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Original Contribution

Patient–physician language concordance and long-term mortality: a retrospective cohort study of Canadians

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Abstract

Linguistic diversity across North America is increasing rapidly. Prior studies have shown that patients who receive healthcare services in their preferred language have better short-term outcomes. We sought to determine whether patient–physician language concordance is associated with all-cause death in Canada. We performed a population-based, retrospective cohort study using data from the Canadian Community Health Survey from January 1, 2003 to December 31, 2014 linked to mortality records (until December 31, 2017). We determined respondents' primary home language using language spoken most often at home (English, French, Indigenous language, or Allophone language [ie, other language]). We defined patient–physician language concordance as agreement between respondents' primary home language and the language spoken with their regular medical doctor. We studied a total of 50 375 respondents. Very few Indigenous-language-speaking respondents (1.8%) received regular language-concordant physician care. Patient–physician language concordance was associated with a lower risk of all-cause death among both French-speaking respondents outside of Quebec (HR 0.89, 95% CI, 0.79-1.00) and Allophone-language-speaking respondents (HR 0.73, 95% CI, 0.65-0.83). Healthcare systems should prioritize the delivery of language-concordant physician care (eg, through patient–physician linguistic matching and/or use of evidence-based interpretation services), as this could potentially improve long-term survival in linguistically diverse populations.

Key words health equity, language concordance, minority language communities, primary care, public health, social determinants of health

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Introduction

Linguistic diversity across North America is increasing rapidly.[1,2] In the United States, more than 1 in 5 people (22%) speak a language other than English at home, while 8% of the overall population reports speaking English less than "very well," according to the American Community Survey conducted from 2017 to 2021.[1] In Canada, approximately 4.6 million residents (13% of the population) reported speaking a language other than 1 of the country's 2 official languages (English or French) at home in the 2021 Census.[2] This proportion of residents, hereafter referred to as "Allophones," has been steadily increasing since information on language was first recorded in the 1901 Census.[2] There is considerable heterogeneity in the distribution of English and French speaking residents in Canada; most French-speaking residents live in Quebec (the only province where French is both the majority language and the only official language), while French is spoken by a minority of residents in provinces and territories outside of Quebec.[3] When Allophones are combined with Canadians living outside of Quebec who predominantly speak French at home (500 000) and Canadians living in Quebec who predominantly speak English at home (900 000), it is believed that approximately 16% of the Canadians live in regions of the country where they are at risk of experience language barriers when accessing healthcare services (which are generally provided in English outside of Quebec and in French in Quebec).[3]

There is a growing body of evidence showing that patient–physician language concordance, which occurs when patients receive care from physicians who speak their preferred language, is associated with better outcomes.[4-9] For instance, several studies of non-English speaking patients with diabetes living in the United States have found that patients who received language-concordant physician care have better glycemic control when compared to patients who received language-discordant care.[10-13] Another recent study of patients with hypertension living in Canada found that patient–physician language concordance was associated with a 36% reduction in the relative risk of major adverse cardiovascular events.[14] However, few studies have been specifically designed to determine whether patient–physician language concordance is associated with improved long-term survival.

The study objective was to test the association between patient–physician language concordance and all-cause death among a nationally representative cohort of Canadians at risk of experiencing language barriers when accessing healthcare services (ie, English-speaking respondents in Quebec, French-speaking respondents outside of Quebec, and respondents speaking Indigenous or Allophone languages throughout Canada).

Methods

Study design

We performed a population-based, retrospective cohort study used data from the Canadian Community Health Survey (CCHS) from January 1, 2003 to December 31, 2014.[15] We included respondents over the age of 18 who had their survey responses linked to mortality records (see below).[16]

Ethics

We followed the Strengthening the Reporting of Observational Studies in Epidemiology reporting for observational studies.[17] The microdata files from the CCHS are made publicly available through a mechanism set out by legislation and regulation. As such, ethics approval was not required for their use (as outlined by the Tri-Council Policy Statement, article 2.2.).[18]

Data sources

The CCHS is an annual cross-sectional survey of the Canadian population conducted by Statistics Canada that collects health information on approximately 65 000 respondents per year.[15] The CCHS has been linked to several administrative databases, including the Canadian Vital Statistics Database (CVSD), which captures all deaths in Canada.[16] The existing linked CCHS-CVSD dataset included mortality records until December 31, 2017 (except for Yukon, where deaths have not been reported since January 1, 2017).[19] Data linkage was performed by Statistics Canada using probabilistic linkage; the linkage rate was 95.1%.[16]

Exposure

We identified respondents' primary home language using language spoken most often at home (which is declared by respondents at the time of CCHS survey completion).[15] We included respondents whose primary home language was English (for respondents in Quebec) or French (for respondents outside of Quebec), as well as all respondents whose primary home language was an Indigenous or Allophone language. This allowed us to create 4 mutually exclusive linguistic groups: English-speaking, French-speaking, Indigenous-language-speaking, and Allophone-language-speaking. We restricted the group of Indigenous-language-speaking respondents to those who (1) self-identified as First Nations, Inuit, or Métis, and (2) either had their primary home language coded as an Indigenous language or as "other" because their language was not included as an answer choice in the CCHS codebook (see Table S1 for complete list of answer choices provided to respondents). We classified as Allophone-language-speaking those who reported speaking a language other than French or English at home, as well as those who (1) reported having immigrated to Canada, and (2) had their primary home language coded as "other." Respondents who spoke 2 or more Indigenous or Allophone languages were included in the Indigenous-language-speaking or Allophone-language-speaking groups, respectively, whereas those who had English and/or French as one of their multiple home languages were excluded.

