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Disparities in COVID-19 infection rates across linguistic groups in long-term care homes in Ontario, Canada

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Abstract

Background The COVID-19 pandemic has had a disproportionate impact on residents of long-term care facilities or nursing homes, characterized by significantly higher infection and mortality rates than in the general population. Previous research has highlighted significant disparities in COVID-19 outcomes, particularly among ethnic minorities. This study examines the association between belonging to a minority language community and COVID-19 infection rates in LTCFs in Ontario, Canada, at both the individual and facility levels.

Methods We conducted a population-based retrospective cohort study of 85,367 LTC home residents in Ontario between January 15, 2019, and March 30, 2020, which we followed until March 31, 2021, using data from the Continuing Care Reporting System. We defined resident language (obtained from routine assessments in nursing homes) as English (Anglophone), French (Francophone), or other (Allophone), and we calculated a weighted average of languages spoken by residents in each LTC facility to determine the linguistic environment of the LTC facility. We calculated incidence rates of COVID-19 for each linguistic group, and we fitted multilevel logistic regression models to assess the main factors influencing the risk of COVID-19 infection, to account for individual-level and facility-level linguistic factors.

Results The overall incidence of COVID-19 was 14.8%. The incidence of COVID-19 was higher among Allophones (23.6%) compared to Anglophones (13.1%) and Francophones (12.2%). Allophones in English homes (22.5%) showed significantly higher incidence rates compared to Anglophones (13.1%) and Francophones (11.0%) in these same homes. After adjusting for sociodemographic and clinical characteristics, the risk of COVID-19 remained significantly higher for Allophones compared to Anglophones (aOR 1.14, 95% CI 1.05–1.22), while residents living in language-discordant nursing homes had a non-significantly higher risk of COVID-19 (aOR 1.07, 95% CI 0.99–1.14).

Conclusions Over the first two waves of the COVID-19 pandemic, the risk of COVID-19 infection in nursing homes was highest among residents whose primary language was a language other than English or French. The results of our study show that COVID-19 disproportionately affected populations living in minority linguistic communities.

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These findings may help informing public health interventions aimed at addressing the language barriers in long-term care in Ontario, and across Canada.

Keywords COVID-19, Linguistic minorities, Language discordance, Nursing homes, Long-term care

Introduction

Globally, the COVID-19 pandemic has severely affected residents of long-term care (LTC) facilities (i.e., nursing homes) and retirement homes [1, 2]. In Canada, residents of nursing homes experienced disproportionately higher rates of infection and death; as of May 2021, deaths in nursing homes constituted nearly half of all COVID-19 fatalities in Canada [3, 4]. Analyses in the general population have revealed several inequities during this pandemic, including risk of COVID-19 infection, hospitalization, and death among marginalized populations, such as ethnic minorities, recent immigrants, and low-income groups [5–9]. However, little is known about the potential inequities in COVID-19 infection rates and outcomes among minorities residing in nursing homes.

Although several studies have examined the influence of facility characteristics on COVID-19 infection rates in nursing homes [10], data specifically addressing the potential effect of linguistic discordance between residents and facilities remain limited. The importance of clear and effective patient-provider communication in healthcare is well known; it is therefore not surprising that language barriers negatively affect access to care, patient satisfaction, and overall quality and safety of care received [11, 12]. Our research group has previously shown that hospitalized patients who receive language-discordant care (when there is a discrepancy between the language of patient and the language in which service is provided) are more likely to experience harmful events (including those related to medical care and/or procedures, as well as accidents and infections), longer hospitalizations, and death [13–15]. Residents in nursing homes are generally more frail when compared to the general population, and thus may be more susceptible to experiencing poor health outcomes as a result of language barriers. Although factors such as gender, health status, and other determinants have been associated with differences in COVID-19 hospitalization rates, medical complications, and mortality [16–19], no previous study has examined the association between linguistic discordance—that is, a discordance between the resident's primary language of communication and the language used by the facility or healthcare staff—and the incidence of COVID-19 among residents of long-term care facilities in Canada. In addition, COVID-19 infections and its consequences can result from a complex interplay of multilevel factors, including patients sociodemographic and health (e.g. limitations, comorbidities) characteristics and institutional (e.g. hospital, nursing homes) or community factors [20–22]. Therefore, our study sought to examine the influence of the linguistic characteristics on the incidence of COVID 19 among patients receiving LTC in nursing homes in Ontario. Understanding the role of linguistic characteristics in an epidemic situation such as the COVID-19 pandemic will help to inform health care policy and clinical practices in LTC for linguistic minorities.

Canada has a population of approximately 37 million, of which 55% and 20% report their mother tongue as English and French, respectively [23]. While the federal government recognizes both English and French as official language, only one province (New Brunswick) is officially bilingual. French is the official language of Quebec, while English is the official language of the remaining provinces (including Ontario, where approximately 5% of the population identifies as Francophone) [24]. Legislation exists in several provinces to protect the rights of Francophones living in minority linguistic communities. For instance, in Ontario, the French Language Services Act designates several provincial agencies and institutions (including nursing homes) which are required by law to provide services in French [25, 26]. Despite this, we have shown that Francophones experience worse health outcomes when they receive care in settings where the provision of care in French is not mandated. For example, Francophones experience better outcomes in French designated nursing homes (i.e., those required to provide care in French) when compared to non-designated nursing homes (i.e., those not required to provide care in French) [27–29]. Similarly, Allophones patients (i.e., those whose primary language is neither English nor French) can also have negative health outcomes in a linguistic discordant care situation [13]. As such, this study sought to assess the role of linguistic characteristics on the risk of COVID-19 infections in LTC. Based on the above outlined evidence, we hypothesized that patients whose main language was other than English or receive care in a discordant context were at higher risk of COVID-19 infection.

The objectives of this study were to: (a) describe the incidence rate of COVID-19 by linguistic group (Anglophone, Francophone and Allophone) among LTC residents in Ontario, Canada, and (b) determine the impact of patient-facility language discordance, defined as occurring when a resident lives in a home where care providers predominantly speak a language other than their primary language.

