

Health Expectancy by Immigrant Status, 1986 and 1991

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Abstract

Analyses based on census data, vital statistics, and data from the Health and Activity Limitation Surveys show that immigrants, especially those from non-European countries, had a longer life expectancy and more years of life free of disability and dependency than did the Canadian-born. But while immigrants were less likely than the Canadian-born to be disabled, they were only slightly less likely to be dependent on others for help with activities of daily living. The reasons for immigrants' longevity and good health are likely related to the "healthy immigrant effect."

Since the 1950s, immigrants have made up about 16% of Canada's total population and have accounted for about 26% of the country's population growth.¹ The recent resurgence of some infectious diseases throughout the world and high rates of illness in some immigrant groups have created concerns about immigrant health.²⁻⁴ However, several health status indicators suggest that immigrants to Canada, especially those from non-European countries, are healthier than the Canadian-born population.⁵ This relative good health manifests itself not only in longer life expectancy, but also in more years free of disability and dependency (see *Immigrant status*).

Key words: *life expectancy, mortality, disabled, dependency, immigrants*

Immigrant status

For ease of reference, immigrant status was classified in this article into three broad groups defined by place of birth: Canadian-born, European immigrants, and non-European immigrants. All persons born in Canada were included in the Canadian-born category, regardless of ethnic origin. European birthplaces included the United States, Australia, and New Zealand, as well as Europe. Non-European birthplaces were all other countries. The term "immigrants" refers not only to recent immigrants to Canada, but also to those who immigrated some time ago.

The European/non-European classification was based on several considerations. First, a majority of immigrants to Canada now come from non-European countries; of those who arrived between 1981 and 1991, 75% were from non-European countries.^{6,7} Second, immigrants from European countries tend to have cultural, lifestyle, and linguistic characteristics more like those of the Canadian-born population than is the case for non-European immigrants. Since these factors are important determinants of health, there may be differences in the health status of these two broad categories of immigrants.

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Methods

Data sources

Death data for 1985-1987 and 1990-1992 were obtained from the Canadian Vital Statistics Data Base. The percentage of death records lacking information about place of birth was higher in Quebec (9% in 1985-87 and 13% in 1990-92) than in the rest of Canada (less than 1% in 1985-87 and 1% in 1990-92). For these incomplete death records, birthplace was imputed using the regional distribution from death records with a stated place of birth. However, the potential bias on mortality estimates at the national level resulting from the imputation of place of birth for a large number of Quebec death records is likely to be small, as estimated life table values for the total Canadian population by place of birth were almost the same as those generated from non-Quebec regions.

Population data from the 1986 and 1991 Censuses, including both residents of households and institutions, were used in the calculation of mortality rates. The census collects information about the mother tongue of residents of institutions, but not their place of birth. Therefore, the place of birth of institutional residents was imputed based on the distribution of place of birth among the household population by mother tongue. This procedure tended to yield more conservative estimates of the number of immigrants residing in institutions than would have been the case by directly applying the distribution of the household population by place of birth. Even so, the number of immigrants in institutions may still be somewhat overestimated. In particular, recent immigrants (the majority of whom were non-European) were not likely to have entered institutions so shortly after arriving in Canada.

Because the 1986 Census did not count non-permanent residents and the 1991 Census did, for purposes of comparison, non-permanent residents were excluded from the 1991 total population. Exclusion of the non-permanent population tended to decrease the denominators and thus increase the mortality rates and reduce the life expectancy of immigrants in 1991. (Non-permanent residents accounted for about 5% of the non-Canadian-born population.)

Census population estimates used to calculate mortality rates were not adjusted for net undercoverage, because adjustments were not available by place of birth or immigration status. Use of an adjusted census population would have had a greater effect on the estimated mortality and life expectancy of non-European immigrants. This is because the reported net undercoverage rates for persons with English, French, Italian or German as their mother tongues were considerably lower than the rates for those with other mother tongues, i.e., 2.5% or less versus 5.8% or more in 1991.⁸ As a result, use of the unadjusted population tended to increase mortality rates and decrease life expectancy slightly for the total population, and especially for non-European immigrants.

The disability and dependency data are from the 1986-87 and 1991 Health and Activity Limitation Surveys (HALS). Because disability and dependency are clearly related to age, all disability and dependency prevalences included both household and institutional residents and were age-standardized by the direct method to the total 1991 adjusted Census population.

HALS did not collect place of birth data for the health-related institutional population. The HALS institutional population by place of birth was estimated using the census distribution of the health-

related institutional population by place of birth. The severity of disability and level of dependency among institutional residents were assumed to be the same across all places of birth.

Information on disability, but not dependency, was available for children under age 15 in households. Based on the severity of their disability and their place of birth, dependency among children in households was estimated using the distribution of disability and dependency by place of birth among people aged 15 to 24.

For prevalence estimates, persons aged 65 and over were grouped together. Sample size considerations limited finer age breakdowns of the senior immigrant population. However, for both men and women, the median ages of the household population aged 65 and over were similar across the three different birthplace groups. This suggests that the estimated prevalence of disability and dependency among seniors should not have been affected by differences in the age structure of the population aged 65 and over by place of birth.

