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- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- P preliminary
- r revised
- X suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published
- * significantly different from reference category ($p < 0.05$)

Use of acute care hospital services by immigrant seniors in Ontario: A linkage study

by Edward Ng, Claudia Sanmartin, Jack Tu and Doug Manuel

Abstract

Background

Seniors constitute the largest group of hospital users. The increasing share of immigrants in Canada's senior population can affect the demand for hospital care.

Data and methods

This study used the linked 2006 Census-Hospital Discharge Abstract Database to examine hospitalization during the 2004-to-2006 period, by immigrant status, of Ontario seniors living in community. Hospitalization was assessed with logistic regressions; cumulative length of stay, with zero-truncated negative binomial regressions. All-cause hospitalization and hospitalizations specific to circulatory and digestive diseases were examined.

Results

Immigrant seniors had significantly low age-/sex-adjusted odds of hospitalization, compared with Canadian-born seniors (OR = 0.81). The odds varied from 0.4 among East Asians to 0.89 among Europeans, and rose with length of time since arrival from 0.54 for recent (1994 to 2003) to 0.86 for long-term (before 1984) immigrants. Adjustment for demographic and socio-economic characteristics did not change the overall patterns. Immigrants' cumulative length of hospital stay tended to be shorter than or similar to that of Canadian-born seniors.

Interpretation

Immigrant seniors, especially recent arrivals, had lower odds of hospitalization and similar time in hospital, compared with Canadian-born seniors. These patterns likely reflect differences in health status. Variations by world region and disease reflect the diverse health care needs of immigrant seniors.

Keywords

Aging, census, databases, health services, hospitalization, length of stay, medical record linkage

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The percentage of people aged 65 or older in the Canadian population rose from 8% in 1960 to 15% in 2011; by 2036, the figure is expected to be at least 23%.^{1,2} Population aging affects the demand for and cost of health care services,³⁻⁵ given that seniors account for about 45% of provincial/territorial government health care dollars.⁶ Hospitals represented an estimated 29% of health care expenditures in 2012. Seniors are not only the largest user group, but per capita spending on hospital visits are consistently higher among seniors.^{6,7}

According to the 2006 Census, 30% of seniors in Canada and 43% of seniors in Ontario are immigrants.^{8,9} The majority of them arrived decades ago and aged in Canada.⁸ However, a small percentage (less than 5%) of recent immigrants were seniors, and thereby contributed directly to the growth of the senior population.¹⁰ Furthermore, the shift in immigrant origins away from Europe has made the senior population more diverse,¹¹⁻¹³ a factor that can influence the demand for hospital care.

Information about immigrant seniors' use of hospital services is limited, largely because hospital administrative records do not include immigration status. This limitation can be overcome if discharge records are linked to databases that contain immigrant-related information. For instance, a pilot study that linked Citizenship and Immigration Canada (CIC) landing

records to health services data in British Columbia and Manitoba found that immigrant seniors generally used fewer hospital services than did non-immigrant seniors, although hospitalization rates rose with duration of residence.¹⁴ Other studies linked landing records to physician claims and to mortality data to examine health service use and health outcomes among immigrants in British Columbia, Ontario and Quebec,¹⁵⁻¹⁷ but did not target seniors.

The present analysis compares hospitalization rates and length of stay of immigrant and Canadian-born seniors in Ontario using linked 2006 Census-Discharge Abstract Database information. This linkage makes it possible to add socio-demographic and immigrant-related characteristics to hospital administrative records.