Methods

Study design

We conducted a population-based retrospective cohort study. Reporting of this study follows RECORD guidelines for observational studies using routinely collected health care data (Appendix 1, Supplemental material).

Population

We established a cohort of all LTC home residents in Ontario who met the criteria of having at least one medical assessment after admission between January 15, 2019, and March 31, 2020. We excluded residents who (a) were not resident in the province or were ineligible for the Ontario Health Insurance Plan (OHIP) at the index event, (b) died before Jan 15, 2020, and (c) those aged < 18 or > 105. All residents were followed up to March 31, 2021 (Appendix 2, Supplemental material

Data sources

We used various administrative health databases that were securely linked using unique encoded identifiers and analyzed at ICES (https://www.ices.on.ca/; formerly Institute for Clinical Evaluative Sciences), an independent, not-for-profit research institute and a prescribed entity under Ontario's privacy legislation, authorized to collect and use health care data for the purposes of health system analysis, evaluation and decision support. To obtain residents' demographic and LTC home information, data from the Registered Persons Database (RPDB), which contains information on all individuals registered for coverage under OHIP, were linked to the Continuing Care Reporting System (CCRS). The CCRS comprises information on all LTC home residents collected using the Resident Assessment Instrument Minimum Data Set (RAI-MDS) version 2.0. Full assessments – which include the language of the resident – are done at the time of admission and repeated on an annual basis. An abbreviated version of the RAI-MDS assessment is administered quarterly and, when there are significant health status changes. We used the COVID-19 Integrated Testing Data (C19INTGR) database to capture COVID-19 cases [30]. We used the first valid assessment within the accrual period to determine baseline characteristics for all LTC residents in the CCRS. We used the Immigration, Refugees and Citizenship Canada (IRCC) Permanent Resident Database, includes records for immigrants and refugees who landed in Ontario between January 1, 1985, and May 31, 2017; to identify immigrants and refugees.

Study variables

Primary language spoken

We used the CCRS to capture the primary language of each resident. We classified the resident as Francophone, Anglophone or Allophone if their reported primary language spoken was French, English, or a language other than English or French, respectively.

Main language of the LTC home

We used the predominant language spoken by the residents in the LTC home as a proxy measure of the main language of service of the facility, as applied in previous studies [28]. To obtain the person-time representation of the three language categories (English, French and Other), we divided the total person-days for each language by the cumulative length-of-stay in person-days of all residents in the facility during our study period. We used the largest proportion of person-days for each language to determine the language most spoken in the home. We classified the homes as predominantly English, predominantly French, or Other language using the proportion of French-speaking residents. A home was classified as French if Francophone patients contributed at least 25% of patient days (37 homes), while a home was classified as 'Other language or Allophone' if Francophone patients contributed less than 25% of patient days AND if Allophone patients contributed more than 50% of patient days (33 homes), so the dominant language of the facility is other than English or French. The remainder of the homes, including those where Francophone and Allophone patients contributed less than 25% and 50% of patient days, respectively, were classified as English (554 homes). We used a lower threshold to define French homes because prior analyses conducted by our group found that this threshold had better sensitivity (81%) and specificity (97%) for identifying homes that are designated by law to provide services in French (Appendix 5, suppl mat.).

We defined language discordant care as the primary language spoken by the resident being different from the main language of the facility. Even though a person can speak more than one language, we used the primary language to assess the effect of the main language of communication as a potential barrier in a minority linguistic context. To define the concordance of the Allophones, non-official languages were combined to form classes of mutually intelligible languages (i.e., languages that are different from one's language but still readily understood without prior familiarity or special effort) [31, 32]. We determined the ten most spoken groups of mutually intelligible languages in the cohort as well as the main language spoken at the home. Then, we defined patient-facility interaction as "language-concordant" if both the patient and the home shared a mutually intelligible language, otherwise the interactions were identified as "language-discordant". Each patient was uniquely assigned to a category of language concordance/discordance status. A list of the language groups is presented in Appendix

Table 1 Rates of COVID-19 and socio-demographic characteristics of nursing home residents, by language group

Characteristics		Anglophone (*N* = 68,681)		Francophone (*N* = 2,852)	
		COVID-19 diagnosis	Rate per 100*	COVID-19 diagnosis	Rate per 100*
		#		#	
Total cohort		9,003	13.1	354	12.4
Age	Mean (SD)	80.5	(11.5)	82.4	(11.2)
Age group	< 50	108	14.5	6	25.0
	50–64	788	16.0	22	14.6
	65+	8,107	12.9	326	12.2
Sex	Female	5,875	12.7	251	12.4
	Male	3,128	13.8	103	12.4
Immigration	Long-standing resident	8,570	12.8	344	12.2
status	Recent Immigrant	433	26.5	10	30.3
Area of	Urban	8,569	14.7	300	14.4
residence	Rural	359	3.7	48	6.4
	Missing	75	15.2	6	24.0
Income level	Q1 (poorest)	2,431	12.4	139	15.3
	Q2	2,467	16.3	96	14.8
	Q3	1,489	12.2	47	8.8
	Q4	1,305	11.1	50	13.8
	Q5 (richest)	1,229	12.9	16	4.3
	Missing	82	15.8	6	24.0
Region/LHIN	Champlain	823	12.7	296	21.3
group	North	*86–90	-	*7–11	-
	Southwest	8,089	14.4	46	10.3
	Missing	*1–5	-	*1–5	-
Concordance of	Concordant	8,748	13.0	212	16.2
care	Discordant	255	20.6	142	9.2
Facility characteristics					
Main Language of	English	8,627	13.1	102	11.0
home	French	193	9.6	252	13.10–13.13
	Other	183	22.5	0	0.0
Rurality of the	Rural	9,731	3.9	758	6.5
home	Urban	58,950	14.6	2,094	14.6
Home/facility size	1–49	110	5.5	*1–5	0.7–3.7
(Number of beds)	50–99	1,194	8.8	*75–79	10.5–11.1
	100–149	2,254	13.0	151	20.2
	150+	5,445	15.2	123	9.8
COVID-19 rates (per 100)					
Community level (PHU)	Mean (SD)	3.1	(1.0)	1.3	(0.8)
Clinical characteristics					
ADL Scale	Independent	137	6.9	7	4.8
	Supervision required	420	10.5	12	6.0
	Limited impairment	862	11.5	37	10.2
	Extensive assistance required (I)/(II)	5434	13.8	221	14.2
	Dependent/Total dependence	2150	13.6	77	13.0
	Missing	0	-	0	-
CPS Scale	Intact	869	10.9	13	4.7
	Borderline intact	916	13.5	31	11.3
	Mild impairment	1665	13.7	52	11.3
	Moderate and Moderate/severe impairment	4265	13.4	184	14.2
	Severe/Very severe impairment	1288	12.8	74	13.5
	Missing	0	-	0	-
Number of	0	413	11.9	23	14.8