To assess the quality of the data and the impact of adjustments for the estimates of life expectancy at birth by place of birth, several alternative life tables for the 1991 population were calculated using alternative assumptions (see Appendix, *Sensitivity analyses*).

Analytical techniques

Life expectancy by place of birth was derived from abridged life tables and calculated using Chiang's method.^{9,10} The life table values were calculated from cross-sectional age-specific mortality rates of the Canadian population by place of birth in 1985-87 and 1990-92. These life tables reflect the combined mortality experience of age groups of a synthetic cohort in a specific period, rather than the actual lifetime mortality experienced by the same cohort over time.

To estimate health expectancy by place of birth, the total population was disaggregated by sex, age group, and place of birth. For each subgroup, the estimated number of person-years of life in each health state was calculated by multiplying the prevalence of disability or dependency in that subgroup by their expected total person-years of life. By summing from highest to lowest ages the expected persons-years lived in a given state of health, and then dividing those sums by the number of persons who survived to a specific age, expected years of life in that state of health were obtained for the people surviving to that age.¹¹⁻¹³

Disability- and dependency-adjusted life expectancy were also calculated.^{11,14} These health-adjusted life expectancies are summary indicators of health, which combine mortality and various aspects of morbidity into a single value.¹¹

In this article, disability- and dependency-adjusted life expectancy were calculated by adding together the expected years of life spent in each discrete health state multiplied by arbitrary weights for the corresponding state. For disability-adjusted life expectancy, the weights were 1.0 for no disability, and 0.7, 0.6, 0.5, 0.4, and 0.3 for slight, moderate, severe level 1, severe level 2, and severe level 3 disability, respectively. For dependency-adjusted life expectancy, the weights were 1.0 for no dependency; 0.8, 0.6, 0.5 and 0.4 for disabled but not dependent, somewhat dependent, moderately dependent, and heavily dependent, respectively.

Conventionally, mortality rates and life expectancy have been the most important indicators of the health consequences of disease. While numerous studies of immigrant health have focused on mortality, few have examined other aspects.¹⁵⁻¹⁹ But increasingly, it has been recognized that the consequences of disease affect not only longevity, but also quality of life, which can be measured by disability and dependency.²⁰

Health expectancy, which integrates mortality and disability or dependency into one indicator, is widely regarded as the most comprehensive indicator of health status.²¹⁻²⁴ This article assesses the health expectancy of Canada's immigrants compared with that of the Canadian-born population (see *Methods*).

The definitions of disability and dependency used in this article are those of the World Health Organization in the International Classification of Impairment, Disabilities, and Handicap (ICIDH). According to the ICIDH framework, an impairment is "any loss or abnormality of psychological, physical, or anatomical structure or function."²⁰ A disability is "any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being."²⁰ However, if an impairment is fully

corrected by an assistive device, such as a hearing aid, then an individual is not considered to have a disability (see *Definitions*).

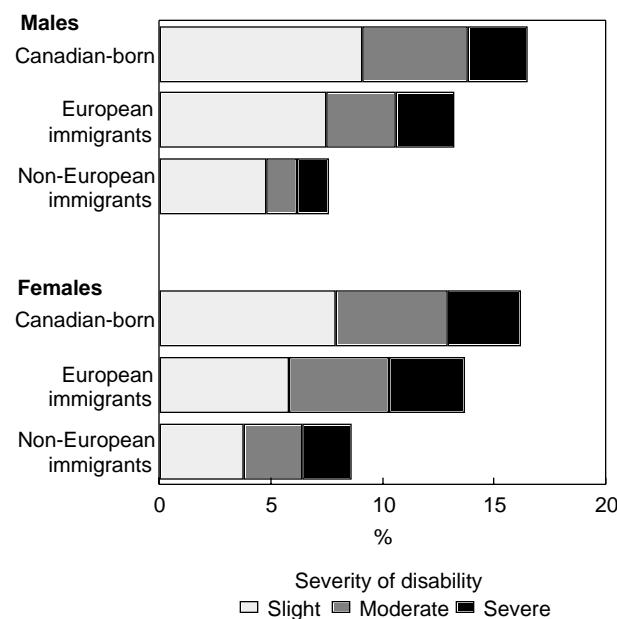
Disability

Immigrants, especially those from non-European countries, were less likely than the Canadian-born population to have a disability (Chart 1). For instance, in 1991, the age-standardized percentage of males from non-European countries who had a disability was 7.6%, compared with 16.5% of Canadian-born males. The figures for females were 8.6% and 16.2%, respectively. The prevalence of severe disability was low, but the overall ranking persisted: 1.4% for non-European males versus 2.7% for the Canadian-born; for females, 2.2% versus 3.3%. For both sexes, changes between 1986 and 1991 in the prevalence of disability by place of birth were small, especially for severe or moderate disability (Appendix, Table A).

