Where and How People With Schizophrenia Die: A Population-Based, Matched Cohort Study in Manitoba, Canada

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ABSTRACT

Objective: To compare place and cause of death for people with and without schizophrenia in Manitoba, Canada.

Method: By using deidentified administrative databases at the Manitoba Centre for Health Policy, a 1:3 matched cohort of decedents aged ≥ 10 years in fiscal years April 1995–March 2008 (n = 3,943 with schizophrenia; n = 11,827 without schizophrenia) was selected and matched on age, sex, geography, and date of death ± 2 months. Schizophrenia was defined as *ICD-9-CM* code 295 or *ICD-10-CA* codes F20, F21, F23.2, or F25 in hospital/physician files at least once within 12 years of death.

Results: The median age at death was 77 years. The attributable percentage of deaths was higher for respiratory illnesses (all ages) and suicide (age 10–59 years only), similar for circulatory illnesses, and lower for cancer in decedents with schizophrenia compared to matched controls. For cancer deaths, decedents with schizophrenia were equally likely to die of gastrointestinal, breast, or prostate cancer, but more likely to die of lung cancer at ages 10–59 (32.5% versus 20.6%, $P < .004$). Place of death was more likely a nursing home (29.7% vs 13.9%) and less likely a hospital (55.5% vs 70.5%) ($P < .0001$) for decedents with schizophrenia overall and by specific cause, with the exception of suicide deaths showing no difference by place. Except for those who died in nursing homes, decedents with schizophrenia had higher general practitioner but lower specialist rates and inpatient hospital separations.

Conclusions: Generally, patients with schizophrenia were more likely to die in nursing homes but less likely to die in hospitals. Understanding where these patients die is critical for improving access to quality palliative end-of-life care.

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Few illnesses are as devastating as schizophrenia. Patients with schizophrenia experience substantially higher incidence and prevalence of and morbidity and mortality due to various health conditions compared with the general population.[1] Eighty percent of people with schizophrenia die of natural causes compared with 97% of the general population, accounting for 59% of excess mortality.[2] By contrast, unnatural causes of death, such as suicide, accidents, and homicide, account for 41% of total excess mortality in people with schizophrenia. While this mortality gap is not new, according to a recent meta-analysis and population-based cohort study,[3,4] it appears to be widening. European studies based on a 25-year follow-up of a relatively small cohort of community-based people with schizophrenia (n = 370) found an elevated overall mortality rate (standardized mortality ratio = 289; 95% CI, 247–337), with a clustering of suicide in the first 5 years. However, long-term mortality approximates common causes of the general population, with 33% of excess mortality due to circulatory and 19% due to respiratory illnesses.[2,5,6]

Several variables have been implicated in explaining this gap, including the direct consequences of schizophrenia, such as suicidal behavior, poor uptake of illness-prevention strategies,[7,8] lifestyle factors (such as smoking, drugs and alcohol, poor diet, and lack of exercise), and possible treatment-associated consequences, such as cardiovascular and metabolic side effects of psychotropic medications.[9–13] People with schizophrenia are also socially marginalized, with stigma possibly resulting in premature death.[14] The authors of a seminal schizophrenia mortality meta-analysis[3] suggest that these patients may simply not be receiving improved health care available to the general population.

While mortality in schizophrenia has received considerable attention, little attention has been paid to where these patients die. Place of death can be a marker and mediator of quality end-of-life care. Optimal outcomes are based on trying to accommodate patient and family preferences and being mindful of the capacity for those settings to deliver effective palliative care. To explore place of death, we examined administrative data within the province of Manitoba, Canada. Manitoba is a prairie province located in the geographical center of Canada, with a population of 1.235 million people and a universal health care system as well as registration of all who receive these benefits. Unlike previous smaller studies, this approach was chosen to provide a more complete picture of how, when, and, of particular interest, where people with schizophrenia die.