Since 2003, the CCHS has asked all respondents to declare whether they have a regular medical doctor and, if so, to specify the language that they usually speak with their regular medical doctor (respondents are provided with the following answer choices: English, French, Cree, Arabic, Chinese, Dutch, German, Greek, Hindi, Hungarian, Italian, Korean, Persian (Farsi), Polish, Portuguese, Punjabi, Russian, Spanish, Tagalog (Filipino or Pilipino), Tamil, Ukrainian, Vietnamese, and other).[15] Patient–physician language concordance was defined as agreement between primary home language and the language spoken with their regular medical doctor. Indigenous-language-speaking and Allophone-language-speaking respondents who spoke to their regular medical doctor in a language coded as "other" were also considered to have received language-concordant physician care (ie, the language coded as "other" was assumed to be an Indigenous or Allophone language not included in the response options). All other respondents were considered to have received language-discordant physician care.

Covariates

Covariates obtained from the CCHS were grouped into the following categories: survey characteristics, sociodemographic characteristics, comorbidities, social factors, and healthcare interactions in the last year. A description of the individual covariates included in this study is presented in Table S2.

Outcomes

The primary outcome was all-cause death. Secondary outcomes included cause-specific death, including cancer and cardiovascular deaths, which are the leading causes of death in Canada.[20] Definitions of secondary outcomes, with corresponding diagnostic codes, are presented in Table S3.

Statistical analysis

We reported descriptive statistics (means and SD for continuous variables and frequencies and percentages for categorical variables) for baseline characteristics of respondents. Duration of follow-up was defined as the time (calculated in years) from the date of CCHS survey completion to either the date of death or the end of the follow-up period (December 31, 2016 for respondents in Yukon and December 31, 2017 for respondents in all other provinces and territories). We calculated the crude mortality rate (reported as number of deaths per person-year) for each linguistic group. Within each linguistic group, we compared outcomes (reported as percentages) experienced by respondents receiving language-concordant physician care to respondents receiving language-discordant physician care using Gray's test.

We fit multivariable Cox proportional hazards regression models to test the association between patient–physician language concordance and both the primary outcome (all-cause death) and secondary outcomes (cancer death and cardiovascular death) within each linguistic group. We initially planned to run separate regression models for each linguistic group (ie, 1 for English, 1 for French, 1 for Indigenous, 1 for Allophone). However, due to the small number of Indigenous-language-speaking respondents, we were limited to fitting regression models for the English, French, and Allophone groups. We used a Fine-Gray subdistribution hazard model to adjust for the competing risk of death where applicable (ie, secondary outcomes of cancer and cardiovascular death). We censored respondents living in Yukon on December 31, 2016 (because of data availability), and we censored all other respondents on December 31, 2017. All regression models were adjusted for survey characteristics, sociodemographic characteristics, comorbidities, and social factors (see Table S2 for a description of the individual covariates). Knowledge of English and/or French was treated as a binary variable for English-speaking and French-speaking respondents (indicating knowledge of French and English, respectively) but as a categorical variable with 4 levels (English and French, English only, French only, and neither English nor French) for Allophone-speaking respondents. Patients receiving language-discordant physician care were the reference group in all analyses. Proportional hazards assumptions were assessed by visual inspection of the cumulative incidence function.[21]

We performed multiple imputation by chained equations to minimize bias related to missing data.[22,23] The imputation models included all model variables (exposure and covariates), the censoring variable, and the time-to-event variable (which was transformed to the cumulative hazard function using the Nelson–Aalen estimator).[24] We used binary logistic regression, multinomial logistic regression, and proportional odds logistic regression for binary data, unordered categorical data, and ordered categorical data, respectively. We performed 10 iterations across 10 imputed datasets. We combined the estimates obtained from analyzing each dataset using Rubin's rules.[25]

We performed sensitivity analyses by substituting the language spoken most often at home for mother tongue, and by censoring at 5 and 10 years after CCHS survey completion. The latter sensitivity analyses were designed to assess potential bias arising from misclassification of patient–physician language concordance/discordance (eg, in cases where patients had multiple physicians with different linguistic abilities, a scenario that is more likely to occur with longer follow-up periods).

Adjusted HRs and their corresponding 95% CIs were estimated using R software, version 4.2.3 (R Foundation for Statistical Computing). Statistical tests were 2-tailed, and the significance threshold was set at $P < .05$.

Results

We studied 50 375 respondents, including 7185 English-speaking respondents, 16 100 French-speaking respondents, 1970 Indigenous-language-speaking respondents, and 25 210 Allophone-language-speaking respondents (see Figure 1). The most common Indigenous language was Cree (33.8% of Indigenous-language-speaking respondents), while the most common Allophone languages were "Chinese languages" (16.3%), Spanish (6.9%), and German (6.8%). Complete lists of individual Indigenous and Allophone languages represented among the respondents are presented in Tables S4 and S5.

Baseline characteristics

The mean age was lower among Indigenous-language-speaking respondents (41.4) compared to English-speaking (50.8), French-speaking (52.2), and Allophone-language-speaking (47.8) respondents. The percentage of female respondents was highest among French-speaking respondents (57.5%) and lowest among Indigenous-language-speaking respondents (50.5%). Most English-speaking respondents (87.4%) and French-speaking respondents (94.7%) reported their ethnicity as White, while slightly more than half of Allophone-language-speaking respondents (57.0%) reported their ethnicity as being other than White, Black, or Indigenous. Most French-speaking respondents lived in New Brunswick (52.1%) or Ontario (34.8%); most Indigenous-language-speaking respondents lived in the Territories (58.4%), Quebec (24.9%), or the Western provinces (14.7%); most Allophone-language-speaking respondents lived in Ontario (45.9%) or the Western provinces (37.8%). English-speaking and Allophone-language-speaking respondents tended to live in urban areas (73.8% and 92.6%, respectively), while relatively more French-speaking and Indigenous-language-speaking respondents live in rural areas (45.1% and 63.2%, respectively). Most Allophone-language-speaking respondents had immigrated to Canada (88.1%), while very few French-speaking respondents had immigrated to Canada (2.9%). A minority of Indigenous-language-speaking and Allophone-language-speaking respondents reported not being able to speak either English or French (9.9% and 12.1%, respectively). Most English-speaking and French-speaking respondents reported being able to speak both English and French (68.4% and 81.4%, respectively).