Dependency

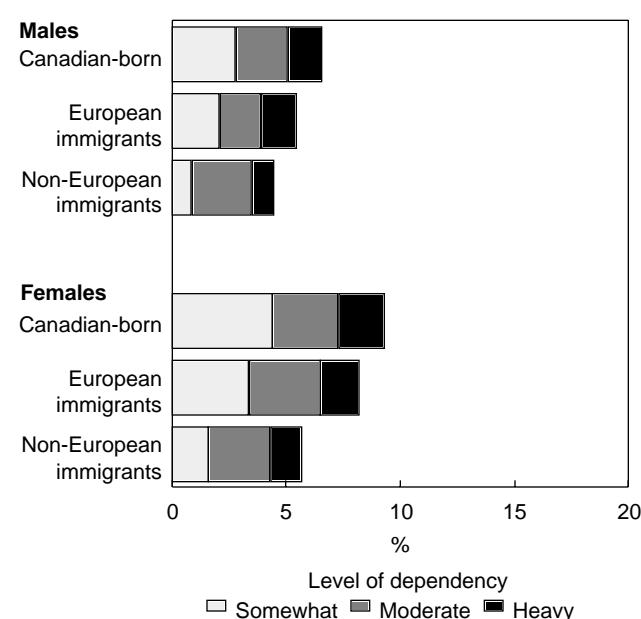
Compared with disability, the age-standardized prevalence of dependency was relatively low (Chart 2). For males in 1991, 4.5% of non-European immigrants and 5.5% of European immigrants were dependent,

Chart 1
Prevalence of disability, by severity, sex and immigrant status, Canada, 1991



Source: Health and Activity Limitation Survey, 1991
Note: Percentages were age-standardized to the 1991 adjusted Census population.

Chart 2
Prevalence of dependency, by level, sex and immigrant status, Canada, 1991



Source: Health and Activity Limitation Survey, 1991
Note: Percentages were age-standardized to the 1991 adjusted Census population.

compared with 6.6% of the Canadian-born. For females, the corresponding prevalences were 5.7%, 8.2%, and 9.3%. But while immigrants, particularly those from non-European countries, were less likely than the Canadian-born to be dependent, their levels of heavy or moderate dependency were similar to those of the Canadian-born. There were few changes in the prevalence of dependency by place of birth between 1986 and 1991 (Appendix, Table B).

Definitions

Disability

Among adults aged 15 and over residing in households or long-term health care institutions, severity of disability was derived by summing the scores from a set of screening questions concerning functional abilities that were asked on both the 1986-87 and 1991 Health and Activity Limitations Surveys (HALS). One point was given for partial loss of function, and two points for total loss of function. Severity of disability was classified according to the following categories:²⁵⁻²⁷

- No disability: 0
- Slight disability: 1-4
- Moderate disability: 5-10
- Severe disability: 11+
 - Level 1: 11-17
 - Level 2: 18-25
 - Level 3: 26-42

Severity of disability among children younger than age 15 residing in households or health-related institutions was classified as follows:

- No disability: 0
- Slight disability: 1-2
- Moderate disability: 3-4
- Severe disability: 5+

At the aggregate level, children in the "severe" category were further assigned to levels 1, 2 or 3 in the same proportions as observed among persons aged 15-24.

Dependency

Dependency was classified into four levels. Only the first applicable category was assigned.

Heavily dependent: Dependent on others for personal care (such as washing, grooming, dressing, or eating), or for moving about within the residence.

Moderately dependent: Dependent on others for going out, or for help with everyday housework (such as dusting, tidying up) or meal preparation.

Somewhat dependent: Dependent or partially dependent on others for heavy housework (such as washing walls, yard work or snow removal) or shopping for groceries, or partially dependent on others for everyday housework or meal preparation.

Not dependent: Neither dependent nor partially dependent on others for the activities mentioned above.

As defined here, dependency was based on whether, for health reasons, the respondents had received any help, rather than on need for help. For persons residing in health-related institutions, the "not dependent" category was not applicable, since all persons living in such institutions were presumed to be at least somewhat dependent, that is, receiving some help.

The relatively smaller differences by place of birth in the prevalence of dependency compared with disability may be explained by several factors. Although immigrants are less likely to have a disability, those who do may be more likely to be dependent than the Canadian-born with a disability. Second, regardless of place of birth, the prevalence of heavy or moderate dependency was low. Consequently, there was little room for larger differences across the three birthplace groups. Finally, in this article, dependency was based on receipt of help as opposed to need for help. Elderly female immigrants (especially those from non-European countries) were more likely to live with relatives.^{28,29} As a result, it is probable that immigrants with disabilities were more likely than the Canadian-born with disabilities to receive help.

Life expectancy

While the overall patterns were similar, in 1991, immigrants had lower mortality rates than did the Canadian-born population (Chart 3). Before age 70, mortality rates for the three birthplace groups generally ran parallel. However, at older ages, rates for the Canadian-born and European immigrants converged.

As a result of these patterns, immigrants, particularly those from non-European countries, had higher age-specific survival probabilities than did the Canadian-born in 1991. For example, 41% of male and 57% of female non-European immigrants could be expected to live to age 85; the corresponding proportions for the Canadian-born were 23% and 45%. The area under each survival curve represents the expected years of life for each group. These curves illustrate that immigrants had longer life expectancies than did the Canadian-born population.

