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# A national cohort study of community belonging and its influence on premature mortality

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## ABSTRACT

**Background** Community belonging, an important constituent of subjective well-being, is an important target for improving population health. Ageing involves transitioning across different social conditions thus, community belonging on health may vary across the life course. Using a nationally representative cohort, this study estimates the life stage-specific impact of community belonging on premature mortality.

**Methods** Six cycles of the Canadian Community Health Survey (2000–2012) were combined and linked to the Canadian Vital Statistics Database (2000–2017). Respondents were followed for up to 5 years. Multivariable-adjusted modified Poisson regression models were used to estimate the relative risk of premature mortality for three life stages: early adulthood (18–35 years), middle adulthood (36–55 years) and late adulthood (56–70 years).

**Results** The final analytical sample included 477 100 respondents. Most reported a ‘somewhat strong’ sense of belonging (45.9%). Compared with their ‘somewhat strong’ counterparts, young adults reporting a ‘somewhat weak’ sense of belonging exhibited an increased relative risk (RR) of 1.76 (95% CI 1.27 to 2.43) for premature mortality, whereas middle-aged adults reporting the same exhibited a decreased RR of 0.82 (95% CI 0.69, 0.98). Among older adults, groups reporting a ‘very strong’ (RR 1.10, 95% CI 1.01, 1.21) or a ‘very weak’ sense (RR 1.14, 95% CI 1.01, 1.28) of belonging exhibited higher RRs for premature mortality.

**Conclusion** The results demonstrate how community belonging relates to premature mortality differs across age groups underscoring the importance of considering life stage-specific perspectives when researching and developing approaches to strengthen belonging.

## INTRODUCTION

Social relationships have been shown to influence overall well-being and life satisfaction.<sup>1–4</sup> Community belonging, in particular, describes the sense of connection and identity people share within a group or community.<sup>5</sup> Several indicators related to social cohesion are associated with increased levels of physical activity,<sup>4</sup> increased use of preventive health services<sup>6</sup> and reduced risks for poor health and mortality.<sup>7–9</sup>

Supporting a strong sense of community belonging and related social infrastructure is thus a promising upstream target for government policies and health systems to improve population well-being. However, there is limited insight into how the influence of community belonging on health

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Sense of belonging is recognised as an important determinant of health, particularly for older adults.
- ⇒ There is a paucity of longitudinal studies examining the varying influence of community belonging on future population health outcomes across different age groups.

## WHAT THIS STUDY ADDS

- ⇒ Using a large nationally representative linked cohort, this study suggests that the influence of community belonging on the risk of premature death (before the age of 75) differs across the life stages.
- ⇒ Generally, young adults with weaker levels of community belonging exhibited an increased risk of premature mortality. However, compared with their counterparts reporting a ‘somewhat strong’ sense of belonging, middle-aged adults reporting a sense of belonging one level weaker were at decreased risk, and older adults reporting one level stronger were at increased risk.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Developing effective policies and programmatic interventions, including social prescribing, to improve sense of community belonging requires consideration of life-stage-specific evidence.

may vary across the life course. Previous cross-sectional work has demonstrated life stage-specific variations in the level of community belonging and the strength of its association with population health outcomes, such as self-rated health,<sup>10 11</sup> but a lack of cohort studies that consider life stage remains a gap.<sup>12</sup> This is an important consideration given that people transition into and out of milestone social roles throughout their lives, during which the importance of community and how this specific need for belonging is met may vary. This study focuses on premature mortality, which has not been studied in relation to community belonging and is a particularly relevant population health outcome because such deaths are considered avoidable and reducible through treatment and preventative policy interventions.<sup>13–15</sup>

This study aims to fill the gap in the literature and to estimate the baseline influence of community



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belonging on premature mortality in the future across three life stages: early, middle and late adulthood.

## METHODS

### Data sources

A cohort of Canadian Community Health Survey (CCHS) respondents that participated between 2000 and 2012 and consented to administrative health database linkage was linked to the Canadian Vital Statistics Death Database (CVSD) by Statistics Canada.

