381 (51,302)	634 (56,116)	86 (7,239.8)
	Men	2,139 (564,730)	251 (46,940)	340 (46,648)	517 (46,240)	72 (6,078.5)
	Women	402 (86,122)	39 (6,476.1)	41 (4,654.4)	117 (9,876.2)	s
Being physically active	All	36,214 (8,802,614)	3,827 (594,090)	6,154 (775,631)	8,838 (762,567)	1,059 (86,529)
	Men	17,499 (4,583,901)	1,854 (305,799)	2,888 (386,003)	4,212 (379,641)	484 (42,496)
	Women	18,715 (4,218,713)	1,973 (288,291)	3,266 (389,628)	4,626 (382,925)	575 (44,033)
Women who breastfed their last baby	Women	3,845 (987,601)	400 (58,858)	611 (79,568)	926 (74,309)	110 (8,629.1)

s Data suppressed due to small numbers.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–7

Age-Standardized Prevalence of Selected Chronic Conditions, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Cause	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Alzheimer's/ other dementia	All	0.3 (0.2–0.4)	s	0.3 (0.2–0.4)	0.3 (0.2–0.3)	s
	Men	0.3 (0.2–0.4)	s	0.2 (0.1–04)	0.3 (0.2–0.5)	s
	Women	0.3 (0.2–0.4)	s	0.4 (0.2–0.6)	0.2 (0.2–0.3)	s
Arthritis/ rheumatism	All	15.4 (15.1–15.7)	17.4 (16.5–18.3)*	15.3 (14.6–15.9)	17.6 (16.9–18.2)*	17.5 (15.9–19.2)*
	Men	11.3 (10.9–11.7)	13.7 (12.5–14.9)*	11.2 (10.4–12.1)	14.1 (13.2–15.0)*	14.4 (12.0–16.8)*
	Women	19.4 (18.9–19.8)	21.4 (20.0–22.8)*	19.3 (18.4–20.2)	21.2 (20.2–22.1)*	21.0 (18.6–23.5)
Asthma	All	8.6 (8.3–8.8)	8.3 (7.6–9.0)	7.9 (7.3–8.4)	7.8 (7.2–8.2)*	7.3 (6.0–8.5)
	Men	7.0 (6.7–7.4)	7.1 (6.1–8.0)	6.3 (5.6–7.1)	6.8 (6.0–7.5)	5.5 (4.0–7.0)
	Women	10.0 (9.6–10.4)	9.6 (8.5–10.7)	9.5 (8.7–10.4)	8.7 (8.0–9.4)*	9.2 (7.1–11.2)
Cancer	All	1.8 (1.7–2.0)	1.6 (1.3–2.0)	1.7 (1.4–1.9)	1.9 (1.6–2.1)	1.5 (1.0–2.0)
	Men	1.8 (1.6–1.9)	1.5 (1.1–1.9)	1.6 (1.3–1.9)	1.7 (1.3–2.0)	s
	Women	1.9 (1.7–2.1)	1.7 (1.3–2.1)	1.7 (1.4–2.0)	2.0 (1.7–2.3)	1.8 (1.0–2.5)
Diabetes	All	4.1 (3.9–4.3)	4.5 (3.9–5.0)	4.4 (4.0–4.8)	4.8 (4.4–5.1)*	5.3 (4.3–6.2)
	Men	4.4 (4.2–4.7)	4.2 (3.5–4.9)	4.7 (4.1–5.3)	4.6 (4.1–5.2)	4.7 (3.5–5.9)
	Women	3.9 (3.6–4.1)	4.6 (3.9–5.4)	4.0 (3.5–4.5)	4.9 (4.4–5.4)*	5.8 (4.4–7.2)*
Emphysema	All	1.3 (1.2–1.4)	1.3 (0.9–1.7)	1.4 (1.2–1.7)	1.0 (0.9–1.2)	1.7 (1.1–2.3)
	Men	1.6 (1.3–1.8)	0.9 (0.5–1.3)	1.8 (1.3–2.2)	1.2 (0.9–1.5)	2.1 (1.1–3.0)
	Women	1.0 (0.9–1.1)	1.8 (1.1–2.5)	1.1 (0.8–1.4)	0.9 (0.7–1.1)	s
Heart disease	All	5.2 (5.0–5.4)	5.5 (5.0–6.1)	5.1 (4.7–5.5)	5.4 (5.0–5.8)	5.3 (4.4–6.2)
	Men	5.5 (5.2–5.8)	5.6 (4.8–6.3)	5.6 (4.9–6.2)	6.0 (5.4–6.5)	4.9 (3.8–6.1)
	Women	5.0 (4.7–5.3)	5.4 (4.5–6.2)	4.7 (4.2–5.2)	4.8 (4.3–5.3)	6.0 (4.6–7.3)
High blood pressure	All	12.9 (12.6–13.2)	12.6 (11.8–13.4)	13.3 (12.7–13.9)	13.5 (13.0–14.1)	14.0 (12.4–15.5)
	Men	11.6 (11.2–12.0)	10.8 (9.7–11.8)	11.4 (10.6–12.3)	11.8 (11.0–12.5)	10.9 (8.8–13.0)
	Women	14.2 (13.8–14.6)	14.6 (13.4–15.7)	15.1 (14.2–15.9)	15.4 (14.6–16.2)	17.4 (15.2–19.6)*
3 or more chronic conditions	All	20.8 (20.4–21.1)	21.7 (20.6–22.7)	19.5 (18.8–20.3)*	21.1 (20.4–21.8)	21.4 (19.5–23.2)
	Men	15 (14.5–15.5)	15.7 (14.3–17.1)	13.6 (12.7–14.6)	15.8 (14.9–16.8)	14.3 (11.9–16.7)
	Women	26.3 (25.7–26.8)	28.0 (26.5–29.6)	25.5 (24.3–26.7)	26.4 (25.3–27.4)	28.9 (26.0–31.8)