Table 1
Life expectancy, by sex and immigrant status, Canada, 1986 and 1991

	Males			Females		
	1986	1991	Change	1986	1991	Change
Years						
At birth						
Canadian-born	72.3	73.6	1.3	79.3	80.4	1.0
European immigrants	75.6	76.3	0.8	81.0	81.8	0.8
Non-European immigrants	77.4	80.3	2.9	83.4	85.7	2.3
At age 65						
Canadian-born	14.6	15.3	0.8	19.0	19.7	0.7
European immigrants	15.7	16.2	0.5	19.7	19.9	0.1
Non-European immigrants	17.3	19.5	2.2	21.5	23.8	2.3

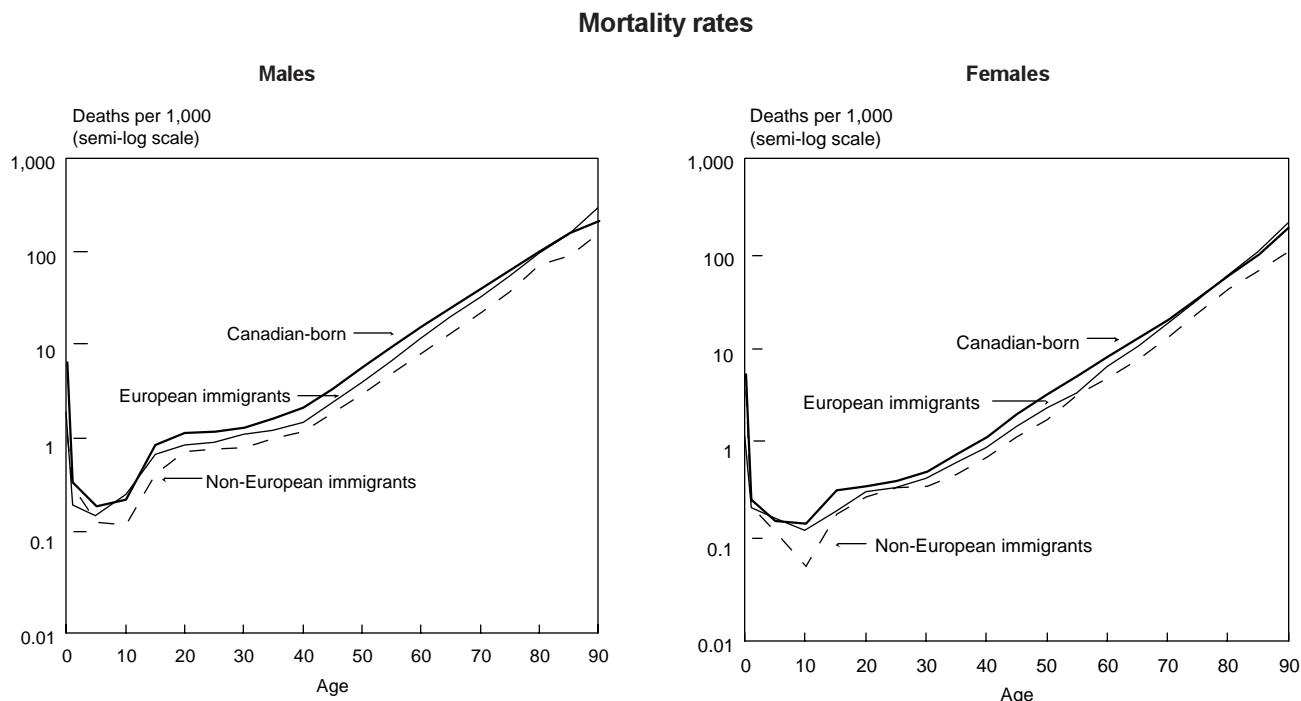
Source: 1986 and 1991 Censuses; Canadian Vital Statistics Data Base, 1985-1987, 1990-1992

In terms of life expectancy at birth, there were substantial differences between immigrants and the Canadian-born population in both 1986 and 1991 (Table 1). In 1991, the life expectancy of non-European immigrants was longer than that of the Canadian-born:

6.7 more years for males and 5.4 more years for females. Differences between European immigrants and the Canadian-born population were less pronounced: 2.7 years for males and 1.4 years for females.

Chart 3

Mortality rates and survival probabilities, by sex, age and immigrant status, Canada, 1991



Source: 1991 Census; Canadian Vital Statistics Data Base, 1990-1992

For life expectancy at age 65, differences between non-European immigrants and the Canadian-born population were still substantial in 1991. However, the corresponding differences between the Canadian-born population and European immigrants were relatively minor, particularly for women.

Between 1986 and 1991, expected years of life at birth and at age 65 increased for each of the three groups. The largest increases were for non-European immigrants (more than two years for both males and females), followed by the Canadian-born (about one year for both males and females), and then by European immigrants (6 months for males; 2 months for females). Although European immigrants' life expectancy increased the least between 1986 and 1991, it remained longer than that of the Canadian-born.