The CCHS is a repeated cross-sectional survey that gathers data about the distribution of health determinants, service use and outcomes. It is representative of 98% of the Canadian population aged 12 years or older living in private dwellings. CCHS data quality is routinely validated and evaluated to minimise non-sampling error. Detailed survey methodology is available elsewhere.<sup>16</sup>

The CVSD is a national administrative dataset that collects death information annually from all provincial and territorial vital statistics registries.<sup>17</sup> Cause-of-death information is coded using the version of the International Classification of Diseases in effect at the time of death.<sup>18</sup> All death events that occurred in Canada between 1 January 2000 and 31 December 2017 were eligible for linkage. Quality assurance is conducted annually on the CVSD to ascertain the completeness and quality of the data. All data were accessed and analysed in a Statistics Canada Research Data Centre at the University of Toronto (<https://www.statcan.gc.ca/en/microdata/data-centres>).

### Measures

The exposure is community belonging measured in the CCHS. The CCHS includes a single-item measure that asks respondents to describe their sense of belonging to their local community using a four-point Likert scale: very strong, somewhat strong, somewhat weak and very weak. This single question has been shown to be positively associated with various forms of social capital, parsimoniously capturing multiple aspects of neighbourhood-level social relations.<sup>5 19–22</sup>

Information on premature deaths was captured using the CVSD. The Canadian Institute of Health Information defines premature mortality using an age cut-off of 75 years, consistent with other nations.<sup>23–25</sup> A fixed follow-up time interval of 5 years following the baseline survey was applied, such that 70 years was the maximum age at baseline and only premature deaths occurring within 5 years were included.

Other covariates: Age was derived from the CVSD and used to define three age groups for life stage-specific estimates: 18–35 years, 36–55 years and 56–70 years. Within each life stage-stratified regression model, we included a continuous age variable. All other covariates were derived from the CCHS: sex, survey cycle, household income quintile, urban/rural designation, immigrant status, ethnicity, smoking, alcohol consumption, physical activity, body mass index (BMI), cancer, chronic obstructive pulmonary disease (COPD)/emphysema, diabetes and heart disease. Covariate selection was informed by the behavioural ecological model and McMillan and Chavis sense of community theory<sup>26–28</sup>; moreover, these variables were found to be meaningful confounders in previous studies.<sup>10</sup>

### Statistical analyses

The cohort's baseline characteristics were described using weighted means, standard deviations, and proportions, which were calculated for the overall sample as well as according to

community belonging. All reported cell counts are unweighted and rounded to the nearest 100 in accordance with Statistics Canada data privacy restrictions.

Regression models were stratified by life stage to estimate the relative risk of premature mortality associated with the sense of community belonging. For transparency, we showed multiple models that sequentially demonstrate the different adjustments. Unadjusted (model 1), sociodemographic-adjusted (model 2) and sociodemographic plus health-behaviour-adjusted (model 3) regressions were run to examine the impacts of confounder adjustment. Model 2 included age, sex, survey cycle, household income quintile, urban/rural designation, immigrant status and racialisation. Model 3 adjusted for all measures included in model 2, as well as smoking behaviour, alcohol consumption, physical activity and BMI. For the older two life stages (36–55 and 56–70 years), model 3 further adjusted for four comorbidity measures: cancer, COPD/emphysema, diabetes and heart disease. Consistent with previous studies using the linked data, pooled survey weights were applied to all analyses to account for the complex survey design of the CCHS such that all estimates represent the Canadian adult population aged between 18 and 70 years.<sup>29</sup>