† Reference group.
* Statistically significant at $p < 0.05$.
s Data suppressed.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–8

Sample Size (and Estimated Population) for Selected Chronic Conditions, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Cause	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Alzheimer's/ other dementia	All	196 (47,575)	s	50 (6,111)	48 (3,746.6)	s
	Men	95 (22,244)	s	21 (2,299.5)	28 (2,576.1)	s
	Women	101 (25,331)	s	29 (3,811.5)	20 (1,170.5)	s
Arthritis/ rheumatism	All	14,252 (3,053,634)	1,684 (2,316,53)	3,090 (327,895)	3,931 (301,943)	543 (40,800)
	Men	4,714 (1,105,426)	661 (97,805)	1,072 (120,600)	1,457 (122,106)	215 (17,651)
	Women	9,538 (1,948,208)	1,023 (133,848)	2,018 (207,386)	2,474 (179,837)	328 (23,149)
Asthma	All	7,188 (1,763,048)	716 (111,984)	1,228 (155,283)	1,521 (132,952)	213 (16,130)
	Men	2,670 (705,098)	291 (49,816)	473 (61,853)	621 (58,202)	78 (6,363.3)
	Women	4,518 (1,057,951)	425 (62,168)	755 (93,430)	900 (74,749)	135 (9,767)
Cancer	All	1,637 (360,391)	169 (21,593)	327 (36,040)	409 (31,908)	51 (3,417.1)
	Men	708 (168,226)	81 (10,709)	157 (18,130)	173 (14,891)	s
	Women	929 (192,165)	88 (10,884)	170 (17,910)	236 (17,017)	28 (1,922.6)
Diabetes	All	3,636 (820,141)	395 (60,151)	815 (94,984)	1,040 (83,041)	178 (12,570)
	Men	1,803 (430,575)	192 (30,772)	416 (51,888)	478 (40,354)	78 (6,270.5)
	Women	1,833 (389,565)	203 (29,379)	399 (43,096)	562 (42,687)	100 (6,299)
Emphysema	All	875 (176,586)	82 (12,156)	186 (22,511)	191 (12,900)	40 (2,926.3)
	Men	447 (104,582)	34 (4,692.2)	113 (13,961)	105 (7,374.8)	22 (1,921.4)
	Women	428 (72,003)	48 (7,463.8)	73 (8,550.3)	86 (5,525.6)	s
Heart disease	All	4,696 (1,006,372)	485 (7,0873)	1,018 (112,620)	1,274 (94,243)	184 (12,794)
	Men	2,235 (522,850)	252 (39,733)	492 (61,777)	655 (53,518)	86 (6,178.8)
	Women	2,461 (483,522)	233 (31,140)	526 (50,843)	619 (40,726)	98 (6,614.7)
High blood pressure	All	11,187 (2,555,723)	1,233 (167,339)	2,509 (289,281)	3,097 (234,708)	469 (33,232)
	Men	4,474 (1,134,722)	542 (77,782)	989 (124,133)	1,235 (102,388)	183 (13,754)
	Women	6,713 (1,421,000)	691 (89,577)	1,520 (165,148)	1,862 (132,320)	286 (19,479)
3 or more chronic conditions	All	18,384 (4,130,704)	1,957 (284,868)	3,511 (400,524)	4,558 (358,218)	637 (48,660)
	Men	5,951 (1,461,065)	694 (109,998)	1,166 (142,208)	1,583 (135,712)	215 (17,537)
	Women	12,433 (2,669,640)	1,263 (174,870)	2,345 (258,315)	2,975 (222,506)	422 (31,123)