Table 1 (continued)

Characteristics		Anglophone (*N* = 68,681)		Francophone (*N* = 2,852)	
		COVID-19 diagnosis	Rate per 100*	COVID-19 diagnosis	Rate per 100*
		#		#	
diseases	1	1150	11.8	52	12.2
	2	1675	12.4	63	10.3
	3	1786	13.0	73	12.9
	4+	3979	14.1	143	13.0

Characteristics		Allophone (*N* = 13,834)		Total (*N* = 85,367)		*p*-value
		COVID-19 diagnosis	Rate per 100*	COVID-19 diagnosis	Rate per 100*	
		#		#		
Total cohort		3,263	23.6	12,620	14.8	< 0.0001
Age	Mean (SD)	84.5	(9.3)	81.6	(11.1)	< 0.0001
Age group	< 50	17	27.9	131	15.8	< 0.0001
	50–64	117	30.1	927	17.0	
	65+	3,129	23.4	11,562	14.6	
Sex	Female	2,253	22.8	8,379	14.5	< 0.0001
	Male	1,010	25.5	4,241	15.5	
Immigration status	Long-standing resident	2,429	23.5	11,343	14.1	< 0.0001
	Recent Immigrant	834	23.7	1,277	24.7	
Area of residence	Urban	3,235	24.0	12,104	16.4	< 0.0001
	Rural	16	6.0	423	3.9	
	Missing	12	16.7	93	15.8	
Income level	Q1 (poorest)	1,155	23.2	3,725	14.6	< 0.0001
	Q2	699	24.4	3,262	17.5	
	Q3	604	24.3	2,140	14.1	
	Q4	338	18.6	1,693	12.2	
	Q5 (richest)	454	28.0	1,699	14.7	
	Missing	13	17.8	101	16.4	
Region/LHIN group	Champlain	84	14.5	1,203	14.2	< 0.0001
	North	*5–9	-	106	1.4	
	Southwest	3,169	24.6	11,304	16.3	
	Missing	*1–5	-	7	26.9	
Concordance of care	Concordant	995	28.4	9,955	13.8	< 0.0001
	Discordant	2,268	22.0	2,665	20.3	
Facility characteristics						
Main Language of home	English	2,125	22.7	10,854	14.3	< 0.0001
	French	15	14.3	460	11.4	
	Other	1,123	25.7	1,306	25.2	
Rurality of the home	Rural	245	6.9	10,734	4.1	< 0.0001
	Urban	13,589	23.9	74,633	16.3	
Home/facility size (Number of beds)	1–49	*48–52	25.8–27.9	163	7.0	< 0.0001
	50–99	*218–222	15.5–15.7	1,491	9.5	
	100–149	639	23.4	3,044	14.6	
	150+	2,354	24.8	7,922	17.0	
COVID-19 rates (per 100)						< 0.0001
Community level (PHU)	Mean (SD)	1.9	(1.2)	2.1	(1.2)	
Clinical characteristics						
ADL Scale	Independent	*24–28	-	*168–172	-	< 0.0001
	Supervision required	139	22.8	571	11.9	
	Limited impairment	307	24.9	1206	13.3	

Table 1 (continued)

Characteristics		Allophone (*N* = 13,834)		Total (*N* = 85,367)		*p*-value
		COVID-19 diagnosis	Rate per 100*	COVID-19 diagnosis	Rate per 100*	
		#		#		
	Extensive assistance required (I)/(II)	1785	23.8	7440	15.3	
	Dependent/Total dependence	1003	23.1	3230	15.6	
	Missing	*1–5	-	*1–5	-	
CPS Scale	Intact	*190–194	-	*1072–1076	-	< 0.0001
	Borderline intact	235	22.9	1182	14.7	
	Mild impairment	587	25.1	2304	15.4	
	Moderate and Moderate/severe impairment	1615	24.4	6064	15.3	
	Severe/Very severe impairment	631	22.8	1993	14.9	
	Missing	*1–5	-	*1–5	-	
Number of diseases	0	108	21.9	544	13.2	0.0002
	1	347	20.8	1549	13.1	
	2	609	23.8	2347	14.1	
	3	690	24.0	2549	14.8	
	4+	1509	24.2	5631	15.8	

ADL Activities of daily living, *CPS* Cognitive Performance Scale

* Rate: COVID-19 cases per 100 long-term care residents

** Mean COVID-19 rate for the study period

*** Mean of Community/PHU rate during the study period

3 and the list of the main language spoken in allophone homes is shown in Appendix 6.

Other resident characteristics

We used RPDB to obtain patient age, sex, and postal code. Ontario residents with an immigration record in the IRCC database was defined as recent immigrant, otherwise they were categorized as 'long-standing resident' (i.e. born in Canada, immigrants and refugees who arrived in Canada before January 1, 1985). We used the CCRS to describe the health status and functional capacity of residents, including Cognitive Performance Scale (CPS) [33]; Activities of Daily Living (ADL) [34]; Changes in Health, End-Stage Disease, Signs, and Symptoms (CHESS) [34], and prevalence of chronic diseases, using validated case ascertainment algorithms [35, 36] (see Appendix 4, supplementary material). Applying previously validated methods, we captured the rurality and neighbourhood income of an individual's last residence by linking to Statistics Canada census data by postal codes, using the postal code conversion file (PCCF) [37]. This approach allows to examine socioeconomic inequities for the purpose of assessing the health of an area or population.