To achieve this objective, we analyzed a matched cohort of decedents (people who died) during fiscal years April 1, 1995, through March 31, 2008, comparing cause and place of death of people with schizophrenia matched 1:3 to people without schizophrenia. Decedents with and without schizophrenia were also compared by place of death as well as health service use by place of death (including health services provided by general practitioners, specialists, in-patient hospital separation, and hospital days).

METHOD

This study used administrative claims data from the Population Health Research Data Repository (herein referred to as the Repository) housed at the Manitoba Centre for Health Policy, University of Manitoba, in Winnipeg, Canada. The Repository data files include deidentified records of all hospital claims, medical claims for ambulatory physician visits, registry files (records

Clinical Points

- People with schizophrenia have a median age of death of 77 years, underscoring the importance of end of life for the elderly patient in a setting providing appropriate physical and mental care.
- People with schizophrenia are twice as likely to die in a nursing home compared to a matched cohort (29.7% vs 13.9%), and this finding holds true for deaths for most chronic diseases. Hence, clinicians need to ensure that disease-specific palliative care needs are met.
- For older adults (age ≥ 60 years) with schizophrenia, the top 3 causes of death compared to a matched cohort of decedents were circulatory system (35.8% vs 36.8% of deaths), cancer (15.2% vs 27.2%), and respiratory system (12.7% vs 8.6%). However, these results do not point out the underlying rate of mortality, which could be double for those with schizophrenia. Hence, these findings translate into a potentially elevated risk of both circulatory and respiratory disease and similar rates of cancer deaths. Appropriate treatment for chronic disease and lifestyle management of those with schizophrenia (such as smoking cessation and dietary considerations) need to be part of the clinician's treatment plan.

of the person's demographic information—age, sex, 6-digit postal code of residence, and birth and death dates) and vital statistics (cause of death) for virtually all (99.5%) residents of the province of Manitoba under the universal health care system. Although the data are anonymized, they are linkable at the person-level and over time by using an encrypted personal health number once approvals are obtained. More details about access to this Repository of data can be found at the Manitoba Centre for Health Policy Web site (http://umanitoba.ca/faculties/medicine/units/community_health_sciences/departmental_units/mchp/).

People aged 10 years and older diagnosed with schizophrenia were defined as those having at least 1 diagnosis code for schizophrenia over a 12-year period. The 12-year period was defined for the matched cohort analysis of decedents as the 12 years prior to death. A diagnosis of schizophrenia used the following codes in either hospital discharge abstracts or physician claims files: *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM)* code 295 or *International Classification of Diseases, Tenth Revision, Canada* (*ICD-10-CA*) codes F20, F21, F23.2, or F25. This definition has been previously tested for validity.[7,8,15]

In a comparison of decedents who died from 1995/1996 to 2007/2008, we looked at cause of death, coded using *ICD-9-CM* chapters, and place of death. Decedents aged ≥ 10 years who had a diagnosis of schizophrenia (n = 3,943) were matched to 3 other decedents without a diagnosis of schizophrenia (n = 11,827).[16] Subjects were matched by age, sex, date of death within 2 months, and aggregate geographic location (Winnipeg, Brandon, Rural South, Mid, and North). In 2010, 683,100 people (over half of Manitoba residents) lived in the capital city of Winnipeg,[17] and 52,550 lived in the next largest urban center of Brandon.[18]

Because this is a matched cohort analysis, no underlying population-based mortality rate was produced. Rather, this analysis was designed to look at differences in distributions of cause and place of death.

Place of death was categorized as hospital, private home, nursing home, and all other places. A nursing home refers to a long-term residential facility designed predominantly for care of the frail elderly with chronic illness or disability who can no longer live in their private home. Death in a hospital could occur either in an acute care setting or in specialized palliative care units within the hospital setting. Cause of death by place was analyzed. For purposes of understanding differences in health care use patterns by place of death, adjusted rates and relative risks (RRs) of health service use in the 6 months prior to death were calculated for the matched cohorts in generalized linear models, controlling for age at death, sex, geographical area of residence, place of death, and year of death. The health service use indicators were general practitioner visit rate per person, physician specialist visit rate per person, inpatient hospital separation rates per person, and rate of inpatient hospital days per person.