Data and methods

Data

In Ontario, about 2.4 million household residents responded to the 2006 Census long form, which collected information on immigrant status (place of birth and period of arrival) and on socio-economic characteristics such as living arrangements, education and income. The Discharge Abstract Database (DAD) (Ontario file) contains information on inpatient hospitalizations (about 0.9 million a year) in acute care facilities, which is provided to Statistics Canada by the Canadian Institute for Health Information.¹⁸ Approximately 2.1 million census long-form respondents were linked to the DAD for the years 2000 to 2010, based on name, date of birth and other demographic information, using the Ontario Registered Person Data Base provided by the Ontario Ministry of Health and Long-Term Care. The linkage was approved by Statistics Canada's Policy Committee. Details about the linkage are available elsewhere.¹⁹

Study sample

This study is based on 279,175 Ontario residents aged 65 or older who lived in private households: 116,410 immigrants and 162,765 Canadian-born. The 2006 Census defined immigrants as people who are, or have been, landed immigrants in Canada. A landed immigrant is not a Canadian citizen by birth, but has been granted the right to live in Canada permanently.⁸ This analysis excludes non-permanent residents and refugee claimants ($n = 815$).

A retrospective cohort approach was used to examine hospitalization during the two years before the 2006 Census (May 17, 2004 through May 16 2006). This approach minimizes potential bias due to losses to follow-up (for example, emigration and death). To ensure that respondents were "eligible" for hospitalization during the two-year study period, immigrant seniors who arrived between 2004 and 2006 were excluded ($n = 395$). Immigrants were classified by selected world region of origin: Europe,

South Asia (Bangladesh, Bhutan, India, Nepal, Pakistan, Republic of Maldives, Sri Lanka), and East Asia (Hong Kong, Japan, Macao, Mongolia, North Korea, People's Republic of China, Taiwan, Singapore, South Korea). Immigrants were also classified by period of arrival: long-term (before 1984), medium-term (1984 through 1993) or recent (1994 through 2003).

Study variables

Hospital use (hospitalization) is defined as inpatient hospital acute service use, excluding alternative levels of care. Two measures of hospital use were analysed: access—at least one acute-care hospitalization during the study period, and intensity—total acute-care hospital days for admissions during the study period. The measures were calculated for all-cause hospitalizations and two leading causes among seniors: circulatory diseases (most responsible diagnosis - ICD10 codes I00 to I99, such as hypertensive/ischemic/pulmonary heart and cerebrovascular diseases), and digestive diseases (most responsible diagnosis - ICD10 codes K00 to K93, such as diseases of liver, oesophagus, stomach and duodenum, peritoneum).

The census covariates used in this study were age (65 to 74 or 75 or older), sex, knowledge of official languages (yes or no), secondary school graduation (yes or no), low income status (yes, no, or not applicable), and residence in a Census Metropolitan Area (CMA) (Toronto, other CMAs, or rest of Ontario). Living arrangements were classified hierarchically—living with children, with spouse, with others, or alone. The Canadian-born population was the reference group.

Methods

Descriptive statistics were used to examine the characteristics of the study cohort. The prevalence of hospitalization in the two years before the 2006 Census and the cumulated average number of days in hospital for all admissions during that period were calculated by the selected characteristics. Chi-square and the Wilcoxon-Mann-Whitney non-

parametric test were used to test for differences between subgroups.

Multivariate statistical analysis was employed to disentangle relationships between immigrant-related characteristics and hospitalization, controlling for age, sex, and the census covariates. With a double-hurdle (two-step) model,²⁰ differences in the likelihood of hospital admission and in the length of time in hospital were investigated. First, logistic regression was used to estimate the odds of at least one admission (yes/no) during the study period (SAS v9.2). Second, zero-truncated binomial regression was used to estimate differences in cumulated length of hospital stay among those who were hospitalized (STATAv11). The latter method was chosen because of the skewed nature of length-of-stay data, and because the variance of hospital use data often exceeds the mean.^{20,21} In zero-truncated negative binomial regression, an incidence rate ratio (IRR) coefficient of less (more) than 1 is interpreted as a decrease (increase) in the expected number of hospital days by a factor of the IRR, holding all other variables constant. For both steps, two sets of regression models were produced: age-/sex-adjusted and fully adjusted.

Results

Descriptive analysis

Immigrants made up 41% of the study cohort of Ontario seniors ($n=279,175$) (Table 1). Two-thirds (68%) of these immigrant seniors were from Europe; 8% were from East Asia, and 6%, from South Asia (data not shown). The majority of immigrant seniors (83%) had arrived in Canada before 1984 (data not shown).