### Missing data and sensitivity analyses

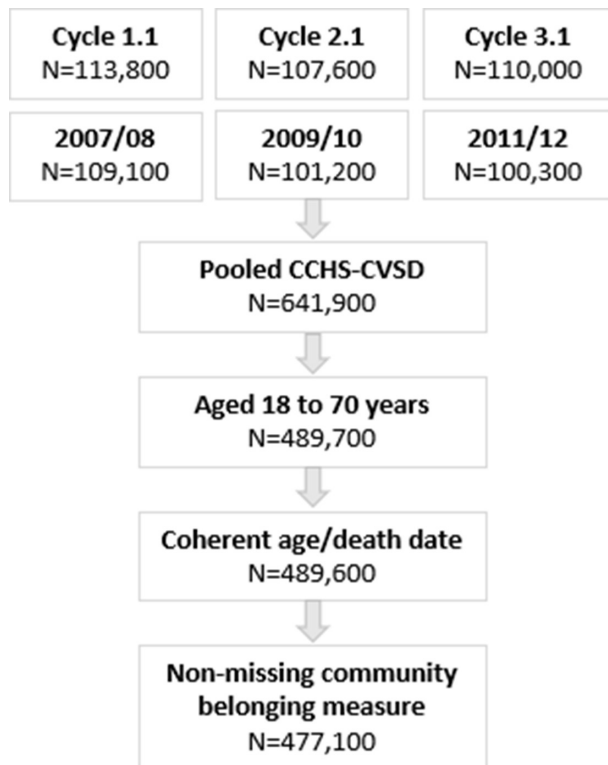
Multiple imputation methods were used to account for missing data. Five imputation iterations were pooled to address the randomness from the estimation procedure.<sup>30</sup> Only household income had >5% missingness (8.7% missing). We also conducted additional sensitivity analyses to limit the potential influence of baseline disease that may impact reports of community belonging. To test this, we estimated lagged models that excluded observations of premature deaths occurring within the first year following the baseline survey. Finally, to account for the influence of poor mental or general health, we estimated fully adjusted models with an additional adjustment for (1) a diagnosed mood or anxiety disorder, (2) self-rated mental health or (3) self-rated general health. Lastly, we carried out a sensitivity analysis to quantify the extent of unmeasured confounding by estimating the E-value for unmeasured confounding.<sup>31 32</sup>

## RESULTS

### Cohort characteristics

After pooling six cycles of the CCHS (2000–2012), we restricted our sample to respondents aged between 18 and 70 years at baseline, removed observations with incoherent age or death dates, and removed observations missing a community belonging value to arrive at a final sample size of 477 100 (figure 1).

The average age of the cohort was 42.3 years, and the largest proportion of respondents (45.9%) reported a somewhat strong sense of community belonging (15.5% reported a very strong sense, 28.2% a somewhat weak sense and 10.4% a very weak sense). Compared with this majority 'somewhat strong' group, those reporting a very weak sense of belonging were more likely to die prematurely (2.2% vs 1.4%), live in an urban region (84.5% vs 81.5%), be a newcomer or immigrant (24.7% vs 21.4%), identify as non-white (18.8% vs 16.0%), be in the lowest household income quintile (18.0% vs 12.1%), currently smoke (33.3% vs 23.3%), be a non-drinker (20.2% vs 16.3%), be physically inactive (60.1% vs 46.3%) and have any one of the four comorbidities indicated (table 1).



**Figure 1** Flow chart of study participants from combined Canadian Community Health Care cycles (2000–2012) linked to the Canadian Vital Statistics Database (2000–2017).

### Association between community belonging and premature mortality

Unadjusted (model 1) and sociodemographic-adjusted (model 2) relative risk estimates for the association between community belonging and premature mortality suggested that a very weak sense of community belonging was associated with an increased risk for premature mortality across all life stages (table 2).

Adjusting for health measures (model 3) revealed differential trends between each age group. Among the youngest age group (18–35 years), compared with their counterparts reporting a somewhat strong sense of belonging, those reporting a somewhat weak sense exhibited 1.76 times the relative risk for premature mortality (95% CI 1.27 to 2.43). Those reporting a very weak sense exhibited 1.53 times the relative risk, though, with full adjustment, the estimate became marginally statistically insignificant (95% CI 0.99 to 2.38).

Among middle-aged adults (36–55 years), compared with those reporting a somewhat strong sense, those reporting a somewhat weak sense exhibited 0.82 times the risk of premature mortality (95% CI 0.69 to 0.98). Those reporting a very weak sense exhibited 1.34 times the relative risk, though as with the young adults, this estimate also became marginally statistically insignificant with full adjustment (95% CI 0.96 to 1.87).

For the oldest 56–70 years group, both the ‘very strong’ and ‘very weak’ groups exhibited an increased risk of premature mortality compared with the ‘somewhat strong’ group. Those reporting a very strong sense had 1.10 times the relative risk of premature mortality (95% CI 1.01 to 1.21), and those reporting a very weak sense had 1.14 times the relative risk (95% CI 1.01 to 1.28).