The study received approval from the Health Information Privacy Committee of the Government of Manitoba (HIPC #2010/2011–01) and the Health Research Ethics Board of the Faculty of Medicine, University of Manitoba. According to confidentiality policies for the use of Repository data, any rate based on 1 to 5 events is suppressed.

RESULTS

No statistically significant differences were found between the matched cohorts of decedents with (n = 3,943) or without (n = 11,827) schizophrenia as to age, sex, region of the province, or year of death. Of the decedents in this study, 43.3% were male. The mean overall age at death was 73.4 years (SD = 16.5), with a median of 77 years and a range from 10 to 108 years. Three-quarters of the people from Manitoba (72.2%) who died were residents of Winnipeg, and 1.8% were from the North; 5.0%, from Brandon; 11.9%, from the Rural South; and 9.1%, from Mid Manitoba.

Attributable Causes of Death

Table 1 shows the causes of death for 2 age groupings of the matched cohort. For those aged 10–59 years, the percentage of overall deaths attributable to cancer for decedents with schizophrenia was only half that of decedents without schizophrenia (16.1% of deaths vs 32.8% of deaths, $P < .0001$). In contrast, suicide and self-inflicted injury represented a much higher percentage of total deaths for those with schizophrenia (19.4% vs 7.8%, $P < .0001$), as was death due to respiratory system (5.7% vs 2.5%, $P < .0001$) and mental disorders (4.4% vs 1.9%, $P < .0001$). Note that *death due to mental disorders* is a category of coding in the cause of death vital statistics files; this coding most likely represents a variety of causes, wherein the physician attributed the death to mental illness rather than 1 of its many consequences,

Table 1. Percentages of Death Attributable to Specific Causes and Percentages of Cancer Death Attributable to Specific Cancers by *ICD-9-CM* Chapter in Decedents With (n = 3,943) and Without (n = 11,827) Schizophrenia by Age Group

	Age 10–59 Years			Age ≥ 60 Years		
Cause of Death	Schizophrenia Cohort (n = 768), %	Matched Cohort (n = 2,269), %	*P* Value	Schizophrenia Cohort (n = 3,175), %	Matched Cohort (n = 9,558), %	*P* Value[a]
Circulatory system	19.27	20.27	.55, NS	35.84	36.82	.32, NS
Cancer	16.15	32.83	< .0001	15.18	27.17	< .0001
Respiratory system	5.73	2.47	< .0001	12.69	8.55	< .0001
External cause of injury	14.19	14.01	.90, NS	3.28	2.96	.37, NS
Endocrine and metabolic	2.73	3.17	.54, NS	4.91	4.68	.59, NS
Mental disorders	4.43	1.94	.0002	8.22	3.59	< .0001
Digestive system	4.17	4.19	.98, NS	4.28	3.47	.036
Nervous system	3.13	2.56	.40, NS	5.83	3.39	< .0001
Suicide and self-inflicted injury	19.40	7.84	< .0001	0.41	0.40	.93, NS
Genitourinary system	0.91	0.84	.85, NS	2.99	2.58	.22, NS
All others	9.90	9.87	.98, NS	6.36	6.39	.95, NS
Cause of cancer death						
Gastrointestinal cancer	17.89	23.63	.16, NS	24.84	26.66	.41, NS
Lung cancer	32.52	20.63	.0034	27.86	25.36	.26, NS
Breast cancer (females only)	13.01	13.66	.84, NS	9.29	8.69	.68, NS
Prostate cancer (males only)	0	1.23	.22, NS	4.97	5.43	.69, NS
All other malignant cancers	36.59	40.85	.37, NS	33.05	33.86	.73, NS

[a]Based on χ^2.
Abbreviations: *ICD-9-CM* = *International Classification of Diseases, Ninth Revision, Clinical Modification*; NS = nonsignificant.

such as suicide or health-related sequelae. All other categories, including circulatory system, were similar between groups. Note, however, that the underlying *rate* of death cannot be captured through this matched cohort method.