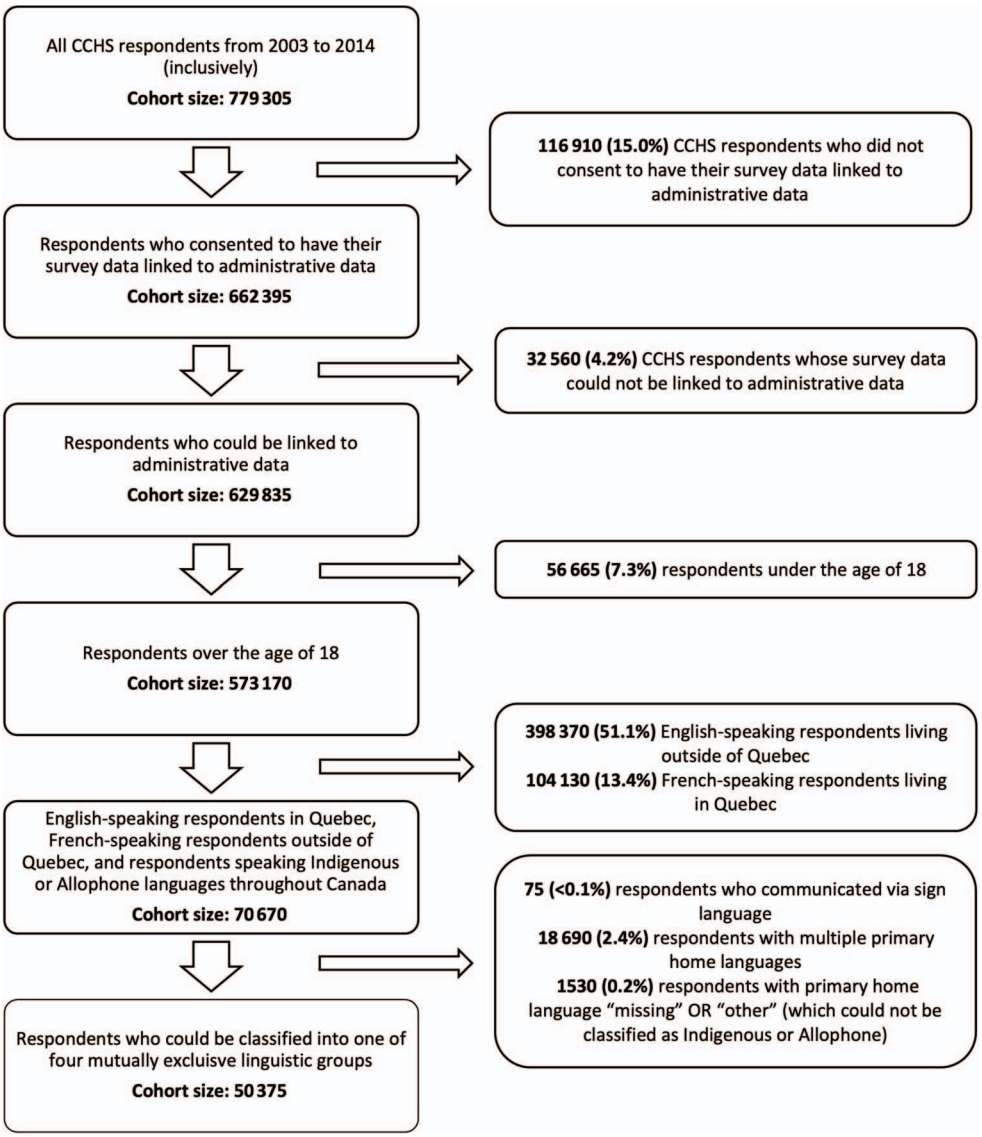

Figure 1 Study flow diagram.

The prevalence of cancer and cardiovascular disease diagnoses at baseline was lower for Indigenous-language-speaking respondents (2.8% and 6.3%) and Allophone-language speaking respondents (4.1% and 6.9%) compared to English-speaking respondents (7.4% and 8.3%) and French-speaking respondents (8.5% and 9.6%). Complete sociodemographic and health characteristics are presented in Tables 1-2 and Table S6.

Access to care

The percentage of respondents with a regular medical doctor was highest for French-speaking respondents (90.7%), followed by Allophone-language-speaking respondents (85.5%) and English-speaking respondents (77.1%). Indigenous-language-speaking respondents were least likely to have a regular medical doctor (27.4%). Of the respondents with a regular medical doctor, the percentage receiving language-concordant physician care was highest for English-speaking and French-speaking respondents (83.7% and 67.7%, respectively), and lowest for Indigenous-language-speaking and Allophone-language-speaking respondents (6.5% and 32.8%, respectively). A complete description of respondents' outpatient healthcare utilization is presented in Table 3.

Outcomes

Unadjusted outcomes stratified by linguistic group are presented in Table 4. The crude death rate (per 1000 person-years) was 13.0 for English-speaking respondents in Quebec, 13.3 for French-speaking respondents outside of Quebec, 11.8 for Indigenous-language-speaking respondents, and 9.4 for Allophone-language-speaking respondents. Unadjusted outcomes stratified by linguistic group and patient–physician language-concordance are presented in Table 5.

In the adjusted models (Figure 2), patient–physician language concordance was associated with a significantly lower risk of all-cause death for both French-speaking respondents outside of Quebec (HR 0.89, 95% CI, 0.79-1.00) and Allophone-language-speaking respondents (HR 0.73, 95% CI, 0.65-0.83). There was no statistically significant difference in the risk of all-cause death when

Table 1 Sociodemographic characteristics of CCHS respondents (2003-2014), stratified by primary home language.