Health expectancy

Disability-based health expectancy reveals that not only did immigrants, on average, live longer than the Canadian-born, but also that a greater proportion of their life was without moderate or severe disability (Chart 4). Dependency-based health expectancy yielded the same ranking by birthplace, but the years of life lived independently varied less widely (Chart 5).

Between 1986 and 1991, expected years of life free of severe or moderate disability increased for each of the three groups (Table 2). In this period, there were also gains in disability- and dependency-based life expectancy (Table 3). For both measures, in general, the largest gains were among non-European immigrants, followed by European immigrants, and then by the Canadian-born.

Healthy immigrant effect

The reasons for immigrants' longevity and good health are likely related to the "healthy immigrant effect." People in ill health tend not to migrate to another country.³⁰⁻³² In addition, all potential immigrants undergo medical screening.³³ As well, Canada selects immigrants partially on the basis of employability, which suggests reasonably sound health. To some extent this is evident in health differentials by place of birth that were larger for men than for women, perhaps because men were more likely to migrate for reasons of employment. The larger increases in life expectancy for non-European immigrants were attributable to a substantial increase in the flow of new arrivals from non-traditional source countries between 1986 and 1991. Because new immigrants are, on average, healthy, the influx of non-European immigrants intensified the healthy immigrant effect for the entire non-European group (which includes less recent immigrants).⁷

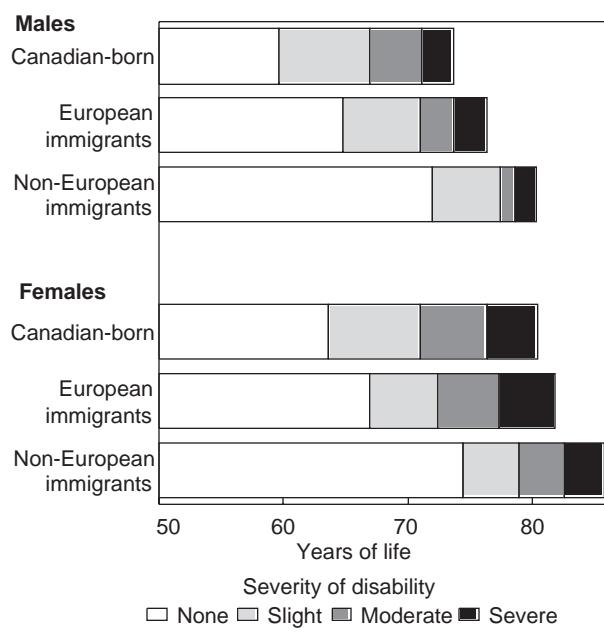
Table 2**Disability-based health expectancy, by severity, sex and immigrant status, Canada, 1991**

	Total life expectancy		Disability-based life expectancy		Free of severe disability		Free of severe or moderate disability		Free of any disability	
	1991	Change 1986-91	1991	Change 1986-91	1991	Change 1986-91	1991	Change 1986-91	1991	Change 1986-91
Years										
Males at birth										
Canadian-born	73.60	1.30	68.38	0.55	71.11	1.16	66.94	0.82	59.61	-0.98
European immigrants	76.30	0.75	71.89	0.76	73.67	0.56	70.96	0.88	64.75	0.82
Non-European immigrants	80.29	2.90	77.18	2.35	78.57	2.82	77.45	3.53	71.89	0.98
Males at age 65										
Canadian-born	15.31	0.76	12.32	0.37	13.37	0.56	10.79	0.22	7.84	-0.27
European immigrants	16.21	0.49	13.94	1.03	14.34	0.71	13.15	1.34	10.76	1.98
Non-European immigrants	19.48	2.23	17.39	1.88	18.18	2.33	18.06	3.29	13.87	0.76
Females at birth										
Canadian-born	80.35	1.03	73.77	0.14	76.27	0.88	70.94	0.30	63.61	-1.62
European immigrants	81.81	0.80	75.72	0.85	77.32	1.58	72.37	1.62	66.87	0.21
Non-European immigrants	85.71	2.28	81.09	2.49	82.51	2.40	78.90	3.51	74.43	2.72
Females at age 65										
Canadian-born	19.65	0.70	15.37	0.13	16.20	0.46	12.91	0.16	9.47	-0.91
European immigrants	19.85	0.14	16.04	0.98	16.26	1.22	13.35	1.67	11.20	1.82
Non-European immigrants	23.79	2.32	20.39	2.78	21.18	2.68	18.50	3.88	15.90	3.49

Source: Health and Activity Limitation Surveys, 1986-87 and 1991; 1986 and 1991 Censuses; Canadian Vital Statistics Data Base, 1985-1987, 1990-1992