Immigrant and Canadian-born seniors were similar in terms of age, sex and level of education. However, they differed in knowledge of official languages, living arrangements, income, and geographic location (Table 1).

Immigrant seniors' characteristics varied by world region of origin. Those from Europe tended to be older than

Table 1
Selected characteristics of seniors (aged 65 or older), by immigration status and selected world region, Ontario, 2004 to 2006

Characteristics	Canadian-born		Immigrants				
	Total		Total	Europe	East Asia	South Asia	Other
Study cohort	277,955	162,765	115,190	78,545	9,470	6,445	20,730
% distribution	100	59	41	28	3	2	7
	Column percentage						
Total	100	100	100	100	100	100	100
Age group							
65 to 74	56	55	56	53	59	68	63
75 or older	44	45	44	47	41	32	37
Sex							
Men	45	44	46	47	46	51	43
Women	55	56	54	53	54	49	57
Period of arrival							
Long-term (before 1984)	...	...	83	95	43	43	68
Medium-term (1984 to 1993)	...	...	9	2	31	28	19
Recent (1994 to 2003)	...	...	8	2	26	29	13
Knowledge of official languages (yes)	94	100	86	91	44	72	89
Secondary school graduation (yes)	54	53	54	51	53	63	65
Living arrangements							
With children*	14	11	19	15	28	23	26
With spouse only	53	54	51	55	46	48	40
With others (relatives or others)	8	7	10	7	15	23	15
Alone	26	29	21	23	11	7	19
Low income							
Yes	11	9	14	11	28	15	19
No	87	88	85	88	72	84	80
Not applicable	2	4	1	1	0	0	1
Census Metropolitan Area							
Toronto	36	21	56	47	88	82	68
Other CMA	49	57	37	45	12	17	28
Non-CMA	15	21	7	8	1	1	4

* may include spouse or others

... not applicable

Note: Because of rounding, detail may not add to 100%.

Source: Linked 2006 Census-Hospital Discharge Database, Ontario.

those from East Asia and South Asia, and more likely to have arrived before 1984. European-born seniors were also more likely than those from East and South Asia to live alone and have knowledge of official languages, but less likely to live in Toronto. Seniors from East Asia were more likely than those from other world regions to be in a low-income category.

An estimated 18% of immigrant seniors in Ontario had been hospitalized at least once in the two years before the Census; this compared with 22% of Canadian-born seniors (Table 2). The percentages hospitalized varied from 10% of those from East Asia to 20% of those from Europe. Immigrant seniors who had arrived most recently (1994

through 2003) were less likely than those who had arrived in earlier periods to have been hospitalized.

About 5% of immigrant seniors and 6% of Canadian-born seniors had at least one circulatory disease hospital admission, and around 3% of both groups were hospitalized for digestive diseases.

The cumulative average number of days for all-cause hospitalizations during the two years before the 2006 Census was significantly lower for immigrant than Canadian-born seniors—9.9 versus 10.3 days. The averages for circulatory diseases did not differ significantly (9.4 versus 9.2 days), but for digestive diseases, the average for immigrants was significantly lower (6.7 versus 7.1 days).

Hospitalization (logistic regression)

The age-/sex-adjusted odds of being hospitalized at least once for any cause during the study period were lower among immigrant seniors than among Canadian-born seniors (OR = 0.81) (Table 3). Results varied by period of immigration, with lower odds among recent immigrants. Even when education, income, living arrangements, knowledge of official languages and CMA residence were taken into account, the odds of hospitalization remained significantly lower among immigrants.

Compared with Canadian-born seniors, those from East Asia (OR = 0.40) or South Asia (OR = 0.75) had lower odds of all-cause hospitalization. The odds for European seniors were close to, but still significantly below those for the Canadian-born. A duration effect was apparent, with lower odds of hospitalization among recent arrivals. Full adjustment reduced the differences, but did not remove the statistical significance, except among medium-term European immigrants and long-term South Asian immigrants.