### Sensitivity analyses

Estimates remained consistent when missing income observations were included as a separate category (online supplemental table 1). Excluding participants who had a premature death within the first year following the survey (online supplemental table 2) or additionally adjusting for baseline mental or general health (online supplemental table 3) did not result in any conceptual differences for the two younger life stages whereas for the 56–70 group, some estimates became marginally statistically insignificant. The sensitivity results from the E-value calculation demonstrate that the results were most robust for the 18–35 group such that an unmeasured confounder would need to have a stronger association with the exposure and outcome in this age group to negate the observed association. The null and weaker findings in the older age groups would be affected by unmeasured confounders of more moderate strength (online supplemental table 4).

## DISCUSSION

### Main findings

Using a large nationally representative cohort and after accounting for several important confounders, we found that a very weak sense of community belonging increased the risk of premature death. The large sample size and complete linkage allow a detailed study of the influence of community belonging by life stage. This study uses nationally representative survey data from over 475 000 individuals linked to a complete vital statistics database, making it the largest such study. Furthermore, this focus on premature mortality as the outcome, which has not been studied in relation to community belonging, is particularly relevant for public health because such deaths are considered avoidable and reducible through preventative interventions, policy and addressing the social determinants of health. Our results did not point to a graded relationship wherein progressively weaker levels of belonging further increase the risk of premature mortality, especially among the older two age groups.

Although there are fewer studies specifically examining the impact of premature mortality, our results agree with published literature showing low sense of community belonging is associated with an increased risk in all-cause mortality<sup>33 34</sup> and the differential findings among older ages.<sup>12 35</sup> The findings also support the recent focus on social prescribing, which emphasises that mechanisms to increase connections and belonging have a role in the clinical setting to improve outcomes.<sup>36</sup> There are several reasons for the observed variability across age groups. Community belonging could impact health via both behavioural and psychobiological factors. For instance, a tightly knit community network could improve access to relevant health services via increased knowledge exchange (eg, learning about local vaccination programmes or where to purchase affordable fresh produce) and via social support (eg, sharing transportation to appointments), social conformity norms could encourage positive and deter negative health behaviours (eg, quitting smoking), and improved interpersonal psychological support could reduce inflammatory stress responses related to loneliness.<sup>37–39</sup> For example, in the case of a person dealing with cancer, a strong community network can provide additional encouragement to seek healthcare early, and a neighbourhood walking group can support the maintenance of physical activity levels.

However, not all social networks are created equal in terms of benefits conferred. Research has shown that the compositional characteristics of a social network (such as its diversity, size or degree of intimacy), can offer differential benefits in

**Table 1** Baseline characteristics\* of pooled adult participants surveyed between 2000 and 2012 and followed for up to 5 years (N=477 100)