Other facility characteristics

We also described the facilities in terms of the size of the nursing home (i.e., number of beds), rurality, neighbourhood income quintile, and associated Local Health Integration Network (LHIN), which are regional health authorities in Ontario established to coordinate, integrate and fund health services [38]. The facility COVID rate and the community-level rate during the study period, were estimated using the Public Health Unit (PHU) as the geographic area.

Outcomes

Our primary outcome was a diagnosis of COVID-19, defined as a person having a confirmed positive laboratory Polymerase Chain Reaction (PCR) test reported in the integrated C19INTGR database. LTC home residents are actively screened and tested routinely regardless of symptoms, and tested for COVID-19 using a laboratory-based PCR [39].

Analysis

We estimated the overall incidence rate of COVID-19 during the study period, as well as incidence rates by linguistic group and other individual characteristics. We used the weekly aggregated cases (with Sunday as the week's start date), to describe the evolution of the overall incidence of COVID-19 by linguistic group over the first

11 months of the pandemic. We also compared the incidence rate of the disease considering the language of the resident and the main language of the facility. We used the χ2 test for hypothesis testing of categorical variables and ANOVA test for continuous variables.

We examined the effect of linguistic characteristics (i.e., resident language, main language of the facility and language discordance) on the incidence of COVID-19 using a multilevel logistic regression analysis. This approach was chosen to account for the two-level factors that might be influencing the outcome: individual and facility level variables [21]; and fitting a random effects model with the LTC facility as a random intercept to properly contextualize and assess the facility effect on the incidence, given the ample variability of the characteristics of these facilities across the province. All models were adjusted for resident demographics: age, sex, neighbourhood income level and region of residence before admission to the LTC home, immigrant status, urbanicity, and health characteristics (ADL, CPS, number of chronic conditions) and facility-level characteristics: facility size, the main language spoken at the LTC home, the facility COVID rate and the community-level COVID rate during the study period.

We used SAS 9.3 (SAS Institute, Inc, Cary, NC) for all analyses performed. Statistical tests were two-tailed, and the significance threshold was set at 0.05.

Ethical approval and consent to participate

The use of data in this project was authorized under Sect. 45 of Ontario's Personal Health Information Protection Act, which does not require review by a Research Ethics Board or the need for consent to participate. ICES is a prescribed entity under Sect. 45, and the project was approved by ICES's Privacy and Compliance Office.

Results

There were 85,367 residents from 624 nursing homes included in the cohort, of which 37 were predominantly French homes (5.9%), and 33 had other language as the main language spoken (5.3%). The majority of residents were Anglophone (89.2%); 6.1% were Allophone and 4.7% were Francophone (Table S1 in Supplementary material). The average age was 82.4 years (SD 10.9), with most residents being 65 years of age or older (92.6%). Women made up two-thirds of the cohort (67.9%). 6% of the cohort were recent immigrants. The majority resided in urban areas (86.6%) and lived in the southeastern region of the province (81.5%). Residents' characteristics were similar across linguistic groups (Table S1, Appendix 7, supplementary material).

Incidence of COVID-19

The incidence rate of COVID-19 by linguistic group is presented in Table 1. Overall, 15 out of every 100 residents were diagnosed with COVID-19 over the course of the study period. By linguistic group, Allophones had significantly higher infection rates (23.6%) at the end of the follow-up period compared to Anglophones (13.1%) and Francophones (12.4%) ($p<.0001$). Allophones showed consistently higher rates of COVID-19 over time and at the peak of each wave of the pandemic (Fig. 1).

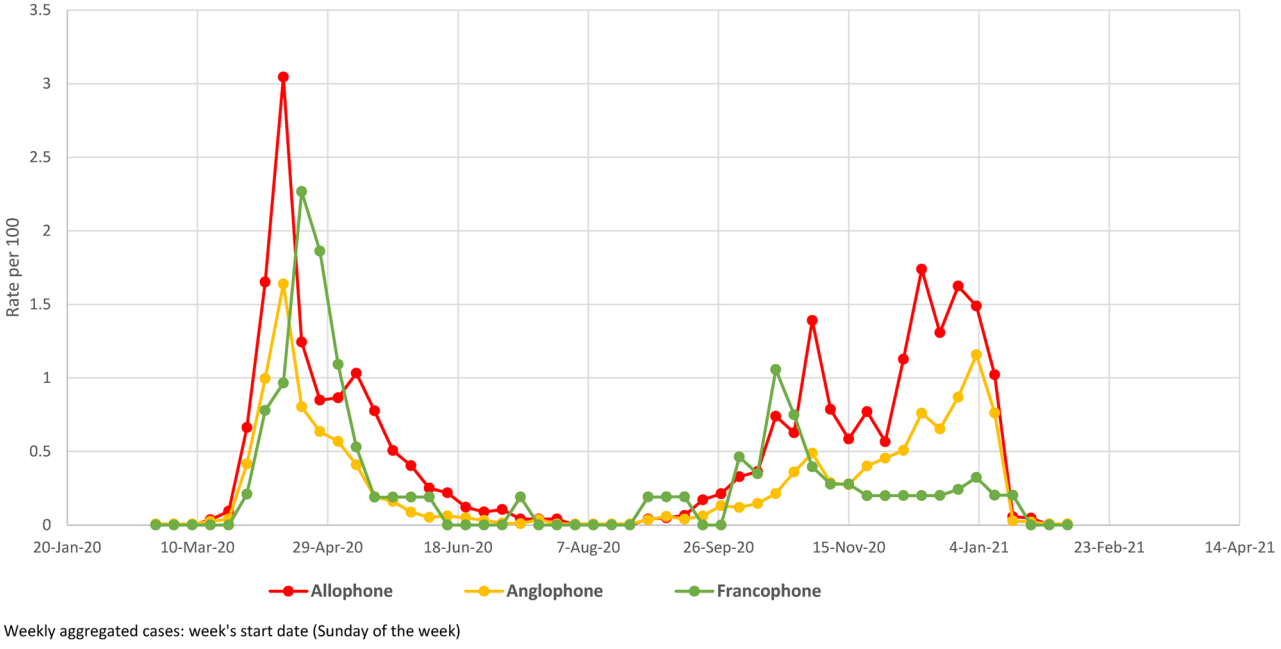


Fig. 1 Trend of COVID-19 infections in nursing homes in Ontario by language group (rate per 100)