Patterns of cause of death for the group aged ≥ 60 years were very similar to the findings of those aged 10–59 years, including the much lower percentage of death due to cancer (15.2% vs 27.2%, $P < .0001$) and the higher percentage of death due to respiratory system (12.7% vs 8.6%, $P < .0001$) for those with schizophrenia. One striking difference for age ≥ 60 was the comparable and small percentage attributable to suicide for decedents with and without schizophrenia (0.41% versus 0.40%, $P = .93$, nonsignificant [NS]) compared to the younger age grouping. Table 1 also shows the percentage of cancer deaths attributable to specific cancers. In the 10- to 59-year-old decedents with schizophrenia, the percentage of cancer deaths due to lung cancer was elevated for the matched cohort (32.5% versus 20.6%, $P < .004$), whereas the percentage of cancer deaths attributable to all other causes showed no statistically significant difference. However, those aged ≥ 60 years, in contrast to the younger group, showed no statistically significant difference in the percentage of decedents with schizophrenia who died of lung cancer (27.9% versus 25.4%, $P = .26$, NS), or any other specific cause of cancer death.

Place of Death Overall and By Cause

Table 2 shows the place of death overall and by cause. Decedents with schizophrenia were twice as likely to die in a nursing home (29.7% vs 13.9%, $P < .0001$), yet less likely to die in hospital (55.5% vs 70.5%, $P < .0001$) compared to the matched cohort. For cancer deaths specifically, the proportion of decedents with schizophrenia who died in a nursing home was over 4 times higher (19.5% vs 4.9%, $P < .0001$) compared to the matched cohort. This pattern of higher proportion of deaths in a nursing home also persists for both circulatory (34.3% vs 16.7%, $P < .0001$) and respiratory deaths (32.7% vs 20.1%, $P < .0001$). Close to half of suicide deaths occurred in people residing in private homes (47.5% schizophrenia vs 42.6% matched cohort, $P = .16$, NS).

Health Services Use Patterns by Place of Death

Table 3 shows the age- and sex-adjusted rates of health service use in the 6 months prior to death, both overall and by place of death. As we have previously shown,[19] for all deaths, those with schizophrenia (n = 3,943) had an elevated rate of use of general practitioners (RR = 1.15; 95% CI, 1.11–1.20; $P < .0001$) but a lower rate of use of physician specialists (RR = 0.72; 95% CI, 0.67–0.77; $P < .0001$), inpatient hospital separations (RR = 0.73; 95% CI, 0.70–0.76; $P < .0001$), and inpatient hospital days (RR = 0.79; 95% CI, 0.72–0.87; $P < .0001$). There are also differences by place of death (see Table 3). For those dying in a nursing home, no statistically significant differences were shown between cohorts for rates of general practitioner visits (RR = 0.95; 95% CI, 0.89–1.02; $P = .17$; NS), specialist visits (RR = 1.14; 95% CI, 0.97–1.33; $P = .11$; NS), or hospital separation rates (RR = 0.93; 95% CI, 0.82–1.06; $P = .28$; NS), but a lower rate of inpatient hospital days (RR = 0.80; 95% CI, 0.67–0.95; $P < .02$) was seen for decedents with schizophrenia. In contrast, for deaths in the hospital, decedents with schizophrenia were more likely to have general practitioner visits (RR = 1.12; 95% CI, 1.07–1.18; $P < .0001$) but less likely to have specialist visits (RR = 0.69; 95% CI, 0.64–0.75; $P < .0001$) or inpatient hospital separations (RR = 0.81; 95% CI, 0.77–0.85; $P < .0001$).