	Overall (N=477 100) Mean (SD)*	Sense of community belonging			
		Very strong (n=85 100)	Somewhat strong (n=225 600)	Somewhat weak (n=122 300)	Very weak (n=44 100)
Age	42.3 (14.2)	45.8 (13.3)	42.5 (13.9)	40.6 (14.7)	41.2 (15.3)
	%				
Premature mortality (within 5 years of baseline survey)					
Yes	1.6	1.9	1.4	1.3	2.2
No	98.5	98.1	98.6	98.7	97.8
Life stage					
18–35	35.0	25.5	33.9	40.2	39.8
36–55	43.7	45.3	44.7	42.3	40.2
56–70	21.4	29.2	21.4	17.5	20.1
Sex					
Male	49.4	49.1	49.0	49.8	49.4
Female	50.6	50.9	51.0	50.2	50.6
Rural/urban					
Rural	18.1	23.3	18.5	15.7	15.5
Urban	81.9	76.7	81.5	84.3	84.5
Newcomer					
Newcomer (≤5 years)	3.8	3.4	3.5	3.7	5.6
Immigrant (>5 years)	18.0	19.6	17.9	16.8	19.1
Canadian-born	78.2	77.0	78.6	79.4	75.3
Racialisation					
Racialised	16.3	16.7	16.0	15.8	18.8
White	83.7	83.3	84.1	84.2	81.2
Household income					
Q1 (Lowest)	13.1	13.1	12.1	12.9	18.0
Q2	14.4	14.3	14.3	13.9	16.1
Q3	19.9	20.1	19.8	19.6	20.8
Q4	26.2	25.7	26.5	26.6	24.6
Q5 (Highest)	26.5	26.8	27.4	27.0	20.5
Smoking status					
Current	25.1	22.4	23.3	26.5	33.3
Former	24.3	25.8	24.3	23.9	22.9
Never	50.6	51.8	52.3	49.6	43.9
Alcohol consumption					
Non-drinker	16.8	20.6	16.3	14.4	20.2
Occasional	16.6	16.2	16.1	16.7	18.7
Regular	27.2	28.9	27.8	26.7	23.3
Regular and binge	39.5	34.3	39.8	42.3	37.8
Physical activity†					
Active	25.5	29.3	27.2	22.8	19.0
Moderate	25.4	26.3	26.5	24.8	20.9
Inactive	49.2	44.4	46.3	52.4	60.1
Body mass index (kg/m <sup>2</sup> )					
Severely obese (≥40)	1.5	1.6	1.3	1.5	2.0
Very obese (35–39.9)	3.3	3.6	3.2	3.3	3.7
Mod obese (30–34.9)	12.3	13.7	12.1	11.7	12.2
Overweight (25–29.9)	33.5	35.5	34.1	32.2	31.1
Normal (18.5–24.9)	46.9	43.3	46.9	48.6	47.4
Underweight (<18.5)	2.6	2.2	2.4	2.8	3.6
Chronic obstructive pulmonary disease/emphysema					
Yes	1.4	1.6	1.2	1.3	2.2
No	98.6	98.4	98.9	98.7	97.8
Cancer					
Yes	1.4	1.8	1.4	1.2	1.6
No	98.6	98.3	98.6	98.8	98.4

Continued



Table 1 Continued

	Overall (N=477 100) Mean (SD)*	Sense of community belonging			
		Very strong (n=85 100)	Somewhat strong (n=2 25 600)	Somewhat weak (n=1 22 300)	Very weak (n=44 100)
Diabetes					
Yes	4.7	5.6	4.6	4.1	5.1
No	95.4	94.4	95.5	95.9	94.9
Heart disease					
Yes	3.4	4.2	3.2	3.1	4.3
No	96.6	95.8	96.8	96.9	95.7

Source: Canadian Community Health Survey (2000–2012), Canadian Vital Statistics Database (2000–2017).  
 \*Estimates are weighted to produce population estimates using pooled sampling weights provided by Statistics Canada.  
 †Physical activity levels were categorised based on total daily energy expenditure values (calculated by multiplying the frequency and duration of each reported physical activity by its metabolic equivalent value). Physically active was defined as  $\geq 3.0$  kcal/kg/day or more, moderately active as 1.5–2.9 and inactive as  $\leq 1.5$ .

terms of type and magnitude.<sup>3 40 41</sup> For instance, Legh-Jones and Moore<sup>42</sup> distinguished the social networks of Canadian adults across three features: reach, range and diversity, and examined how these features were differentially associated with physical activity levels. They found that participants with a more diverse network were less likely to be physically inactive, whereas neither reach nor range components were found to be influential.<sup>42</sup> Similarly, Li and Zhang<sup>41</sup> found that network diversity was associated with the most positive health indicators and that friend-focused networks yielded more benefits in terms of physical health outcomes, but the same was not true for psychological health outcomes.<sup>41</sup>