Sociodemographic characteristics	English-speaking respondents in Quebec (*n* = 7185)	French-speaking respondents outside of Quebec (*n* = 16 100)	Indigenous-language-speaking respondents (*n* = 1970)	Allophone-language-speaking respondents (*n* = 25 120)
Age—mean ± SD	50.8 ± 19.1	52.2 ± 18.0	41.4 ± 17.4	47.8 ± 18.8
Sex—*n* (%)				
Female	3260 (45.4)	9250 (57.5)	995 (50.5)	13 550 (53.9)
Male	3925 (54.6)	6850 (42.5)	975 (49.5)	11 570 (46.1)
Ethnicity—*n* (%)				
White	6280 (87.4)	15 240 (94.7)	0 (0)	10 055 (40)
Black	250 (3.5)	125 (0.8)	0 (0)	585 (2.3)
Indigenous	200 (2.8)	555 (3.4)	1970 (100)	50 (0.2)
First Nations	–[a]	–[a]	240 (12.2)	–[a]
Métis	–[a]	–[a]	100 (5.1)	–[a]
Inuit	–[a]	–[a]	675 (34.3)	–[a]
Missing	–[a]	–[a]	955 (48.5)	–[a]
Other	445 (6.2)	120 (0.7)	0 (0)	14 320 (57.0)
Missing	15 (0.2)	60 (0.4)	0 (0)	115 (0.5)
Marital status—*n* (%)				
Single (divorced/separated, never married, and widowed)	3550 (49.4)	6595 (41.0)	975 (49.5)	8285 (33.0)
Married or common-law	3635 (50.6)	9490 (58.9)	995 (50.3)	16 820 (67.0)
Missing	0 (0)	15 (0.1)	5 (0.2)	20 (0.1)
Education—*n* (%)				
Less than high school	1230 (17.1)	5020 (31.2)	1145 (58.1)	5850 (23.3)
High-school graduate	1690 (23.5)	3170 (19.7)	300 (15.2)	5260 (20.9)
Post-secondary graduate	4190 (58.3)	7790 (48.4)	480 (24.4)	13 735 (54.7)
Missing	75 (1.0)	125 (0.8)	40 (2.0)	275 (1.1)
Household income quintile—*n* (%)				
1 (Lowest)	1355 (18.9)	3665 (22.8)	270 (13.7)	8670 (34.5)
2	1270 (17.7)	3140 (19.5)	90 (4.8)	5590 (22.3)
3	1185 (16.5)	2665 (16.6)	105 (5.3)	3620 (14.4)
4	1255 (17.5)	2690 (16.7)	120 (6.1)	2610 (10.4)
5 (Highest)	1545 (21.5)	2615 (16.2)	55 (2.8)	1760 (7.0)
Missing[b]	580 (8.1)	1335 (8.3)	1325 (67.3)	2870 (11.4)
Geographic region—*n* (%)				
Western Provinces	0 (0)	1240 (7.7)	290 (14.7)	9505 (37.8)
Ontario	0 (0)	5605 (34.8)	–[a]	11 535 (45.9)
Quebec	7185 (100)	0 (0)	490 (24.9)	3470 (13.8)
New Brunswick	0 (0)	8385 (52.1)	–[a]	115 (0.5)
Atlantic Canada (excluding New Brunswick)	0 (0)	700 (4.3)	–[a]	270 (1.1)
Territories	0 (0)	170 (1.1)	1150 (58.4)	230 (0.9)
Urban/rural residence—*n* (%)				
Urban	5305 (73.8)	8840 (54.9)	725 (36.8)	23 250 (92.6)
Rural	1880 (26.2)	7260 (45.1)	1245 (63.2)	1875 (7.5)
Immigration status—*n* (%)				
Yes	1325 (18.4)	460 (2.9)	–[a]	22 125 (88.1)
No	5855 (81.5)	15 635 (97.1)	–[a]	2815 (11.2)
Missing	10 (0.1)	10 (0.1)	–[a]	180 (0.7)
Knowledge of English and/or French—*n* (%)				
English and French	4915 (68.4)	13 105 (81.4)	150 (7.6)	2645 (10.5)
English only	2270 (31.6)	–[d]	1605 (81.5)	18 285 (72.8)
French only	–[c]	2990 (18.6)	15 (0.8)	1155 (4.6)
Neither English nor French	–[c]	–[d]	195 (9.9)	3035 (12.1)
Missing	0 (0)	0 (0)	0 (0)	5 (0.0)

[a] Responses not reported due to small sample sizes ($n < 15$).
[b] Questions pertaining to household income were not asked to respondents living in the territories.
[c] Variable not relevant for respondents whose primary home language is English.
[d] Variable not relevant for respondents whose primary home language is French.

comparing English-speaking respondents in Quebec who received language-concordant physician care to English-speaking respondents in Quebec who received language-discordant care (HR 1.25, 95% CI, 0.97-1.61).

The association between patient–physician language concordance and secondary outcomes (incidence of cancer death and cardiovascular death) for each linguistic group is presented in Figure 2. For English-speaking respondents in Quebec, patient–physician language

Table 2 Health characteristics of CCHS respondents (2003-2014), stratified by primary home language.