Furthermore, residents who had recently immigrated to Canada had higher infection rates (24.7%) than long-standing residents (14.1%) (p<.0001).

In general, COVID-19 infection rates were higher among Allophones across most resident characteristics. However, Francophone recent immigrants had significantly higher rates (30.3%) compared to Anglophone (26.5%) and Allophone (23.7%) recent immigrants (p<.0001). By location, in the eastern region (Champlain), Francophones had the highest rates (21.3% vs. 13% for Anglophones and 14% for Allophones, [p<.0001]), whereas Allophones showed the highest rates in the southwest region of the province (24.6% vs. 10.3% for Francophones and 14.4% for Anglophones, [p<.0001]).

Language discordance and COVID-19

Allophone residents had higher incidence rates of COVID-19 across all types of homes, compared to Anglophone and Francophone residents. Overall, the rates of COVID-19 were highest in homes with a language predominantly different to English or French (25.1 per 100 residents) and in the discordant care (20.3 vs. 13.8 per 100 residents) (p<.0001). The rates were significantly higher for Allophones in English (22.5%) and French homes (22.9%) relative to Anglophones (13.0 and 15.8 per 100 residents) and Francophones (9.2 and 16.2 per 100 residents) in these homes (p<.0001) (Fig. 2). Notably, Anglophones had significantly higher rates in nursing homes with a main language other than English or French (23.5 per 100 residents) relative to the incidence among English-speaking residents in English and French homes (13 and 15.8 per 100 residents, respectively) (p<.0001). However, only Anglophones had higher rates of infection in a linguistic discordant care (28.4 vs. 22.0 per 100 residents) (p<.0001).

Regression analysis

After adjusting for sociodemographic and clinical characteristics (see full model results in Table S2), the risk of COVID-19 infection was significantly higher for Allophones compared to Anglophones (aOR 1.14, 95% CI 1.05–1.22; p = < 0.0008), while the risk of COVID-19 infection was not significantly different when comparing Francophones to Allophones (aOR 1.10, 95% CI

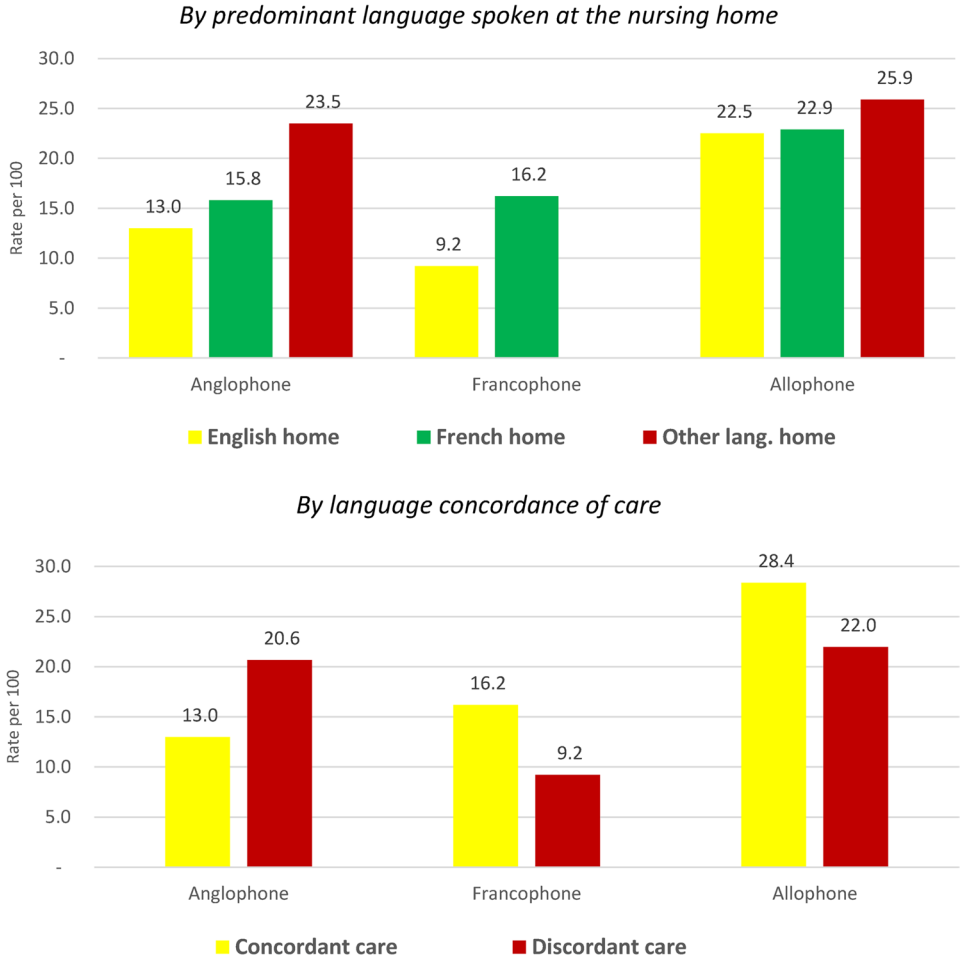


Fig. 2 Frequency of Covid-19 diagnosis by language group according to the main language of the nursing homes and language concordance of care