Some evidence further suggests that in addition to the magnitude of the effect, network compositions can influence the direction of impact. In other words, some network features have been shown to be associated with negative health outcomes. In their study of European older adults, Litwin and Stoeckel<sup>43</sup> defined six social networks according to their size and inclusion of proximal or distal family members, friends or other social contacts.<sup>43</sup> Of the six network types, one was negatively associated with

well-being and characterised as being larger than average, having below-average contact frequency, and mostly consisting of people living geographically close, neither friends nor family. Regarding our results, perhaps the relevance of certain network compositions to evaluations of community belonging changes as we age. For instance, having a geographically close but intimately distant network may contribute to a strong sense of community belonging in old adulthood but not in early adulthood. Additionally, given that social identities and health status do not remain static throughout life, how certain compositions impact health may also change as we age.<sup>44</sup> However, there is limited insight into this complex dynamic, seeing as the majority of relevant studies only examine one point in time.<sup>29 30 32</sup> Additionally, it has been proposed that in addition to positive benefits, there are some potentially negative aspects to community belonging, which possibly promote negative health outcomes. This can occur by restricting freedom due to excessive informal control, possible exclusion of out-group members, straining group members by expectations, supporting certain risky behaviours and ‘downlevelling’ norms so that individuals trying to break

Table 2 Unadjusted and multivariable-adjusted relative risk estimates\* and 95% CIs for premature mortality within 5 years of follow-up per level of community belonging (N=477 100)

	Model 1: unadjusted	Model 2: sociodemographic adjustments†	Model 3: sociodemographic and health adjustments‡
18–35 years (n=1 51 000)			
Very strong	1.20 (0.75 to 1.94)	1.19 (0.73 to 1.91)	1.17 (0.73 to 1.88)
Somewhat strong	Ref.	Ref.	Ref.
Somewhat weak	<b>1.87 (1.35 to 2.58)</b>	<b>1.80 (1.31 to 2.49)</b>	<b>1.76 (1.27 to 2.43)</b>
Very weak	<b>1.89 (1.22 to 2.90)</b>	<b>1.71 (1.10 to 2.64)</b>	1.53 (0.99 to 2.38)
36–55 years (n=1 91 000)			
Very strong	1.00 (0.81 to 1.22)	0.93 (0.76 to 1.15)	0.92 (0.75 to 1.13)
Somewhat strong	Ref.	Ref.	Ref.
Somewhat weak	0.88 (0.74 to 1.05)	0.86 (0.72 to 1.03)	<b>0.82 (0.69 to 0.98)</b>
Very weak	<b>1.90 (1.37 to 2.65)</b>	<b>1.58 (1.13 to 2.20)</b>	1.34 (0.96 to 1.87)
56–70 years (n=1 35 100)			
Very strong	<b>1.14 (1.04 to 1.26)</b>	<b>1.10 (1.00 to 1.21)</b>	<b>1.10 (1.01 to 1.21)</b>
Somewhat strong	Ref.	Ref.	Ref.
Somewhat weak	1.09 (0.99 to 1.21)	1.07 (0.97 to 1.18)	0.99 (0.90 to 1.10)
Very weak	<b>1.55 (1.38 to 1.74)</b>	<b>1.43 (1.27 to 1.61)</b>	<b>1.14 (1.01 to 1.28)</b>

Source: Canadian Community Health Survey (2000–2012), Canadian Vital Statistics Database (2000–2017).

\*Estimates are weighted to produce population estimates using pooled sampling weights provided by Statistics Canada.

†Model 2 adjustments include age, sex, survey cycle, urban/rural designation, household income quintile, racialisation and immigrant status.

‡Model 3 adjustments include all model two covariates plus smoking behaviour, alcohol consumption, physical activity and body mass index. Models for the older two age groups (36–55 years and 56–70 years) additionally adjust for diagnosis of chronic obstructive pulmonary disease/emphysema, cancer, diabetes or heart disease.

free from negative actions are penalised.<sup>45 46</sup> As an illustrative example of community belonging's dualistic nature on health outcomes, close neighbours can be a source of emotional and social support for one another. Yet, if the exchange of support occurs in contexts where there is smoking and/or excessive unhealthy food and alcohol intake, the impact of community belonging on health outcomes may be both positive and negative. These theoretical perspectives might help explain why a strong sense of community belonging was associated with an elevated risk of mortality in some age groups.