Chart 4

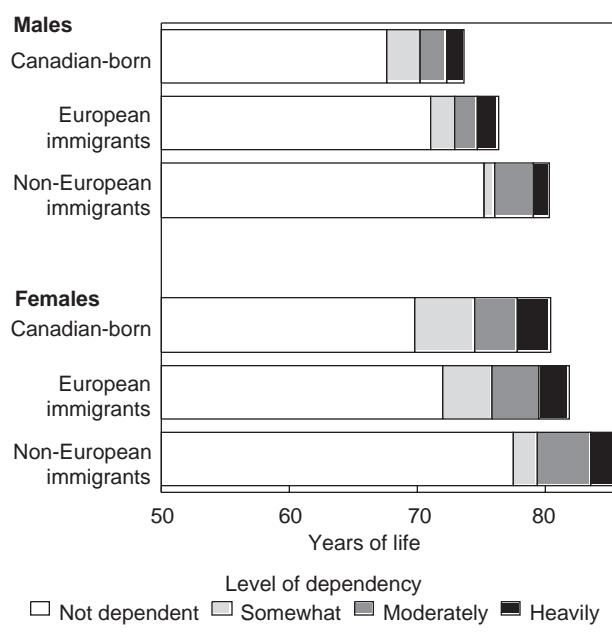
Disability-based health expectancy at birth, by severity, sex and immigrant status, Canada, 1991



Source: Health and Activity Limitation Survey, 1991; 1991 Census; Canadian Vital Statistics Data Base, 1990-1992

Chart 5

Dependency-based health expectancy at birth, by level, sex and immigrant status, Canada, 1991



Source: Health and Activity Limitation Survey, 1991; 1991 Census; Canadian Vital Statistics Data Base, 1990-1992

Table 3

Dependency-based health expectancy, by level, sex and immigrant status, Canada, 1991

	Total life expectancy		Dependency-based life expectancy		Free of heavy dependence		Free of heavy or moderate dependence		Free of any dependence	
	1991	Change 1986-91	1991	Change 1986-91	1991	Change 1986-91	1991	Change 1986-91	1991	Change 1986-91
Years										
Males at birth										
Canadian-born	73.60	1.30	69.15	0.79	72.28	1.20	70.23	0.94	67.62	1.23
European immigrants	76.30	0.75	72.45	0.74	74.66	0.63	72.92	0.47	71.02	0.81
Non-European immigrants	80.29	2.90	77.07	2.01	79.06	2.92	76.02	1.09	75.22	1.21
Males at age 65										
Canadian-born	15.31	0.76	12.57	0.41	14.29	0.78	12.68	0.45	10.79	0.15
European immigrants	16.21	0.49	14.06	0.92	14.87	0.53	13.70	0.61	12.74	1.06
Non-European immigrants	19.48	2.23	17.23	1.58	18.40	2.27	16.12	0.87	16.00	1.07
Females at birth										
Canadian-born	80.35	1.03	74.08	0.19	77.82	0.60	74.49	0.15	69.81	0.06
European immigrants	81.81	0.80	76.06	1.07	79.50	1.54	75.81	1.42	72.02	2.04
Non-European immigrants	85.71	2.28	80.97	2.10	83.54	2.33	79.35	1.60	77.47	1.18
Females at age 65										
Canadian-born	19.65	0.70	15.35	0.08	17.29	0.30	14.73	0.00	11.83	-0.31
European immigrants	19.85	0.14	16.08	1.02	17.80	0.96	15.10	1.26	12.95	1.89
Non-European immigrants	23.79	2.32	20.16	2.09	21.81	2.34	18.22	0.97	17.20	0.60

Source: Health and Activity Limitation Surveys, 1986-87 and 1991; 1986 and 1991 Censuses; Canadian Vital Statistics Data Base, 1985-1987, 1990-1992

Length of residence in Canada, lifestyle, and culture may also play important roles in health differentials by place of birth. The differences in life expectancy between non-European immigrants and the Canadian-born were sharper than were those for European immigrants. This may be explained partly by duration of residence, since non-European immigrants were more likely to be recent immigrants.^{5,7,30,32,34,35} Their relatively better health status may also be partly attributable to culture and lifestyle, which tend to differ more from those of the Canadian-born than is the case for European immigrants. For instance, non-European immigrants were much less likely than the Canadian-born to have ever smoked.^{5,36}

Concluding remarks

Immigrants, especially those from non-European countries had a longer life expectancy and more years of life free of disability and dependency than did the Canadian-born population. These indicators show that immigrants, notably those from non-European countries, were healthier than the Canadian-born population.

Since immigrants are a heterogeneous group, studying their health with a simple breakdown by European and non-European origins is only a beginning. A finer breakdown by country of origin would be desirable for future investigations.