Overall, immigrant seniors from Europe or East Asia were less likely than Canadian-born seniors to be hospitalized for circulatory and digestive diseases (Table 3). For South Asians, this was true for digestive diseases, but not for circulatory diseases, as their odds of hospitalization (overall, as well as medium- and long-term) did not differ significantly from the odds for Canadian-born seniors. As well, medium-term European immigrant seniors' odds of hospitalization for circulatory and digestive diseases were the same as those of Canadian-born seniors.

Full adjustment changed the results slightly. For example, among recent European and South Asian immigrants, the fully adjusted odds of hospitalization no longer differed significantly from the odds for Canadian-born seniors, especially for circulatory diseases.

Hospital days (truncated negative binomial regression)

Immigrant seniors who were hospitalized (all causes) spent significantly less

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Table 2

Prevalence of hospitalization and cumulative length of stay among seniors (aged 65 or older), by immigration status, period of arrival, selected world region of origin, and selected causes, Ontario, 2004 to 2006

Cause, hospitalization and length of stay	Total	Canadian-born	Immigrants				Region of origin			
			Period of arrival		Recent (1994 to 2003)	Europe	East Asia	South Asia	Other	
			Total	Long-term (before 1984)						Medium-term (1984 to 1993)
Study cohort	277,955	162,765	115,190	95,715	10,700	8,775	78,545	9,470	6,445	20,730
% distribution	100	59	41	34	4	3	28	3	2	7
Total										
Hospitalized (%)	20.3	21.6	18.3*	19.3*	15.0*	12.2*	20.0*	9.8*	16.4*	16.4*
Hospital stay (mean number of days)	10.1	10.3	9.9*	9.8*	10.3	9.5*	9.9*	9.4*	10.5	9.5*
Circulatory diseases										
Hospitalized (%)	5.9	6.4	5.3*	5.6*	4.3*	3.3*	5.9*	2.0*	5.5*	4.5*
Hospital stay (mean number of days)	9.3	9.2	9.4	9.3	10.1	9.6	9.4	8.0	9.7	9.6
Digestive diseases										
Hospitalized (%)	3.2	3.4	2.9*	3.0*	2.5*	1.9*	3.2	1.9*	1.9*	2.5*
Hospital stay (mean number of days)	7.0	7.1	6.7*	6.7	6.6	6.6	6.6*	6.4	8.7	6.7

* significantly different from Canadian-born ($p < 0.05$)

Source: Linked 2006 Census-Hospital Discharge Database, Ontario.

time in hospital than did Canadian-born seniors (IRR = 0.94), a reflection of the situation among long-term immigrants (Table 4). Full adjustment yielded significantly less time in hospital among recent immigrants as well, but did not change the overall finding that immigrant seniors' hospital stays tended to be shorter than those of Canadian-born seniors.

Immigrant seniors from Europe and East Asia spent significantly less time in hospital than did Canadian-born seniors. Results varied slightly by period of arrival, but in no case did immigrant seniors' hospital days significantly exceed those of Canadian-born seniors.

Time in hospital attributable to circulatory diseases did not differ between Canadian-born and immigrant seniors, except those from East Asia whose hospital stays were significantly shorter after full adjustment (IRR = 0.77).

Among seniors hospitalized for digestive diseases, medium-term (1984 to 1993) South Asian immigrants spent significantly more time in hospital than did the Canadian-born. By contrast, medium-term immigrants from Europe spent significantly less time in hospital for digestive diseases than did Canadian-born seniors.

Discussion

This study is unique in its use of linked hospital and census data to compare hospitalization rates and length of hospital stay among Ontario seniors by immigrant status. Over a two-year period, immigrant seniors had lower odds of all-cause and selected cause hospitalization than did Canadian-born seniors. Adjusting the results for socio-economic covariates available in the census reduced the differences, but with minor exceptions, did not change the overall results.