The effect of community belonging on premature mortality is likely modified by the complex interplay of different social roles with physical and psychological changes. In this way, network types that confer weaker or even negative impacts on well-being, and how relevant these are to evaluations of community belonging may be associated with specific life stages or roles, which could explain why we did not observe a consistent dose-response across the age groups. Additionally, survival bias may be contributing to these seemingly contradictory findings in older age, as well as the different causes of death. The most common causes of death differ across each life stage, and the positive effects of a strong sense of community belonging may be more potent for some causes than others. Notably, the largest magnitudes of effects were observed among the youngest age group, whose most common causes of death were considerably different from that of the older two life stages (ie, intentional self-harm and accidental poisoning compared with lung cancer and myocardial infarction). The mechanisms through which community belonging improves health are likely particularly important to mental health, which stresses the importance of strengthening community connections within the context of a growing mental health burden.

### Limitations

There are limitations that are important to consider. First, the observational nature of this study is such that we cannot rule out all risks of bias, particularly confounding and information bias. We did take all steps to account for these biases in our study design and statistical analyses. In addition, we were very transparent in our adjustments to ensure the reader could identify the impacts of such adjustments. Our sensitivity analysis for unmeasured confounding demonstrated that it would most likely affect the findings in the 36–55 and 56–70 age groups. Second, the findings may have been affected by selection bias; that is, people who are already sick and are at higher risk for premature death are those who may be less able to form or maintain social connections—or, conversely, may make greater efforts to seek out and develop their social connections and community belonging. To further limit the effect of poor baseline health, we conducted several sensitivity analyses, including running lag models and additionally adjusting for mental and general health, and found that the results were not affected. Third, reported community belonging is a subjective measure and was only recorded at baseline. It is possible that the sense of community belonging could have changed over the 5 years, although we have found this measure stable over time. Fourth, although we could pool twelve years of survey respondents and our models adjusted for the survey cycle, the age-stratified subsamples nonetheless came from different birth cohorts. As such, it is possible that age-graded differences can be attributed to cohort rather than age effects. Despite these limitations, this study uniquely contributes to a growing body of evidence linking community belonging with key population health and health

system outcomes with the ability to adjust for a wide range of confounders. The individual-level linkage between a comprehensive health survey and reliable administrative health data allowed us to examine community belonging concerning premature mortality, a key population health indicator. Using a large nationally representative sample improved the generalisability of findings, and pooling survey cycles created a large enough sample size to meaningfully examine the association across three distinct life stages, which has been lacking in the existing literature. Compared with similar cross-sectional studies, our cohort design further clarified temporality and reduced biases seen in prior studies.

### Future directions

Our study emphasises the importance of generating evidence that considers age and life stage more explicitly, given the differential associations. In addition, this study points to the need for longitudinal studies that incorporate measures of community belonging and important confounders over time. These study designs can further illuminate the effect of community belonging on subsequent population health outcomes and allow for further investigation of the mechanisms. Finally, there is a need to design and test the impact of policies and interventions that target community belonging in different contexts.

### CONCLUSIONS

Supporting a strong sense of community belonging and related social infrastructure is thus a promising upstream target for policies and programmes to improve population health. We found that community belonging impacts the risk of dying prematurely in different directions and magnitudes across life stages. Importantly, our findings demonstrate that the relationship was highest in the youngest age group, highlighting the importance of early-stage and life-stage appropriate interventions.

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**Competing interests** None declared.

**Patient consent for publication** Not applicable.

**Ethics approval** This study involves human participants and was approved by University of Toronto Research Ethics Board (Protocol #41965). Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data may be obtained from a third party and are not publicly available. This study used the Canadian Community Health Survey (CCHS) respondents that participated between 2000 and 2012 and consented

to administrative health database linkage linked to the Canadian Vital Statistics Death Database (CVSD) by Statistics Canada. The datasets used in this study belong to Statistics Canada and cannot be shared publicly because of personal health information at the individual level. These data can only be accessed in secure computing environments on approval of a project proposal and subsequent release of data for research by Statistics Canada. CCHS data are available through the Research Data Centres program administered by Statistics Canada (see this link for eligibility and access process: [www.statcan.gc.ca/en/microdata/data-centres](http://www.statcan.gc.ca/en/microdata/data-centres)). Data access needs to be approved by Statistics Canada, and output is vetted by Statistics Canada before being released. We did not receive special access to data and followed a process open to others. Access can be granted to others by following the request to access outlined by Statistics Canada using the link provided.

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