DISCUSSION

Age at Death

Although most literature refers to elevated risks of early death for people with schizophrenia, it is interesting to note that the median age of death of the schizophrenia decedents in our study was 77 years. So despite elevated rates of suicide and self-inflicted injury for those with schizophrenia

Table 2. Percentage of Decedents by Place and Cause of Death in Decedents With (n = 3,943) and Without (n = 11,827) Schizophrenia

Cause of Death	Hospital, %	Private Home, %	Nursing Home, %	All Other Places, %	*P* Value[a]
All deaths					
Overall deaths					
Schizophrenia	55.5	8.8	29.7	6.0	<.0001
Matched cohort	70.5	8.2	13.9	7.5	
Specific cause of death					
Circulatory					
Schizophrenia	53.5	9.6	34.3	2.6	<.0001
Matched cohort	69.3	9.4	16.7	4.6	
Cancer					
Schizophrenia	75.9	2.3	19.5	2.3	<.0001
Matched cohort	85.9	6.3	4.9	2.9	
Suicide					
Schizophrenia	33.3	47.5	…	…	.16, NS
Matched cohort	28.2	42.6	…	…	
Respiratory					
Schizophrenia	60.6	4.7	32.7	2.0	<.0001
Matched cohort	74.0	4.2	20.1	1.7	
All other causes of death					
Schizophrenia	49.7	7.7	32.1	10.5	<.0001
Matched cohort	58.7	7.4	18.5	15.4	

[a]Based on χ^2.
Abbreviation: NS = nonsignificant.
Symbol: … = Suppressed due to small cell size (any rate based on 1 to 5 events is suppressed).

Table 3. Age- and Sex-Adjusted Rates of Health Service Use Comparing Decedents With and Without Schizophrenia, 6 Months Prior to Death, by Place of Death[a]

Health Services Indicator (within 6 mo of death)	Decedents With Schizophrenia (95% CI)	Decedents Without Schizophrenia (95% CI)	Adjusted Relative Risk (95% CI)	*P* Value
Deaths in hospital, n	2,190	8,339		
General practitioner visit rate[b]	5.97 (5.68–6.28)	5.31 (5.12–5.51)	1.12 (1.07–1.18)	<.0001
Physician specialist visit rate[b]	1.56 (1.43–1.71)	2.25 (2.12–2.39)	0.69 (0.64–0.75)	<.0001
Inpatient hospital separation rate[c]	1,189.76 (1,123.16–1,260.30)	1,469.02 (1,422.90–1,516.65)	0.81 (0.77–0.85)	<.0001
Inpatient hospital days, rate[b]	24.82 (22.09–27.89)	27.70 (25.43–30.17)	0.90 (0.80–1.00)	.0509
Deaths in private homes, n	346	966		
General practitioner visit rate[b]	5.91 (5.38–6.49)	4.68 (4.40–4.99)	1.26 (1.14–1.40)	<.0001
Physician specialist visit rate[b]	1.48 (1.27–1.72)	1.70 (1.53–1.88)	0.87 (0.73–1.03)	.1070
Inpatient hospital separation rate[c]	458.33 (388.84–540.25)	558.17 (509.23–611.81)	0.82 (0.68–0.99)	.0343
Inpatient hospital days, rate[b]	8.31 (6.72–10.27)	6.82 (5.92–7.86)	1.22 (0.96–1.54)	.1008
Deaths in nursing homes, n	1,169	1,640		
General practitioner visit rate[b]	7.98 (7.50–8.48)	8.38 (7.93–8.86)	0.95 (0.89–1.02)	.1748
Physician specialist visit rate[b]	0.82 (0.72–0.93)	0.72 (0.64–0.81)	1.14 (0.97–1.33)	.1114
Inpatient hospital separation rate[c]	411.96 (371.24–457.15)	441.68 (406.08–480.40)	0.93 (0.82–1.06)	.2765
Inpatient hospital days, rate[b]	7.35 (6.33–8.52)	9.15 (8.01–10.46)	0.80 (0.67–0.95)	.0131
Deaths in other locations, n	238	882		
General practitioner visit rate[b]	5.25 (4.70–5.86)	3.95 (3.69–4.22)	1.33 (1.18–1.50)	<.0001
Physician specialist visit rate[b]	1.30 (1.08–1.57)	1.14 (1.02–1.28)	1.14 (0.93–1.41)	.2171
Inpatient hospital separation rate[c]	573.91 (483.03–681.88)	587.66 (536.55–643.63)	0.98 (0.81–1.18)	.8066
Inpatient hospital days[b]	7.73 (6.04–9.89)	8.03 (7.16–9.62)	0.93 (0.71–1.22)	.6067