Health characteristics	English-speaking respondents in Quebec (*n* = 7185)	French-speaking respondents outside of Quebec (*n* = 16 100)	Indigenous-language-speaking respondents (*n* = 1970)	Allophone-language-speaking respondents (*n* = 25 120)
Comorbidities				
Cancer—*n* (%)	535 (7.4)	1375 (8.5)	55 (2.8)	1040 (4.1)
Cardiovascular disease (heart disease or stroke)—*n* (%)	595 (8.3)	1540 (9.6)	125 (6.3)	1730 (6.9)
Diabetes—*n* (%)	530 (7.4)	1385 (8.6)	165 (8.4)	2025 (8.1)
Hypertension—*n* (%)	1915 (26.7)	4825 (30)	425 (21.6)	6075 (24.2)
Mental health disorder (anxiety or mood disorder)—*n* (%)	715 (10)	1925 (12)	155 (7.9)	1600 (6.4)
Obesity (by BMI)—*n* (%)				
Normal (BMI $<$ 25.0)	3390 (47.2)	6525 (40.5)	630 (32)	13 025 (51.9)
Overweight (BMI 25.0-29.9)	2325 (32.4)	5580 (34.7)	535 (27.2)	7490 (29.8)
Obese (BMI $\geq$ 30.0)	1225 (17)	3325 (20.7)	530 (26.9)	2960 (11.8)
Missing	245 (3.4)	675 (4.1)	270 (13.7)	1650 (6.6)
Obstructive lung disease—*n* (%)	860 (12)	1830 (11.4)	145 (7.4)	1475 (5.9)
Social factors				
Alcohol use—*n* (%)				
Regular alcohol use	4740 (66.0)	9075 (56.4)	720 (36.5)	10 620 (42.3)
Occasional alcohol use	1130 (15.7)	3535 (22.0)	370 (18.8)	4695 (18.7)
No alcohol use in the last 12 months	1300 (18.1)	3435 (21.3)	860 (43.7)	9735 (38.8)
Missing	10 (0.3)	55 (0.3)	10 (0.5)	70 (0.3)
Consumption of fruits/vegetables—*n* (%)				
Less than 5 times per day	2940 (40.9)	7600 (47.2)	1230 (62.4)	12 760 (50.8)
5-10 times per day	2155 (30)	5360 (33.3)	290 (14.7)	8465 (33.7)
More than 10 times per day	250 (3.5)	555 (3.4)	50 (2.5)	755 (3.0)
Missing[a]	1840 (25.6)	2580 (16.1)	395 (20.1)	3145 (12.6)
Food insecurity—*n* (%)				
Severe food insecurity	105 (1.5)	180 (1.1)	195 (9.9)	265 (1.1)
Moderate food insecurity	250 (3.5)	495 (3.1)	370 (18.8)	1245 (5.0)
No food insecurity	5220 (72.7)	9160 (56.9)	520 (26.4)	17 310 (68.9)
Missing[b]	1610 (22.4)	6265 (38.9)	885 (44.9)	6300 (25.1)
Sense of belonging to the community—*n* (%)				
Very weak	760 (10.6)	1570 (9.8)	65 (3.3)	2745 (10.9)
Somewhat weak	1945 (27.1)	3375 (21)	225 (11.4)	6010 (23.9)
Somewhat strong	3030 (42.2)	6940 (43.1)	760 (38.6)	10 685 (42.5)
Very strong	1265 (17.6)	3695 (23)	840 (42.6)	4155 (16.5)
Missing	195 (2.7)	525 (3.3)	85 (4.3)	1530 (6.1)
Physical activity—*n* (%)				
Inactive	3420 (47.6)	8390 (52.1)	1195 (60.7)	14 095 (56.1)
Moderately active	1820 (25.3)	3835 (23.8)	345 (17.5)	5320 (21.2)
Active	1830 (25.5)	3495 (21.7)	380 (19.3)	4665 (18.6)
Missing	115 (1.6)	380 (2.4)	45 (2.3)	1045 (4.2)
Smoking—*n* (%)				
Current	1735 (24.1)	3420 (21.2)	1225 (62.2)	3370 (13.4)
Former	3180 (44.3)	7535 (46.8)	515 (26.1)	6950 (27.7)
Never	2260 (31.5)	5120 (31.8)	225 (11.4)	14 755 (58.7)
Missing	10 (0.1)	25 (0.2)	0 (0)	50 (0.2)

Abbreviations: CCHS, Canadian Community Health Survey; BMI, body mass index.
[a]Fruit and vegetable consumption was an optional module from 2005 to 2006.
[b]The derived variable for food insecurity was re-defined in 2007, and it could not be combined with the derived variable for food insecurity from earlier CCHS cycles (2003-2006). As a result, respondents included in one of the earlier CCHS cycles (2003-2006) were missing data for food insecurity.

concordance was not associated with incidence of cardiovascular death (HR 1.04, 95% CI, 0.66-1.62) but was associated with a nonsignificant trend toward a higher incidence of cancer death (HR 1.67, 95% CI, 1.00-2.81). Patient–physician language concordance was associated with a lower incidence of cardiovascular death for both French-speaking respondents outside of Quebec (HR 0.82, 95% CI, 0.66-1.01) and Allophone-language-speaking respondents (HR 0.80, 95% CI, 0.65-0.98), although the association for French-speaking respondents outside of Quebec did not reach statistical significance. There was no statistically significant association between patient–physician language concordance and the incidence of cancer death for either French-speaking respondents outside of Quebec (HR 0.98, 95% CI, 0.80-1.20) or Allophone-speaking respondents (HR 0.84, 95% CI, 0.69-1.03).

Results from all adjusted models (including sensitivity analyses) are presented in Figures S1–S3. The HRs obtained for French-speaking and Allophone-language-speaking respondents were similar across all sensitivity analyses. However, for English-speaking respondents,

Table 3 Outpatient healthcare utilization of CCHS respondents (2003-2014), stratified by primary home language.

Outpatient healthcare utilization	English-speaking respondents in Quebec (*n* = 7185)	French-speaking respondents outside of Quebec (*n* = 16 100)	Indigenous-language-speaking respondents (*n* = 1970)	Allophone-language-speaking respondents (*n* = 25 120)
Current doctor				
Regular medical doctor—*n* (%)				
Yes	5540 (77.1)	14 600 (90.7)	540 (27.4)	21 485 (85.5)
No	1645 (22.9)	1495 (9.3)	1430 (72.6)	3630 (14.5)
Missing	5 (0.1)	5 (0.0)	0 (0)	5 (0.0)
Patient–physician language concordance—*n* (%)[a]				
Yes	4635 (83.7)	9885 (67.7)	35 (6.5)	7045 (32.8)
No	865 (15.6)	4650 (31.8)	500 (92.6)	14 425 (67.1)
Other language	35 (0.6)	55 (0.4)	0 (0)	0 (0)
Missing	10 (0.2)	20 (0.1)	0 (0)	25 (0.1)
Healthcare interactions in last year				
Consulted family doctor/general practitioner (last 12 months)—*n* (%)				
Yes	4945 (68.8)	12 035 (74.8)	995 (50.5)	18 635 (74.2)
No	1780 (24.8)	2990 (18.6)	910 (46.2)	5205 (20.7)
Missing	460 (6.4)	1075 (6.7)	65 (3.3)	1285 (5.2)
Consulted other doctor (last 12 months)—*n* (%)				
Yes	2520 (35.1)	4555 (28.3)	325 (16.5)	6470 (25.8)
No	4205 (58.5)	10 480 (65.1)	1595 (81)	17 405 (69.3)
Missing	455 (6.4)	1065 (6.7)	50 (2.5)	1250 (5.0)