The findings of previous Canadian studies of immigrants' use of health care services have varied. Analyses of self-reported data have shown similar or lower utilization rates for immigrants, compared with the Canadian-born.^{22,23} Recent studies using administrative data²⁴⁻²⁶ found both lower and higher health care service utilization rates for immigrants, depending on the service and/or immigrant category. A study that linked health care data to immigration landing data reported fewer visits to specialists among immigrants in British Columbia and Ontario.¹⁶ An analysis of hospitalization data and aggregated census data for Toronto showed higher hospitalization rates among people in neighborhoods with relatively large percentages of recent immigrants, but concluded that the results were heavily influenced by

the socio-economic characteristics of the neighborhoods.²⁵ Most of these studies presented overall comparisons by immigrant status, and did not focus on seniors.

Lower use of hospital services may reflect unmet needs for care, or alternatively, differences in health status. Although the presence of unmet medical needs among immigrants has been suggested,²⁷ lower utilization may be due to differences in cultural beliefs and behaviours²⁸ and/or lower health literacy.²⁹

Survey-based research found that the health status of recent senior immigrants was similar to or less favourable than that of the Canadian-born population,³⁰⁻³¹ and that immigrant seniors were more likely to experience health decline but less likely to be hospitalized. These results suggest service underutilization or unmet health needs.²⁷ Therefore, it might be expected that immigrant seniors who do access care may be sicker and spend more days in hospital than their Canadian-born counterparts. However, the present analysis generally shows less time in hospital among immigrants. Immigrant seniors' hospital stays tended to be shorter or equal to those of the Canadian-born, but not higher, except for digestive disease among South Asians. Further research is necessary to determine if underutilization of other health care services is associated with South Asians' longer hospital stays for digestive diseases.

Table 3
Odds ratios of hospitalization for selected causes, by immigrant status, world region of origin and period of arrival, household population aged 65 or older, Ontario, 2004 to 2006