s Suppressed due to small numbers.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–9

Age-Standardized Proportions of Screening Test Utilization, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Causes	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Mammography	Women	65.1 (64.4–65.8)	65.5 (63.6–67.4)	61.4 (59.8–62.9)*	62.4 (61.1–63.7)*	61.6 (58.1–65.0)
Pap test	Women	83.3 (82.9–83.8)	80.9 (79.4–82.4)*	78.9 (77.7–80.1)*	78.9 (77.9–79.9)*	77.9 (75.3–80.5)*
PSA test	Men	34.6 (33.7–35.5)	33.9 (31.5–36.3)	30.5 (28.8–32.3)*	32.0 (30.4–33.5)*	26.6 (22.3–30.8)*

† Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Table D–10

Sample Size (and Estimated Population) for Screening Test Utilization, by Sex and Place of Residence, 12 Years of Age and Over, Canada, 2000–2001

Causes	Population	CMA/CA†	Strong MIZ	Moderate MIZ	Weak MIZ	No MIZ
Mammography	Women	18,906 (4,316,526)	1,907 (275,330)	3,637 (422,439)	4,378 (346,712)	589 (44,202)
Pap test	Women	34,691 (8,169,231)	3,397 (505,502)	6,290 (764,744)	8,395 (684,028)	1,093 (83,100)
PSA test	Men	8,624 (2,209,299)	1,040 (157,923)	1,803 (230,447)	2,116 (186,861)	286 (23,619)

Data source: Canadian Community Health Survey 2000–2001, Statistics Canada.

Appendix E

Supplementary Regression Analyses

Table E–1

Adjusted Relative Risk (RR) Estimates for the Association Between Place of Residence and All-Cause Mortality, by Age Group and Sex, Canada, Excluding the North, 1986 to 1996

Place of Residence	Men 0–44 RR (95% CI)	Women 0–44 RR (95% CI)	Total Population 0–44 RR (95% CI)
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.11 (1.07, 1.14)	*1.08 (1.04, 1.13)	*1.11 (1.08, 1.15)
Moderate MIZ	*1.18 (1.15, 1.22)	*1.20 (1.16, 1.25)	*1.20 (1.17, 1.23)
Weak MIZ	*1.18 (1.15, 1.22)	*1.15 (1.10, 1.20)	*1.19 (1.15, 1.22)
No MIZ	*1.33 (1.23, 1.44)	*1.26 (1.13, 1.41)	*1.33 (1.24, 1.43)
	Men 45–64 RR (95% CI)	**Women 45–64 RR (95% CI)**	**Total Population 45–64 RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.04 (1.01, 1.07)	1.02 (0.98, 1.06)	*1.04 (1.01, 1.07)
Moderate MIZ	*1.08 (1.05, 1.11)	*1.05 (1.02, 1.09)	*1.08 (1.05, 1.10)
Weak MIZ	*1.10 (1.06, 1.13)	*1.07 (1.03, 1.10)	*1.09 1.06, 1.12)
No MIZ	*1.16 (1.07, 1.24)	1.07 (0.99, 1.17)	*1.15 (1.08, 1.23)
	Men 65 +RR (95% CI)	**Women 65+ RR (95% CI)**	**Total Population 65+ RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	1.02 (1.00, 1.04)	1.01 (0.98, 1.03)	*1.03 (1.01, 1.05)
Moderate MIZ	*1.07 (1.06, 1.09)	*1.05 (1.03, 1.07)	*1.07 (1.06, 1.09)
Weak MIZ	*1.09 (1.07, 1.11)	*1.03 (1.01, 1.05)	*1.07 (1.05, 1.09)
No MIZ	*1.09 (1.04, 1.14)	0.99 (0.94, 1.04)	*1.08 (1.03, 1.12)