[a]The regression models that produce these rates included the following covariates: schizophrenia cohort (yes/no), age (continuous linear and quadratic terms), sex, aggregate region, place of death, and year of death. The cohorts were matched on age at death within ± 5 years; hence, the need for more specific age in the regression.
[b]Per person.
[c]Per 1,000 persons.

compared to the matched cohort in the younger age group of 10–59 years, this age group represents only 768 of 3,943 people with schizophrenia (see Table 1). So if 19.4% of those 768 decedents died due to suicide, this translates into only 3.8% of the total schizophrenia cohort. Hence, the overwhelming experience of people with schizophrenia is that they live past the age of 60, and indeed, half live to 77 and beyond. The cause of death of the matched cohort is comparable to published population-based analyses[20] of cause of death for all Manitobans in the years 2001–2005 (33.6% circulatory, 27.2% cancer) compared to 33.6% for circulatory and 28.3% for cancer in our matched cohort of people without schizophrenia. This finding underscores the fact that, although relative risks of death due to causes often present in younger people (like suicide) may be higher for the schizophrenia cohort, the rarity of these events in the entire group results in very little skewing of cause of death in a matched cohort.

Place of Death

Place of death is an important issue in end-of-life care. Ideally, where one dies should provide an environment that can deliver optimal physical, psychological, and spiritual comfort for terminally ill patients and their families. Patients with schizophrenia are especially challenged in having their end-of-life care needs met.[19] In this study, the first to explicitly examine place of death in patients with schizophrenia, we found a much higher proportion of these patients dying in nursing homes (29.7% vs 13.9%) and a much lower proportion in hospitals (55.5% vs 70.5%) compared to the matched cohort. In other words, decedents with schizophrenia were much more likely to die (and by assumption, to have lived out their final days or months) in a long-term care institutional setting for the elderly. Given universal access to any modality of care—nursing home, palliative care, home care, or hospital—there should be no financial barriers to receiving the right care at the right place and time by the right provider. A nursing home may be a reasonable place to die if the particular nursing home has adopted appropriate palliative care training and practices. This setting would also be preferable to transferring a dying person to an acute care hospital bed. However, depending on the nature and circumstances of the illness, palliative care hospital beds may be a better alternative to a nursing home if the resident's symptoms cannot otherwise be optimally managed. Our previous publication[19] showed that people living in nursing homes were far less likely to have comprehensive palliative care compared to those dying in a hospital. Our present findings also underscore the importance of examining the staff mix in nursing homes and the necessity of psychiatric specialist training for nursing home health care providers. During the years of this study, very few nursing homes in Manitoba were staffed with psychiatric specialists despite the fact that 30% of the people with schizophrenia died in this setting.

Cause of Death

It is important to understand the difference between attributable percentages of causes of death in our matched cohort study and actual underlying population-based rates of these causes. We are limited by the matched cohort design of this study. Assuming equal mortality rates, these attributable percentages would reflect underlying rates. However, according to the recent European small community–based cohort research, there was a 2 to 3 times higher elevated overall mortality rate (standardized mortality ratio = 289; 95% CI, 247–337) for those with schizophrenia compared to the rest of the population.[2,5,6]

Therefore, if the attributable percentage of death for cause A for people with schizophrenia were half that for the matched cohort, given the knowledge that an underlying overall mortality rate of death could be at least double, then this would translate into the rate of death for cause A being equal in the 2 cohorts. Similarly, if the attributable percentage of death for cause A is 3-fold for people with schizophrenia, then this would translate into 6 times the population-based rate of cause A. Therefore, one must exert caution when interpreting an attributable percentage cause of death rather than the rate of this cause.