Cause, immigrant status, world region of origin and period of arrival	Odds ratios					
	Age-/Sex-adjusted	95% confidence interval		Fully adjusted [§]	95% confidence interval	
		from	to		from	to
All causes						
Canadian-born[†]	1.00	...	...	1.00	...	...
Immigrants (total)[‡]	0.81*	0.80	0.83	0.90*	0.88	0.92
Long-term (before 1984)	0.86*	0.84	0.88	0.92*	0.90	0.94
Medium-term (1984 to 1993)	0.64*	0.61	0.68	0.72*	0.68	0.76
Recent (1994 to 2003)	0.54*	0.51	0.58	0.62*	0.58	0.66
Europe	0.89*	0.87	0.91	0.94*	0.92	0.96
Long-term (before 1984)	0.90*	0.88	0.92	0.94*	0.92	0.96
Medium-term (1984 to 1993)	0.87*	0.78	0.98	0.91*	0.81	1.02
Recent (1994 to 2003)	0.66*	0.58	0.75	0.71*	0.62	0.81
East Asia	0.40*	0.37	0.43	0.45*	0.41	0.48
Long-term (before 1984)	0.44*	0.40	0.49	0.48*	0.43	0.53
Medium-term (1984 to 1993)	0.39*	0.34	0.44	0.42*	0.37	0.47
Recent (1994 to 2003)	0.34*	0.29	0.39	0.37*	0.31	0.42
South Asia	0.75*	0.70	0.80	0.84*	0.79	0.90
Long-term (before 1984)	0.89*	0.80	0.98	0.99	0.90	1.09
Medium-term (1984 to 1993)	0.70*	0.61	0.79	0.76*	0.67	0.87
Recent (1994 to 2003)	0.62*	0.54	0.71	0.68*	0.59	0.77
Circulatory diseases						
Canadian-born[†]	1.00	...	...	1.00	...	...
Immigrants (total)[‡]	0.82*	0.79	0.85	0.90*	0.87	0.93
Long-term (before 1984)	0.86*	0.83	0.89	0.92*	0.89	0.95
Medium-term (1984 to 1993)	0.67*	0.61	0.74	0.76*	0.68	0.84
Recent (1994 to 2003)	0.54*	0.48	0.61	0.63*	0.55	0.71
Europe	0.90*	0.87	0.93	0.94*	0.91	0.98
Long-term (before 1984)	0.90*	0.87	0.93	0.94*	0.91	0.98
Medium-term (1984 to 1993)	0.89	0.73	1.08	0.92	0.76	1.13
Recent (1994 to 2003)	0.73*	0.58	0.92	0.79	0.62	1.00
East Asia	0.31*	0.26	0.35	0.34*	0.29	0.39
Long-term (before 1984)	0.37*	0.30	0.45	0.40*	0.33	0.49
Medium-term (1984 to 1993)	0.30*	0.23	0.38	0.32*	0.24	0.41
Recent (1994 to 2003)	0.21*	0.15	0.30	0.22*	0.16	0.32
South Asia	0.90	0.81	1.01	1.01	0.91	1.14
Long-term (before 1984)	1.03	0.88	1.20	1.17	1.00	1.37
Medium-term (1984 to 1993)	0.87	0.71	1.06	0.95	0.77	1.17
Recent (1994 to 2003)	0.74*	0.59	0.93	0.81	0.65	1.02
Digestive diseases						
Canadian-born[†]	1.00	...	...	1.00	...	...
Immigrants (total)[‡]	0.85*	0.82	0.89	0.92*	0.88	0.97
Long-term (before 1984)	0.89*	0.85	0.93	0.94*	0.90	0.99
Medium-term (1984 to 1993)	0.73*	0.64	0.82	0.80*	0.70	0.92
Recent (1994 to 2003)	0.59*	0.50	0.69	0.67*	0.57	0.79
Europe	0.93*	0.88	0.97	0.97	0.92	1.02
Long-term (before 1984)	0.93*	0.89	0.98	0.97	0.92	1.02
Medium-term (1984 to 1993)	0.97	0.75	1.25	1.02	0.79	1.32
Recent (1994 to 2003)	0.68*	0.49	0.94	0.75	0.54	1.04
East Asia	0.55*	0.48	0.64	0.62*	0.53	0.74
Long-term (before 1984)	0.57*	0.45	0.71	0.63*	0.49	0.79
Medium-term (1984 to 1993)	0.60*	0.46	0.77	0.66*	0.51	0.87
Recent (1994 to 2003)	0.47*	0.34	0.65	0.53*	0.38	0.74
South Asia	0.60*	0.50	0.72	0.66*	0.55	0.80
Long-term (before 1984)	0.76*	0.60	0.97	0.84	0.66	1.08
Medium-term (1984 to 1993)	0.42*	0.29	0.63	0.47*	0.31	0.69
Recent (1994 to 2003)	0.53*	0.37	0.76	0.58*	0.41	0.83

[†] reference group

[‡] includes immigrants from regions other than Europe, East Asia and South Asia

[§] age, sex, knowledge of official languages, education, living arrangements, income, and Census Metropolitan Area of residence

* significantly different from reference group (p < 0.05)

...not applicable

Source: Linked 2006 Census-Hospital Discharge Database, Ontario.

A longitudinal study found little evidence that immigrants have less access to health care, compared with the Canadian-born, in terms of having a regular doctor or reporting an unmet health care need.³⁰ Less hospital use by immigrants likely reflects a dominant observation in health research—namely, immigrants tend to be healthier than the Canadian-born population,^{31,32} especially when they arrive. This has been attributed to the medical screening required before admission to Canada,³³ and to self-selectivity (individuals willing to undertake the complications and personal disruption involved in immigrating are likely to be relatively healthy).²² An important exception would be refugees admitted on humanitarian grounds, who are not denied entry because of medical conditions.^{33,34}

Research in the United States and Europe has generally shown higher hospitalization among immigrant seniors, compared with locally born populations.³⁵⁻³⁷ A factor associated with higher hospitalization in the American studies was the lack of health insurance among immigrant seniors;³⁸ European studies tend to include foreign-born respondents regardless of legal status. Immigrants to many European countries came because of geographic proximity, cultural similarity, war situations, and job opportunities, and thus, could be quite different from immigrants to Canada.³⁹ These factors could help explaining international differences in hospitalization rates among immigrant seniors.