ǂ Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

Table E–2

Adjusted Relative Risk (RR) Estimates for the Association Between Place of Residence and Suicide Mortality, by Age Group and Sex, Canada, Excluding the North, 1986 to 1996

Place of Residence	Men 15–24 RR (95% CI)	Women 15–24 RR (95% CI)	Total Population 15–24 RR (95% CI)
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.21 (1.07, 1.37)	0.86 (0.61, 1.21)	*1.20 (1.07, 1.35)
Moderate MIZ	*1.34 (1.21, 1.48)	1.10 (0.87, 1.39)	*1.40 (1.28, 1.53)
Weak MIZ	*1.29 (1.16, 1.43)	1.01 (0.78, 1.30)	*1.33 (1.21, 1.46)
No MIZ	*1.42 (1.08, 1.86)	1.49 (0.87, 2.53)	*1.49 (1.16, 1.91)
	Men 25–44 RR (95% CI)	**Women 25–44 RR (95% CI)**	**Total Population 25–44 RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	1.08 (0.98, 1.19)	*0.81 (0.68, 0.97)	1.04 (0.95, 1.14)
Moderate MIZ	*1.19 (1.10, 1.29)	0.93 (0.82, 1.06)	*1.16 (1.07, 1.24)
Weak MIZ	*1.11 (1.02, 1.21)	*0.78 (0.67, 0.91)	1.05 (0.97, 1.15)
No MIZ	1.10 (0.87, 1.41)	0.63 (0.39, 1.01)	1.04 (0.82, 1.32)
	Men 45–64 RR (95% CI)	**Women 45–64 RR (95% CI)**	**Total Population 45–64 RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.16 (1.05, 1.28)	*0.73 (0.59, 0.91)	1.07 (0.96, 1.19)
Moderate MIZ	*1.31 (1.21, 1.42)	*0.83 (0.71, 0.97)	*1.15 (1.05, 1.25)
Weak MIZ	*1.25 (1.14, 1.37)	*0.79 (0.66, 0.95)	1.10 (1.00, 1.22)
No MIZ	*1.62 (1.30, 2.02)	*0.43 (0.21, 0.87)	1.27 (1.00, 1.63)
	Men 65+ RR (95% CI)	**Women 65+ RR (95% CI)**	**Total Population 65+ RR (95% CI)**
CMA/CA	Reference	Reference	Reference
Strong MIZ	*1.29 (1.13, 1.48)	0.82 (0.60, 1.11)	*1.24 (1.10, 1.41)
Moderate MIZ	*1.46 (1.31, 1.61)	*0.64 (0.49, 0.83)	*1.30 (1.18, 1.43)
Weak MIZ	*1.43 (1.28, 1.61)	*0.67 (0.50, 0.90)	*1.30 (1.16, 1.44)
No MIZ	*1.70 (1.29, 2.24)	0.78 (0.37, 1.64)	*1.54 (1.19, 2.00)

ǂ Reference group.
* Statistically significant at $p < 0.05$.
Data source: Canadian annual mortality data, 1986 to 1996, Statistics Canada.

This publication is part of CPHI's ongoing inquiry into the patterns of health across this country. Consistent with our broader findings, it reflects the extent to which the health of Canadians is socially determined, interconnected, complex and changing. CPHI is committed to deepening our understanding of these patterns.