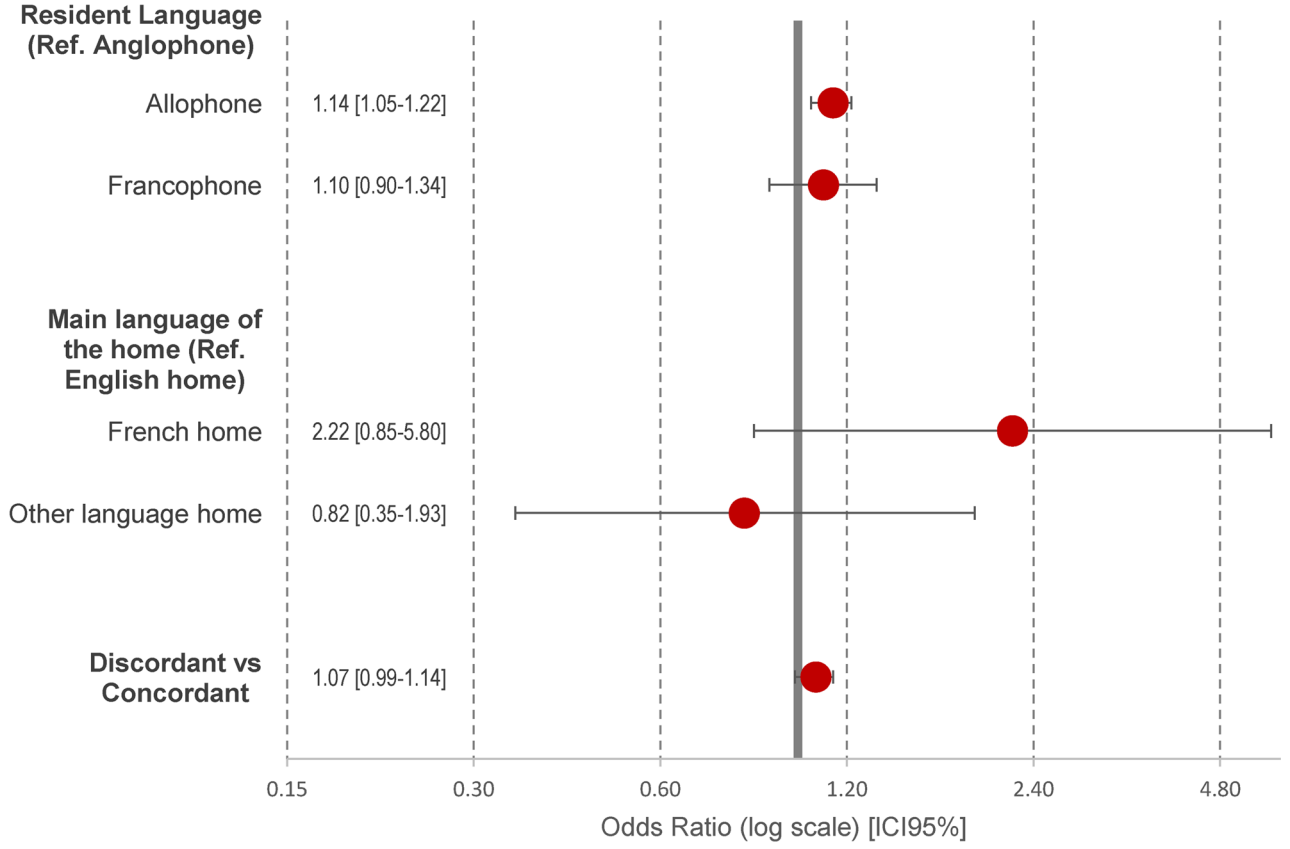


Fig. 3 Adjusted risk of COVID-19 infection by linguistic characteristics among LTC home residents (OR, 95%CI)[*]. [*] Multilevel logistic regression model of effect of patient language on risk of COVID-19, using LTC facility as a random intercept. Adjusted by resident characteristics: age, sex, income level, rurality, region, immigrant status, CPS, ADL CHESS score, # chronic diseases; and facility-level factors: # beds, main language of the home, and COVID rates at the facility and the community-level rate during the study period

0.90–1.34; p = < 0.3621). With regards to facility-level language, we found that the risk of COVID-19 was higher among predominantly French homes (aOR 2.22, 95% CI 0.85–5.80; p = < 0.1031), although this finding was not statistically significant at the 0.05 level. Finally, we found a trend towards statistical significance for higher risk of COVID-19 infection among residents living in language-discordant nursing homes (aOR 1.07, 95% CI 0.99–1.14; p = < 0.0760) (Fig. 3 and Table S2, in Appendix 7, supplementary material).

Discussion

This study examined the evolution of COVID-19 infection rates in the first 11 months of the COVID-19 pandemic among LTC residents in Ontario, Canada. We hypothesized that linguistic discordance between residents and facilities could impact COVID-19 infection rates in nursing homes, with residents from minority language communities potentially at increased risk of infection. Regardless of the language of the residents, the incidence of COVID-19 was higher among immigrants, in larger nursing homes (150 or more beds), and in nursing homes in urban and highly populated regions. The risk of COVID was disproportionally higher in lower socioeconomic areas, which have been shown in previous analyses [40]. We also found that facility factors and the community levels of COVID-19 had a significant effect on the risk of infections. The variation in COVID incidence explained by the LTC facility was evident when accounting for LTC facility characteristics in the regression analysis (Variance partition coefficient dropped from 68% to 61% when adding the facility factors in the model). This indicates that facility characteristics were important in explaining incidence of COVID-19 in this cohort. Moreover, it also reflects the epidemic situation at the community in which the facility is located, which is also consistent with studies in Canada [41, 42] and other countries [43].