Abbreviation: CCHS, Canadian Community Health Survey.
[a] Proportion of respondents relative to those who have a regular medical doctor.

the association between patient–physician language concordance and higher risk of cancer death was not statistically significant in any of the sensitivity analyses.

Discussion

In this retrospective cohort study of Canadians, we found that both French-speaking respondents outside of Quebec and Allophone-language-speaking respondents who received language-concordant physician care had a lower risk of all-cause death compared to respondents from the same linguistic group who received language-discordant physician care. We hypothesize that this finding is due to a combination of cultural and language factors that improved the quality of healthcare services. Evidence from prior studies suggests that patient–physician language concordance is associated with patient satisfaction, medical comprehension, receipt of health counseling, attendance at follow-up appointments, and adherence to treatments.[4-8] In this study, the difference in all-cause death was

Table 4 All-cause and cause-specific mortality among CCHS respondents (2003-2014), stratified by primary home language.

Baseline characteristics	English-speaking respondents in Quebec (*n* = 7185)	French-speaking respondents outside of Quebec (*n* = 16 100)	Indigenous-language-speaking respondents (*n* = 1970)	Allophone-language-speaking respondents (*n* = 25 120)
Primary outcome—*n* (%)				
Death	880 (12.2)	1950 (12.1)	240 (12.2)	2195 (8.7)
Secondary outcomes—*n* (%)				
Cancer	280 (3.9)	630 (3.9)	70 (3.6)	670 (2.7)
Cardiovascular	255 (3.5)	565 (3.5)	55 (2.8)	685 (2.7)
Non-cancer, non-cardiovascular	345 (4.8)	755 (4.7)	115 (5.8)	845 (3.4)
Accidents	30 (0.4)	90 (0.6)	30 (1.5)	90 (0.4)
Dementia	50 (0.7)	135 (0.8)	–[a]	170 (0.7)
Endocrine	35 (0.5)	90 (0.6)	–[a]	105 (0.4)
Gastrointestinal	40 (0.6)	75 (0.5)	–[a]	90 (0.4)
Genitourinary	25 (0.3)	45 (0.3)	–[a]	60 (0.2)
Infections (excluding respiratory infections)	25 (0.3)	30 (0.2)	–[a]	45 (0.2)
Neuropsychiatric (excluding dementia)	25 (0.3)	55 (0.3)	–[a]	55 (0.2)
Respiratory disease	60 (0.8)	130 (0.8)	25 (1.3)	120 (0.5)
Respiratory infections	30 (0.4)	35 (0.2)	–[a]	65 (0.3)
Other	25 (0.3)	65 (0.4)	–[a]	50 (0.2)

Abbreviation: CCHS, Canadian Community Health Survey.
[a] Outcomes not reported due to small sample sizes ($n < 15$).

Table 5 All-cause and cause-specific mortality among CCHS respondents (2003-2014) with a regular medical doctor, stratified by primary home language and patient–physician language concordance/discordance.

Outcomes	English-speaking respondents in Quebec (n = 5500)			French-speaking respondents outside of Quebec (n = 14 535)			Allophone-language-speaking respondents (n = 21 470)		
	Language-concordant physician care (n = 4635)	Language-discordant physician care (n = 865)	*P*-value	Language-concordant physician care (n = 9885)	Language-discordant physician care (n = 4650)	*P*-value	Language-concordant physician care (n = 7045)	Language-discordant physician care (n = 14 425)	*P*-value
Primary outcome—*n* (%)									
Death	700 (15.1)	75 (8.7)	<.01	1160 (11.7)	630 (13.5)	.06	600 (8.5)	1490 (10.3)	<.01
Secondary outcomes—*n* (%)									
Cancer	225 (4.9)	15 (1.7)	<.01	375 (3.8)	200 (4.3)	.36	185 (2.6)	445 (3.1)	.04
Cardiovascular	210 (4.5)	25 (2.9)	.03	345 (3.5)	185 (4.0)	.39	175 (2.5)	485 (3.4)	<.01
Non-cancer, non-cardiovascular	270 (5.8)	35 (4.0)	.01	445 (4.5)	245 (5.3)	.19	235 (3.3)	565 (3.9)	.02

Abbreviation: CCHS, Canadian Community Health Survey.

driven by cardiovascular death. We believe that this is because most cardiovascular risk factors (such as diabetes, dyslipidemia, hypertension, obesity, and smoking) are generally treated in primary care settings, while cancer is primarily diagnosed and treated by specialists (eg, oncologists, radiation oncologists, and surgeons). Since physician language was defined as the self-reported language that respondents spoke with their regular medical doctor, our measure of patient–physician language concordance likely captured the language used by respondents in primary care settings. We believe that the disparities identified in this study could be mitigated through equitable access to medical education for underrepresented linguistic communities, systematic collection of patients' preferred language on health card (which is currently only being done in a minority of jurisdictions), systematic collection of linguistic abilities of healthcare providers, and consistent and reliable access to evidence-based interpretation services. Most Canadian jurisdictions offer professional interpretation services, whereby trained interpreters can be accessed both in-person and remotely. There is a growing body of evidence supporting the use of remote interpretation, as well as emerging artificial intelligence-based translation applications that may support bedside communication when traditional interpretation services are not available.[26,27]