As per other studies,[12–14] we found that people with schizophrenia were much more likely to die of respiratory causes compared to their matched cohort. This is not surprising, given that people living with schizophrenia may have higher rates of smoking, poor diet, and lack of exercise, as well as treatment-associated consequences such as cardiovascular or metabolic side effects of psychotropic medications, all of which may lead to higher rates of all chronic diseases.[9–13] We also found that patients with schizophrenia compared to their match controls were much more likely to die of suicide below the age of 60 (19.4% versus 7.84%; $P < .0001$).

For cancer deaths, decedents with schizophrenia were equally likely to die of gastrointestinal, breast, or prostate cancer, but more likely to die of lung cancer at ages 10–59 years only (32.5 % vs 20.6% of all cancer deaths, $P = .0034$). The literature concerning the risk of cancer death for those with mental disorders has been mixed, with some studies finding elevated rates and others reporting lower risk or no statistically significant differences or gender-dependent differences.[21–25] Some researchers speculate that medications to treat schizophrenia may exhibit some sort of protective effect, that people with schizophrenia may have tumor suppressant genes, or that the reduced life expectancy of people with mental disorders may result in lowering the chances of dying of cancer as an elderly person.[23,26] However, many of these articles are based on persons who were institutionalized for mental disorders and therefore may be reflecting those with the most complex conditions. The latter point is not an issue in our current study, since we matched persons by age and sex, which essentially negates the bias of confounding through age. As well, we found a persistent effect in both age groups, with half the percentage of deaths attributable to cancer for people with schizophrenia compared to the matched cohort (16.2% vs 32.8% of deaths for those aged 10–59 years; 15.2% vs 27.2% of deaths for those aged ≥ 60 years). Assuming double the mortality rates at a population level but half the attributable deaths in our study, cancer death rates could be approximately the same in the 2 groups. Further study would be required to verify actual rates at the population level in Manitoba. The more specific causes of cancer deaths in Table 1 do highlight an intuitively valid finding, whereby a much higher percentage of decedents aged 10–59 years in the schizophrenia cohort died of lung cancer (32.52% vs 20.63%, $P < .004$), presumably reflective of elevated smoking rates, but no statistically significant differences were shown for any other cancers.

We were particularly interested in knowing if any connection exists between cause of death and place of death. Aside from suicide, we found that the pattern of where patients with schizophrenia die—being more likely to take place in nursing homes and less likely in hospitals—held across all causes of death. This finding implies that, for these patients, the underlying life-limiting illness holds

little sway in determining where they die. There is no doubt that attending to the challenges of end-stage chronic illness, such as cancer, respiratory, and circulatory disease, requires exquisite skill and expertise[27–29] and that those skills are more likely to be found within tertiary care settings or hospital-based palliative care rather than nursing homes. However, for patients with schizophrenia, disease-driven palliation needs and where they die needs to be examined. For example, the majority of people who died of cancer do, indeed, die in a hospital: 75.9% for those with schizophrenia, and 85.9% for the matched cohort (see Table 2). However, 19.5% of people with schizophrenia who died of cancer, compared to only 4.9% of the matched cohort, died in a nursing home. This finding may have ramifications for best possible palliative care and needs further study.