Linguistic characteristics and risk of COVID-19

Regarding the impact of linguistic characteristics, three findings are worth highlighting. First, the adjusted risk of COVID-19 was significantly higher for Allophones and non-significantly higher for Francophones compared to Anglophones. Linguistic barriers can limit access and use of healthcare services which, in turn, can contribute

to worse health outcomes in patients with low English proficiency [11]. Recent analyses have shown that patients with language and/or communication barriers and people belonging to ethnic minorities are at higher risk of COVID-19 [44, 45]. Also, the larger proportion of recent immigrants among Allophones, adds another layer of vulnerability to this group. Research shows that immigrants face important disparities in health and healthcare [46]. A recent report found that although immigrants and refugees represented 25% of the Ontario population, they accounted for 43.5% of all COVID-19 cases in the province [47]. Moreover, higher rates of comorbidities among Allophones makes them further susceptible to developing infection as well as complications of infection (which are more likely to trigger testing and thus be detected). This is consistent with numerous studies showing higher risk of COVID-19 and worse outcomes in patients with physical and cognitive impairment, and comorbidities [48–50].

Second, the results didn't sustain the hypothesis of higher risk of COVID-19 in homes with a predominant language different to English or French, as the risk of infection seems to be influenced by the community levels of COVID-19 incidence and other facility characteristics. Although, we were unable to access data on the ownership status for this study, research suggests that for-profit nursing homes tend to deliver inferior quality of care across a variety of outcome and process measures [51, 52]. Recent analyses have shown that for-profit status [9], and nursing homes with more crowding conditions [53] are associated with COVID-19 outbreaks, which indicate higher risk of transmission in these facilities. Other language homes in our study are mostly related to so called 'ethnic or culturally-sensitive' nursing homes in Ontario that are usually non-for profit and smaller in size [54, 55], which should put them at lower risk. However, the pandemic situation might have confronted them with difficult conditions that leave these facilities in the opposite situation. First, they are mainly located in large metropolitan areas in the southeast of the province, where most of the immigrant population has settled and where the COVID-19 rates were highest. Also, structural and organizational facility-level factors (e.g. distinct administrative features, staffing practices, infection control measures, or resource availability), which were not accounted for in this study, may have influenced the differences in the infection rates. For example, financial restrictions to ensure timely acquisition of protective equipment and medical supplies, insufficient staff, long working hours, staff working in multiple facilities [3, 56]. Other facility-specific factors such as staff involvement (e.g., less monitoring, depth of history taking or physical examinations), personal and family preferences when it comes to goals of care, could also influence health outcomes, including risk of new infections. However, the lack of data about these facility characteristics prevented us from examining those relationships.

Thirdly, contrary to our hypothesis, we were only able to demonstrate a small non-statistically significant increase in risk of COVID-19 infection among residents living in language-discordant nursing homes. The weak relationship between resident-facility language discordance and risk of COVID-19 infection might be explained by the relatively small sample of non-English nursing homes. This may also be related to the demographic regional differences and the variations in the public health response to the COVID-19 across the province. Despite the null findings regarding resident-facility language discordance, we think it is plausible that language barriers do in fact play a role in the quality and safety of care delivered within nursing homes, albeit this may be confounded by socioeconomic factors, and the magnitude of the effect may be attenuated when adjusting for such factors in multivariable regression models.

Addition to current evidence and policy implications

These findings are consistent with other studies which found higher risk of COVID infection and complications among the general population (i.e., not explicitly considering residents of nursing homes) [44, 57]. One factor which could influence the risk of COVID-19 infection is the lack of timely information about COVID-19 in languages other than English. Delays in COVID-19 related communications in languages other than English by the Ontario government [58, 59] may have affected timely implementation of infection control measures among minority linguistic communities. Similarly, known barriers to access health information and services faced by immigrants in Canada [60, 61] could also have negatively influenced timely access to relevant information about the disease for Allophones. Nevertheless, our findings do not demonstrate any causal relationship between language characteristics and the incidence of COVID-19. Patient-provider language discordance can be an important factor influencing health care and outcomes [15, 62]. However, it shows that linguistic characteristics can be closely related with other socio-cultural characteristics (e.g. race, ethnicity, education), which were not controlled for in this study, and could be an important factor influencing access and receiving health care services. As many Francophones in Ontario can also speak English and therefore, they might not be affected by receiving care in a predominantly non-French context. Hence, linguistically discordant care would have more severely impacted Allophones, as it is a heterogeneous group that includes individuals from a wide range of linguistic and cultural backgrounds, who might be exposed to a different experiences and challenges, facing barriers based on

their cultural practices, familiarity with health systems, or ability to navigate the system in another language due to lower rates of bilingualism [63].

Therefore, health care authorities implementing LTC services should take into consideration these findings to renew policies and strategies in order to address the language barriers, which can be further aggravated in a pandemic context.

Limitations

These results must be interpreted in the context of the evolving changes in the testing strategy over time in Ontario. Thus, like other sources of data rapidly collected during the pandemic [64], the SARS-CoV-2 infection status in LTC facilities are also subject to misclassification due to the lack of testing capacity or timeliness in the reporting during the first waves of the epidemic. However, as many analyses have shown, the C19INTGR data has being a valid source of COVID-19 infections since the beginning of the pandemic [65]. Thus, we are confident that the findings properly reflect the situation of the epidemic during the timeframe covered by the study. We included the community level of COVID-19 where the home is located as confounder in the modelling analysis, and it showed that it is an independent factor determining the incidence of the infection, so we think that regression analyses are robust when including this factor in the study and we're also confident that we accounted for the regional differences in PHU epidemic situation, and the control and management strategies.