The magnitude of the association between patient–physician language concordance and all-cause death was larger for Allophone-language-speaking respondents compared to French-speaking respondents. We offer 2 reasons for this finding. First, French-speaking respondents generally have greater English proficiency compared to Allophone-language-speaking respondents. Since most Allophone-language-speaking patients immigrated to Canada (88.1%), some may have learned English later in life (eg, after immigration) and may not have acquired native-like English proficiency.[28] Therefore, we believe that Allophone-language-speaking respondents who received language-discordant care may have faced more severe language barriers compared to French-speaking respondents who received language-discordant care. Second, it is possible that some patients who were classified as receiving language-discordant physician care were in fact receiving care in their preferred language (eg, patients who speak French or an Allophone language at home but seek care in English). We believe that such misclassification, which would bias the measured association toward the null, may be more common among French-speaking respondents than among Allophone-language-speaking respondents due to their higher level of English proficiency.

Indigenous-language-speaking respondents were much less likely to receive language-concordant physician care compared to respondents who spoke English, French, or an Allophone language. We believe that this finding can be explained by barriers related to access and availability of healthcare services in Indigenous communities (including the Territories, where the majority of Indigenous-language-speaking respondents in this study lived),[29] as well as an under-representation of Indigenous peoples in medicine (ie, less than 1% of Canadian physicians are Indigenous, while Indigenous peoples represent 5% of Canada's population).[30] The under-representation of Indigenous peoples in medicine has previously been attributed to multiple factors, including anti-Indigenous racism (eg, admission processes that disadvantage Indigenous applications),[31,32] geographic barriers, socioeconomic barriers, and limited early exposure to healthcare professions.[33,34] Although the CCHS sample size was too small to test the association between patient–physician language concordance and long-term survival among Indigenous-language-speaking

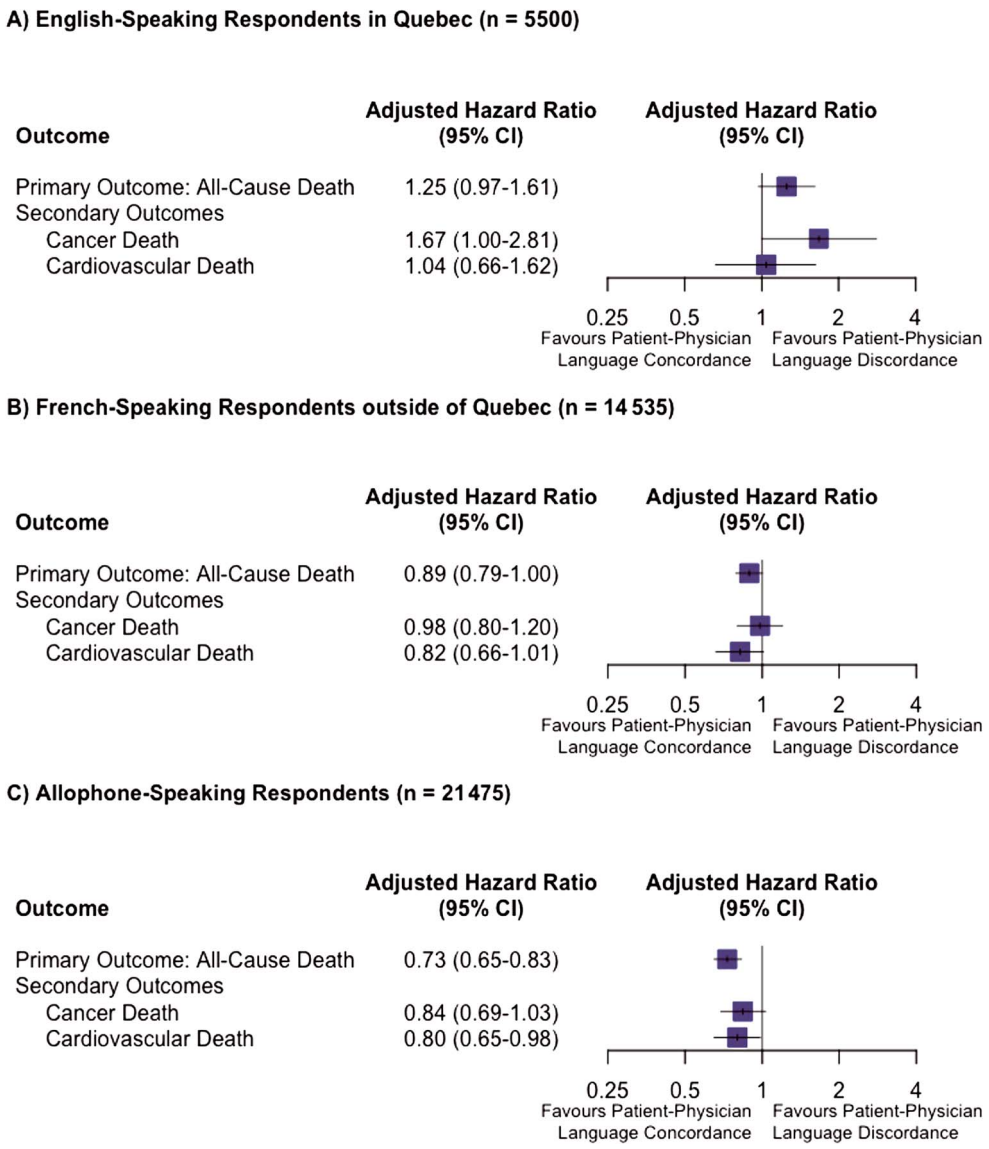

Figure 2 Adjusted HRs for all-cause death, cancer death, and cardiovascular death for patients receiving language-concordant physician care compared with patients receiving language-discordant physician care, stratified by linguistic group.

respondents, prior studies have found that Indigenous language use is protective against health disparities,[35-37] which has led to recommendations for Indigenous language revitalization initiatives to be viewed as health promotion strategies.[36-38]

Patient–physician language concordance was not associated with all-cause death for English-speaking respondents in Quebec. We believe that this finding may be explained by inadequate statistical power due to small sample sizes in the language-discordant group. While patient–physician concordance was associated with an increase in the incidence of cancer death in the primary analysis, this finding was not robust to sensitivity analyses, which also suggests numerical instability due to small sample sizes (ie, the association was likely driven by an association among a small number of respondents that was only present in the primary analysis). Lastly, it is possible that neither language spoken most often at home nor mother tongue should be used as surrogate measures of preferred language for healthcare encounters among English-speaking communities in Quebec. Given the unique linguistic profile of Quebec (ie, only jurisdiction where French is the majority language), further research is needed to validate language variables captured in surveys and administrative data in Quebec.