The present study demonstrates the importance of considering world region of origin, duration and disease-specific effects in determining the health care needs of immigrant seniors. For example, immigrants from East Asia were less likely than Canadian-born seniors to be hospitalized, particularly for circulatory diseases. By contrast, South Asians' odds of circulatory disease hospitalization did not differ significantly from those of Canadian-born seniors, which is consistent with the higher risk of circulatory diseases among South Asians.^{32,40-41}

The analysis has a number of limitations. The 2006 Census did not collect

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Table 4

Multivariate zero-truncated negative binomial regression results for length of hospital stay for selected causes, by immigrant status, status, by world region of origin and period of arrival, household population aged 65 or older, Ontario, 2004 to 2006

Cause, immigrant status, world region of origin and period of arrival	Age-/Sex- adjusted	Incidence rate ratios				
		95% confidence interval		Fully adjusted [§]	95% confidence interval	
		from	to		from	to
All causes						
Canadian-born [†]	1.00	...	...	1.00	...	...
Immigrants (total) [‡]	0.94*	0.92	0.96	0.94*	0.91	0.96
Long-term (before 1984)	0.94*	0.92	0.96	0.94*	0.92	0.96
Medium-term (1984 to 1993)	1.00	0.94	1.07	0.93	0.87	1.00
Recent (1994 to 2003)	0.92	0.85	1.00	0.86*	0.79	0.93
Europe	0.94*	0.92	0.97	0.94*	0.92	0.97
Long-term (before 1984)	0.94*	0.92	0.97	0.94*	0.92	0.97
Medium-term (1984 to 1993)	1.08	0.95	1.23	1.02	0.89	1.16
Recent (1994 to 2003)	0.89	0.75	1.04	0.82*	0.70	0.97
East Asia	0.90*	0.83	0.99	0.85*	0.77	0.93
Long-term (before 1984)	0.90	0.80	1.02	0.88*	0.77	0.99
Medium-term (1984 to 1993)	0.91	0.78	1.06	0.82*	0.70	0.96
Recent (1994 to 2003)	0.90	0.75	1.08	0.80*	0.67	0.97
South Asia	1.05	0.97	1.14	1.02	0.93	1.10
Long-term (before 1984)	1.04	0.93	1.17	1.03	0.92	1.16
Medium-term (1984 to 1993)	1.16	0.99	1.35	1.07	0.92	1.25
Recent (1994 to 2003)	0.96	0.82	1.13	0.91	0.77	1.07
Circulatory diseases						
Canadian-born [†]	1.00	...	...	1.00	...	...
Immigrants (total) [‡]	1.02	0.98	1.06	0.99	0.95	1.02
Long-term (before 1984)	1.01	0.97	1.05	0.98	0.95	1.02
Medium-term (1984 to 1993)	1.11	1.00	1.24	1.02	0.92	1.15
Recent (1994 to 2003)	1.07	0.94	1.22	0.99	0.86	1.14
Europe	1.01	0.98	1.05	0.98	0.94	1.03
Long-term (before 1984)	1.01	0.97	1.05	0.98	0.94	1.03
Medium-term (1984 to 1993)	1.14	0.92	1.41	1.05	0.85	1.30
Recent (1994 to 2003)	1.00	0.77	1.28	0.92	0.71	1.18
East Asia	0.85	0.72	1.00	0.77*	0.65	0.91
Long-term (before 1984)	0.81	0.65	1.18	0.75	0.59	1.21
Medium-term (1984 to 1993)	0.93	0.70	1.23	0.83	0.62	1.11
Recent (1994 to 2003)	0.82	0.56	1.21	0.72	0.48	1.07
South Asia	1.08	0.96	1.22	1.01	0.90	1.14
Long-term (before 1984)	1.07	0.90	1.27	1.04	0.88	1.23
Medium-term (1984 to 1993)	1.12	0.90	1.40	1.00	0.80	1.25
Recent (1994 to 2003)	1.06	0.83	1.36	0.99	0.77	1.25
Digestive diseases						
Canadian-born [†]	1.00	...	...	1.00	...	...
Immigrants (total) [‡]	0.95	0.90	1.00	0.96	0.90	1.01
Long-term (before 1984)	0.95	0.90	1.01	0.96	0.90	1.02
Medium-term (1984 to 1993)	0.91	0.79	1.06	0.91	0.77	1.06
Recent (1994 to 2003)	0.93	0.77	1.13	0.94	0.77	1.15
Europe	0.93*	0.88	0.99	0.94	0.89	1.00
Long-term (before 1984)	0.94	0.89	1.00	0.95	0.90	1.01
Medium-term (1984 to 1993)	0.60*	0.44	0.81	0.60*	0.44	0.82
Recent (1994 to 2003)	0.90	0.61	1.32	0.89	0.60	1.32
East Asia	0.93	0.77	1.11	0.95	0.78	1.16
Long-term (before 1984)	0.98	0.75	1.28	0.97	0.73	1.28
Medium-term (1984 to 1993)	0.86	0.63	1.16	0.86	0.62	1.19
Recent (1994 to 2003)	0.93	0.64	1.37	0.95	0.64	1.41
South Asia	1.29*	1.04	1.59	1.33*	1.07	1.65
Long-term (before 1984)	1.04	0.78	1.38	1.07	0.80	1.43
Medium-term (1984 to 1993)	2.29*	1.46	3.59	2.32*	1.47	3.64
Recent (1994 to 2003)	0.99	0.65	1.52	1.02	0.66	1.57