The resident language was obtained from RAI-HC assessments, during which interviewers record residents' preferred language for day-to-day communication. Interviewers are not provided with objective criteria to determine residents' preferred language; by listening, observing, and reviewing clinical records, which might introduce variability across interviewers [66]. Thus, there is a risk of misclassification of the resident language. However, we have performed agreement analyses of the language variable in the RAI-HC database with the with language spoken at home, measured by the Canadian Community Health Survey which resulted in a high level of agreement ($\kappa = 0.75$) [67]. In the absence of data on the language spoken by the staff to determine the main language of service in nursing homes, which play a critical role of an effective communication between residents and caregivers for infection prevention and patients care, we used the most frequent language spoken by residents as a proxy for the predominant language of the home and the language discordance. The rationale for using this approach is that patients and family members seek admission to nursing homes where they can receive care in the language of their preference, therefore many of the staff (e.g. nurses, physicians, support staff) would speak that language. Thus, the interpretation of our analyses assumes that LTC facilities with a high proportion of residents who speak a given language are also staffed by healthcare providers who speak that same language. Moreover, this measure is consistent with provincial norms to provide services in the official languages, such as the Ontario Government French designation of public services, which ensure the provision of health services in French [25]. The comparison of the two classification methods shows a high correlation of the proportion of official language groups (i.e. the proportion of Francophones is higher in Designated homes and the proportion of Anglophones is higher in non-Designated) and has been used in previous studies (Appendix 5 in suppl material) [28]. Furthermore, considering that staff members in nursing homes are often part of ethno-linguistic minorities, which could influence the actual level of "language discordance", we used a list of closely related and mutually intelligible languages to create the language discordance/discordance context for each individual in the cohort. Even though some residents classified as Allophones could speak some English or French, or get interpretation help from friends and family members, their ability for understanding can be limited or suboptimal [68]. Thus, interpretation of our findings should take these elements into consideration. Finally, other factors that could influence the incidence of the disease were not considered in this study, such as the ownership status, due to the lack of up-to-update data. Therefore, future analyses need to be carried out to explore its influence on the relationship between language factors and the risk of COVID-19 in these healthcare settings.

Conclusions

This study showed differences in the incidence of COVID-19 by linguistic groups among LTC residents in Ontario and confirmed that some facility and community characteristics are important factors in the risk of infection. Although the effect of linguistic discordance was not significant, these findings add to the body of evidence demonstrating that the COVID-19 pandemic disproportionately affected ethnolinguistic minorities, and it highlights the unique impact that language barriers may have had on health outcomes experienced by patients receiving LTC living in minority linguistic communities in Ontario during the pandemic. As this health care setting was the most hardly impacted by the pandemic, government and public health officials should recognize the importance of incorporating linguistic factors and variables into their strategies for addressing the needs of vulnerable populations during a pandemic, such as non-Anglophone speakers or interpretation services in nursing homes.

Thus, these findings may help inform public health interventions aimed at addressing the language barriers in long-term care homes in Ontario, but it might also have implications for improving culturally appropriate LTC care across Canada. However, additional research is needed to better understand why Allophone residents are experiencing higher rates of COVID-19 across all subgroups, and whether this is due to other individual- or home-level characteristics, or both.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-026-28468-w.

Supplementary Material 1.

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This study was supported and conducted using data housed at ICES. ICES collects information most notably for the purposes of Sect. 45 of Ontario's Personal Health Information Protection Act (PHIPA). Parts of this material are based on data and/or information compiled and provided by the Ontario Ministry of Health. The analyses, conclusions, opinions, and statements expressed herein are solely those of the authors and do not reflect those of the funding or data sources; no endorsement is intended or should be inferred. Parts or whole of this material are based on data and/or information compiled and provided by Immigration, Refugees and Citizenship Canada (IRCC), current to May 31, 2017. However, the analyses, conclusions, opinions, and statements expressed in the material are those of the author(s), and not necessarily those of IRCC. Parts of this material are based on data and/or information compiled and provided by the Canadian Institute of Health Information (CIHI). However, the analyses, conclusions, opinions, and statements expressed in the material are those of the author(s), and not necessarily those of CIHI.

Data sharing statement

The data set from this study is held securely in coded form at ICES. ICES collects information most notably for the purposes of section 45 of Ontario's Personal Health Information Protection Act (PHIPA). This document used data adapted from the Statistics Canada Postal CodeOM Conversion File, which is based on data licensed from Canada Post Corporation, and/or data adapted from the Ontario Ministry of Health Postal Code Conversion File, which contains data copied under license from ©Canada Post Corporation and Statistics Canada. While data sharing agreements prohibit ICES from making the data set publicly available, access may be granted to those who meet pre-specified criteria for confidential access, available at https://can01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.ices.on.ca%2FDAS&data=05%7C02%7Crbatista%40ohri.ca%7Cbf03b451aa27497acd7608dc6dc0a630%7C859b41b6130f4d13a6931ffec4e7cb5a%7C0%7C0%7C638505921434027849%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=ALL%2FrsKX%2FEFqHm5ICNzcVA6pae4SEFo6RXebUVZbWU8%3D&reserved=0.

Authors' contributions

Ricardo Batista, Denis Prud'homme and Peter Tanuseputro conceived the original idea. Ricardo Batista and Michael Fitzgerald performed a background literature review. Ricardo Batista, Michael Reaume, Roshanak Mahdavi, Lise M. Bjerre, Claire E. Kendall, Alain P. Gauthier, and Peter Tanuseputro designed the study and interpreted the results. Roshanak Mahdavi and Haris Imsirovic performed the statistical analyses. Ricardo Batista, Alain P. Gauthier, Marie-Helene Chomienne, Josette-Renée Landry, Louise Bouchard, Douglas G. Manuel and Amy Hsu reviewed and verified the results of the analyses. Ricardo Batista and Michael Fitzgerald drafted the manuscript, and all authors provided critical feedback to the final manuscript. All authors gave final approval of the version to be published and agreed to be accountable for all aspects of the work.

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Data availability

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Declarations

Ethics approval and consent to participate

ICES is a prescribed entity under Ontario's Personal Health Information Protection Act (PHIPA). Section 45 of PHIPA authorizes ICES to collect personal health information, without consent, for the purpose of analysis or compiling statistical information with respect to the management of, evaluation or monitoring of, the allocation of resources to or planning for all or part of the health system. Projects that use data collected by ICES under section 45 of PHIPA, and use no other data, are exempt from REB review. The use of the data in this project is authorized under section 45 and approved by ICES' Privacy and Legal Office.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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