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References

1. Basavarajappa KG, Beaujot RP, Samuel TJ. *The Impact of Migration on Receiving Countries: Canada*. Kosinski LA (editor). Geneva: International Organization on Migration, 1993.
2. Fanning EA. The impact of global tuberculosis in Canada: We are our brothers' keepers [Editorial]. *Canadian Journal of Infectious Disease* 1995; 6(5): 225-7.
3. St. John R. Preventing the spread of infectious disease in the modern world [Editorial]. *Canadian Journal of Public Health* 1994; 85(6): 370-1.
4. Wilkins K. Tuberculosis, 1994. *Health Reports* (Statistics Canada, Catalogue 82-003) 1996; 8(1): 33-9.
5. Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. *Health Reports* (Statistics Canada, Catalogue 82-003) 1996; 7(4): 33-45.
6. Badets J. Canada's immigrants: Recent trends. *Canadian Social Trends* (Statistics Canada, Catalogue 11-008E) 1993; 29: 8-11.
7. Badets J, Chui T. *Canada's Changing Immigrant Population*. (Statistics Canada, Catalogue 96-311E) Ottawa: Minister of Supply and Services Canada, 1994.
8. Statistics Canada. *1991 Census Technical Reports: Coverage* (Catalogue 92-341E) Ottawa: Minister of Industry, Science and Technology, 1994.
9. Chiang CL. *The Life Table and Its Applications*. Malabar, Florida: Krieger Publishing, 1984.
10. Ng E, Gentleman JF. The impact of estimation method and population adjustment on Canadian life table estimates. *Health Reports* (Statistics Canada, Catalogue 82-003) 1995; 7(3): 15-22.
11. Wilkins R, Adams O. *Healthfulness of Life*. Montreal: Institute for Research on Public Policy, 1983.
12. Wilkins R, Adams O. Health expectancy in Canada, late 1970s: Demographic, regional, and social dimensions. *American Journal of Public Health* 1983; 73(9): 1073-80.
13. Sullivan DF. A single index of mortality and morbidity. *HSMHA Health Reports* 1971; 86(4): 347-54.
14. Wilkins R, Chen J, Ng E. Changes in health expectancy in Canada from 1986 to 1991. In: Mathers C, McCallum J, Robine J-M (editors). *Advances in Health Expectancies: Proceedings of the 7th Meeting of the International Network on Health Expectancy (REVES)*: February 1994; Canberra: Australian Institute of Health and Welfare, 1994: 115-32.
15. Travato F. Mortality differences among Canada's indigenous and foreign-born population, 1951-1971. *Canadian Studies in Population* 1985; 12(1): 49-80.
16. Sharma RC, Michalowski M, Verma R. Mortality differentials among immigrant populations in Canada. *International Migration* 1990; 28(4): 443-50.
17. Michalowski M. Mortality patterns of immigrants: Can they measure the adaptation? Paper presented at the XIth World Congress of Sociology, Madrid, Spain: July 9-13, 1990.
18. Travato F, Clogg C. General and cause-specific adult mortality among immigrants in Canada, 1971 and 1981. *Canadian Studies in Population* 1992; 19(1): 47-80.
19. Travato F, Verma R, George MV, et al. *Mortality Patterns and Differentials of Visible Minorities in Canada 1980-82 and 1985-87* (Statistics Canada, uncatalogued) Ottawa: 1993.
20. World Health Organization. *International Classification of Impairments, Disabilities and Handicaps (ICIDH): A Manual of Classification Relating to the Consequences of Disease*. Geneva: World Health Organization, 1980.
21. Robine J-M, Blanchet M, Dowd JE (editors). *Health Expectancy. First Workshop of the International Healthy Life Expectancy Network (REVES)*. OPCS Studies on Medical and Population Subjects, No. 54. London: HMSO, 1992.
22. Robine J, Mathers CD, Bone MR, et al (editors). *Calculation of Health Expectancies: Harmonization, Consensus Achieved and Future Perspectives*. Proceedings of the 6th REVES International Workshop (Colloques INSERM, vol. 226) London: John Libbey Eurotext, 1993.
23. Mathers C, McCallum J, Robine J (editors). *Advances in Health Expectancies. Proceedings of the 7th Meeting of the International Network on Health Expectancy (REVES)*. Canberra: Australian Institute of Health and Welfare, 1994.
24. World Bank. *World Development Report 1993: Investing in Health*. New York: Oxford University Press, 1993.
25. McDowell I. *A Disability Score for the Health and Activity Limitation Survey (for adults in the household population)* (Statistics Canada, uncatalogued) Ottawa: Disability Database Program, July 8, 1988.

26. Brodeur M. *Severity Score for Adult Residents of Institutions* (Statistics Canada, uncatalogued) Ottawa: Health and Activity Limitation Survey, Disability Database Program, October 28, 1988.
27. Brodeur M. *Severity Score for Children*. (Statistics Canada, uncatalogued) Ottawa: Health and Activity Limitation Survey, Disability Database Program, 1988.
28. Boyd M. Immigration and living arrangements: Elderly women in Canada. *International Migration Review* 1991; 25: 4-27.
29. Zukewich Ghalam N. Living with relatives. *Canadian Social Trends* (Statistics Canada, Catalogue 11-008) 1996; 42: 20-4.
30. Marmot MG, Adekstein AM, Bulusu L. Lessons from the study of immigrant mortality. *Lancet* 1984; June 30: 1455-7.
31. Young CM. Changes in the demographic behaviour of migrants in Australia and the transition between generations. *Population Studies* 1990; 4: 68-89.
32. Kliewer E. Epidemiology of disease among migrants. *International Migration* 1992; 30: 141-65.
33. Marrocco FN, Goslett HM (editors). *The Annotated Immigration Act of Canada*. Toronto: Thompson Professional Publishing, 1993: Sections 11(1), 19(1)(a).
34. Stephen EH, Foote K, Hendershot GE, et al. Health of the foreign-born population: United States, 1989-90. *Advance Data from Vital and Health Statistics*. Hyattsville, Maryland: National Center for Health Statistics, 1994; 241: 1-10.
35. Donovan J, d'Espaignet E, Merton C, et al (editors). *Immigrants in Australia: A Health Profile* (Australian Institute of Health and Welfare: Ethnic Health Series, No.1) Canberra: AGPS, 1992.
36. Millar WJ. Place of birth and ethnic status: Factors associated with smoking prevalence among Canadians. *Health Reports* (Statistics Canada, Catalogue 82-003) 1992; 4(1): 7-24.