[†] reference group

[‡] includes immigrants from regions other than Europe, East and South Asia

[§] age, sex, knowledge of official languages, education, living arrangements, income, and Census Metropolitan Area of residence

* significantly different from reference group ($p < 0.05$)

... not applicable

Source: Linked 2006 Census-Hospital Discharge Database, Ontario.

information about immigration class (economic, family or refugee), which may be important for health service use. Another limitation is the lack of data about risk factors, such as nutrition, smoking, and alcohol consumption. Smoking, for example, would be important in explaining differences in circulatory disease hospitalizations. The 2006 Census covered only the community-based population, and therefore, offers no information about hospitalization among institutionalized seniors.

What is already known on this subject?

- Immigrants make up a substantial share of the senior population, the age group most likely to be hospitalized.
- Because hospital records do not indicate immigration status, information about immigrant seniors' use of hospital services is limited.
- A pilot linkage of landing records to health services data found that immigrant seniors used relatively fewer hospital services, although hospitalization rates increased with duration of residence.

What this study adds

- Based on linked census-hospital discharge administrative data for Ontario, odds of hospitalization were lower among immigrant seniors, compared with Canadian-born seniors.
- Immigrant seniors' time in hospital was generally less than or no different from that of the Canadian-born.
- Variations by world region in hospitalization and length of time in hospital reflected differences in health care needs among immigrants.

Conclusion

This study is a first look at hospital service use access and intensity among immigrant seniors in Ontario. The linked data have several advantages. First, the use of administrative data removes potential recall bias⁴² and linguistic and cultural barriers that may affect self-reported survey data.²⁴ Second, the sample size of the census and the availability of information about immigrant origins and period of arrival offer opportunities to examine

differences within the immigrant population. Finally, the covariates available in the census permit a better understanding of differences in the hospital use of the immigrant and Canadian-born populations. Such understanding is valuable to health care planners. In the future, this analysis could be extended beyond Ontario to other Canadian jurisdictions for inter-provincial comparisons and to other outcomes, such as the cost of hospital services. ■

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