Strengths and limitations

This study has several notable strengths. First, we used data from a large, nationally representative survey (CCHS) which includes approximately 65 000 respondents annually.[15] Whereas many previous studies examining the association between patient–physician language concordance and health outcomes have been limited by small sample sizes,[4-8] our approach enabled the analysis of more than 50 000 Canadians who may be at risk of experiencing language barriers when accessing healthcare services. Second, Statistics Canada has implemented multiple measures to ensure that data quality is not compromised by respondents' ability to speak English and/or French.[15] For example, respondents whose preferred language is neither English nor French are, when possible, matched with interviewers proficient

in their preferred language, and survey questionnaires are available in numerous translated versions, including Indigenous and Allophone languages.[15] Third, patient–physician language concordance was measured entirely using patient-reported data, reducing the risk of misclassification that can arise when physician language is inferred from administrative sources (such as physician-reported language proficiency),[39,40] which may not reflect the actual language used during healthcare encounters. Finally, all outcomes were identified using an administrative database (CVSD) developed, maintained, and validated by Statistics Canada.[19]

This study also has limitations. First, the CCHS sampling frame excluded individuals living on First Nations communities in the provinces, resulting in small sample sizes for Indigenous-language-speaking respondents. Second, we assumed that respondents' primary home language reflected their preferred language for healthcare encounters. While this assumption may not be true for all respondents, prior validation studies found that patient language captured in home care and long-term care databases in Ontario, Canada had greater agreement with language spoken most often at home than with other language variables captured in the CCHS, including first official language spoken (English/French), knowledge of English and/or French, and mother tongue.[41] Third, respondents who reported speaking multiple languages at home were excluded if the languages corresponded to different linguistic groups. While this may limit the generalizability of this study, we feel that this is unlikely to have introduced meaningful bias given that only 2.4% of respondents were excluded for this reason. Fourth, some respondents may have received care from multiple physicians with different linguistic abilities (eg, within group practices or when patients changed physicians, due to practice closure or relocation). However, respondents could only report a single language when asked to specify the language that they usually speak with their regular medical doctor, which likely reflects their family doctor. As such, some respondents may have received both language-concordant and language-discordant physician care that could not be captured. While this misclassification may be non-differential (eg, in cases of transitions between family doctors), it is also possible that individuals with greater healthcare needs (eg, those with poorer health status) interact with more providers and are therefore more likely to experience misclassification, which could introduce differential misclassification and bias the observed association in unpredictable directions. Fifth, we do not have information regarding the use of professional interpretation services. Despite legislation mandating the provision of professional interpretation services in most Canadian jurisdictions, professional interpretation services remained underutilized in the Canadian healthcare system.[42,43] Furthermore, prior studies have generally found that *ad hoc* or untrained interpreters do not improve objective outcomes,[44,45] which means that the effect of interpretation provided by family members or friends on long-term survival is likely to have been negligible. Finally, because we used an observational study design with self-reported baseline characteristics, we cannot exclude the possibility of residual confounding, either from data unavailability or self-report bias. In particular, we were unable to adjust for the local or regional availability of both physician and non-physician healthcare services in minority languages, which may vary according to health policies, institutional capacity, and workforce diversity. Furthermore, unmeasured patient-level factors such as engagement in care and health literacy may influence both access to language-concordant physician care and health outcomes, introducing the possibility of residual confounding. Lastly, we were unable to account for changes in health status during the follow-up period. Worsening health status may both influence patterns of healthcare utilization and increase the risk of mortality, thereby raising the possibility of time-varying confounding. However, some changes in health status may lie on the causal pathway between language concordance and mortality, rendering these changes mediators rather than confounders.

Conclusion

In this retrospective cohort study, we found large disparities in access to both regular physician care and language-concordant physician care across linguistic groups. We also found that patient–physician language concordance was associated with a lower risk of all-cause death among French-speaking respondents outside of Quebec and Allophone-language-speaking respondents. Healthcare systems should prioritize the delivery of language-concordant physician care (eg, through patient–physician linguistic matching and/or use of evidence-based interpretation services), as this could potentially improve long-term survival in linguistically diverse populations.

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Supplementary material

Supplementary material is available at *AJE Advances: Research in Epidemiology* online.

Conflicts of interest

Dr H. Singh has been on advisory boards or consulted for Fresenius Kabi Canada, BioJAMP, Celltrion, AbbVie Canada, Pfizer Canada, Takeda Canada, Organon Canada, Pendopharm, Eli Lilly Canada and Guardant Health Inc., received educational funding from Pfizer Canada, Fresenius Kabi Canada, Organon Canada and has received research funding for an investigator-initiated study from Pfizer and

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Data availability

Data used for this study consists primarily of survey data (CCHS) collected by Statistics Canada linked to administrative data (CVSD) collected by the Canadian Institute for Health Information. While aggregate or summary data are publicly available via Statistics Canada website, the microdata files containing individual level data are only available at designated Research Data Centers through a mechanism set out by legislation and regulation. As such, requests for data sharing should be directed to Statistics Canada Research Data Centers (https://crdcn.ca/publications-data/access-crdcn-data/) to determine whether researchers meet the criteria to access microdata files.

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