Appendix

Table A
Prevalence of disability, by severity, sex and immigrant status, Canada, 1986 and 1991

	Any disability			Severe disability			Moderate disability			Slight disability		
	1986	1991	Change	1986	1991	Change	1986	1991	Change	1986	1991	Change
%												
Males												
Canadian-born	14.2	16.5	2.3	2.7	2.7	0.0	4.5	4.7	0.2	7.0	9.1	2.1
European immigrants	12.7	13.2	0.5	2.4	2.6	0.2	3.3	3.1	-0.2	7.0	7.5	0.5
Non-European immigrants	6.6	7.6	1.0	1.5	1.4	-0.1	1.8	1.4	-0.4	3.3	4.8	1.5
Females												
Canadian-born	13.7	16.2	2.5	3.3	3.3	0.0	4.5	5.0	0.5	5.9	7.9	2.0
European immigrants	12.2	13.7	1.5	4.0	3.4	-0.6	4.4	4.5	0.1	3.8	5.8	2.0
Non-European immigrants	8.8	8.6	-0.2	2.3	2.2	-0.1	3.3	2.6	-0.7	3.2	3.8	0.6

Source: Health and Activity Limitation Surveys, 1986-87 and 1991

Note: Percentages were age-standardized to the 1991 adjusted Census population.

Table B
Prevalence of dependency, by level, sex and immigrant status, Canada, 1986 and 1991

	Any dependency			Heavily dependent			Moderately dependent			Somewhat dependent		
	1986	1991	Change	1986	1991	Change	1986	1991	Change	1986	1991	Change
%												
Males												
Canadian-born	6.9	6.6	-0.3	1.4	1.5	0.1	2.1	2.3	0.2	3.4	2.8	-0.6
European immigrants	5.5	5.5	0.0	1.5	1.6	0.1	1.6	1.8	0.2	2.4	2.1	-0.3
Non-European immigrants	3.3	4.5	1.2	1.1	1.0	-0.1	1.2	2.6	1.4	1.0	0.9	-0.1
Females												
Canadian-born	8.7	9.3	0.6	1.7	2.0	0.3	2.5	2.9	0.4	4.5	4.4	-0.1
European immigrants	8.9	8.2	-0.7	2.3	1.7	-0.6	2.7	3.1	0.4	3.9	3.4	-0.5
Non-European immigrants	5.5	5.7	0.2	1.5	1.4	-0.1	2.7	2.7	0.0	1.3	1.6	0.3

Source: Health and Activity Limitation Surveys, 1986-87 and 1991

Note: Percentages were age-standardized to the 1991 adjusted Census population.

Sensitivity analyses

To assess the quality of the data and the impact of adjustments for the estimates of life expectancy at birth by place of birth, several alternative life tables for the 1991 population by place of birth were calculated using alternative assumptions for data adjustment.

Because a relatively high percentage of death records in Quebec did not report place of birth (13% versus 1% for the rest of Canada), the following alternative estimates were calculated for Quebec and the rest of Canada separately. For the rest of Canada, assuming all death records with unknown place of birth were deaths of immigrants, life expectancy at birth for the Canadian-born would have increased 0.1 of a year for both males and females; that of European immigrants would have decreased by 1.1 years for males and 0.5 of a year for females; and that of non-European immigrants would have decreased by 0.6 of a year for males and 0.7 of a year for females. In other words, for Canada excluding Quebec, the effect would have been to somewhat diminish immigrants' advantage in life expectancy, but the rank order of the three groups would have remained the same.

For Quebec, the assumption that all deaths of unknown place of birth were deaths of immigrants is clearly untenable: immigrants made up less than 9% of the Quebec population but would have accounted for 22% of deaths, and their life expectancy at birth would have decreased by nine or more years, depending on place of birth and sex.

Assuming all immigrants experienced the same infant mortality as did the Canadian-born, life expectancy at birth for European immigrants would have decreased by 0.4 of a year for males and females; and that of non-European immigrants would have decreased by 0.5 of a year for males and 0.2 of a year for females.

Assuming the 1991 institutional population distribution by mother tongue and place of birth was the same as that of the 1986 household population, life expectancy at birth of the Canadian-born would have decreased by less than 0.1 of a year for both sexes; that of European immigrants would have increased by 0.1 of a year for males and 0.2 of a year for females; and that of non-European immigrants would have increased by 0.2 of a year for males and 0.6 of a year for females.