Use of the Healthcare System Prior to Death

As previously reported,[19] decedents with schizophrenia in their final months of life were more likely to be seen by general practitioners and less so by specialists; they were also less likely to enter or stay in hospitals. In the current study, we were able to examine these parameters factoring in place of death. Those with schizophrenia dying in a hospital were more likely to have seen general practitioners yet less likely to have seen specialists or to have been admitted previously to a hospital (although the number of hospital days were similar) compared to a matched cohort without schizophrenia. With 1 notable exception, this pattern held across all locations of death. While receiving primary care from generalists is not inherently problematic, not knowing if there is good continuity of care, a paucity of contact with specialists, and less hospital care suggests these patients are most likely being underserved.[3,30] On the other hand, patients with schizophrenia dying in nursing homes were no more likely to see general practitioners or specialists or to be hospitalized (they also spent less time in hospital) compared to their matched cohort. This finding raises the uncomfortable question of how the additional mental and physical health care needs of these patients were addressed within this particular setting. It appears that dying with schizophrenia in a nursing home does not garner additional investment of health care resources, with no greater likelihood of patients either being seen by a general practitioner or specialist or being transferred to a tertiary care hospital.

Limitations

There are several noteworthy limitations to this study. First, this study was conducted in 1 of the 10 provinces of Canada, and, as such, may not be generalizable. However, most provinces would have similar universal health care coverage as well as similar settings for providing care. In Manitoba in the late 1990s, a concerted effort was made to deinstitutionalize people with mental illness, so most care is provided in the community. This setting may not be generalizable to others where more institutionalized care is still being provided. A further limitation is the use of administrative claims data from the Repository housed at Manitoba Centre for Health Policy. Although this is a powerful population-based data source containing most health care encounters (hospitals, nursing homes, homecare, physician visits, specialist visits with psychiatrists), the Repository may be missing data from psychologists; this will be understated in both groups. That being said, especially for the institutionalized comparisons of people in nursing homes, receiving services from specialists who do bill into the system would be equally likely in either cohort. The study does not contain any qualitative data, such that, while we can report on place of death, we do not have information regarding patient- or family-stated preferences for place of death, nor any indicators of postdeath family satisfaction. As to the coding of schizophrenia in the Repository of data, previous studies have done face validity for this coding based on similar findings with national surveys and clinical studies.[7,8,15] Because of the severity of the diagnosis, we have found that this is one of the most reliable and valid mental illness diagnoses in the Repository compared to other diagnoses such as mood disorders.

A further limitation is in the coding of "cause of death" through the Vital Statistics department of the government of Canada. Little effort has been made to validate the broad spectrum of causes of death, and, in Manitoba, we are currently limited to 1 (primary) cause of death. That being said, an attending physician, or, in some cases of death at home or suspicious death, the provincial coroner will be the person coding cause of death. "Death by mental illness" is an example of a coding that is misleading, and presumably, if we had access to further causes (some provincial databases contain more than 1 coding for cause of death), we would have a greater ability to understand the real cause of death for those coded in this way. Further study is needed in Canada to ascertain the meaning of this coding. In Manitoba, we are working toward obtaining more than 1 cause of death in the Repository data, which would be helpful in explaining such findings.

In summary, whether they are dying of circulatory, cancer, or respiratory causes, people with schizophrenia tend to die in nursing homes and less so in hospitals relative to their matched controls. Where one dies should be a reflection of what patients and families want, along with the capacity of a given setting to deliver quality health care services and comprehensive palliative care. Knowing the age distribution at death, where these patients die, and the challenges of addressing their needs within those settings are critical steps toward being able to improve their palliative end-of-life care.

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Additional information: The Population Health Research Data Repository is housed at the MCHP at the University of Manitoba, and owned by the Province of Manitoba. The database is individual or service-level data housed in a deidentified form at MCHP. Access to the data is restricted to individuals that have appropriate approvals from the province of Manitoba (Health Information Privacy Committee) and the University Research Ethics Board. It is not available externally. For more information regarding access or use of the data, contact Charles Burchill (telephone: 204-789-3429), Associate Director Data Access and Use, MCHP. Policy and procedure for access and use of the Repository can be found on the University of Manitoba's MCHP Web site: http://umanitoba.ca/faculties/medicine/units/community_health_sciences/departmental_units/mchp/.

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