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Research letter

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Language and Geographical Location influences the Incidence of Chronic Cough in the Canadian Longitudinal Study on Aging (CLSA)

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BMI; body mass index, CLSA; Canadian Longitudinal Study of Ageing, COPD; chronic obstructive pulmonary disease,

To the Editor

The prevalence of chronic cough is highly variable globally ranging from 2-18%[1]. The prevalence was higher in Australia, Europe, America (11-18%) and much lower in Asia (4%) and Africa (2%), even after adjusting for smoking. The majority of the studies used the 3 month chronic bronchitis definition, but even in studies using the same 8 week cut-off, variations still persist: UK (12%)[2], Finland (7.2%)[3], Germany (5%) [4], Denmark (4%)[5], South Korea (2.6%)[6], Japan (2.2%)[7], Nigeria (1.1%)[8]. The reasons for these variations, even in geographically similar countries are unclear.

The prevalence of chronic cough in the Canadian Longitudinal Study on Ageing (CLSA) is 16%, but is lower in Quebec (10.4%) than in Ontario (15.8%)[9]. We therefore investigated whether language (English vs French) or geographical location (provinces) influences the prevalence and incidence of chronic cough independent of age, sex, smoking, body max index (BMI), province, respiratory diseases and self-perceived general health.

The CLSA is a large, nationally generalizable, stratified random sample of Canadians aged 45-85 years at baseline (2011-2015) from the 10 Canadian provinces and followed every three years until 2033 or death[9-11]. The first follow-up was conducted between 2015-2018. Only the follow-up 1 were included in the current analyses. This study was approved by the Hamilton integrated Research Ethics Board and by the CLSA scientific advisory board (Project ID:1909024).

Chronic Cough was defined as a daily cough on most days within the last 12 months. Prevalent chronic cough was categorized as having a chronic cough at baseline, whilst incident chronic cough were those who developed chronic cough at follow-up 3 years later. Participants in Ontario and Quebec were given the choice to complete the interview in English of French. The language used to complete the questionnaire was used as the dominant language of the subject in this study.

Covariates which impact the incidence of chronic cough were included in the core model; age, sex, smoking status, BMI, province, self-reported general health, and physician-diagnosed

respiratory airways diseases (asthma, chronic obstructive pulmonary disease). Participants who reported no chronic cough at baseline were considered for incidental chronic cough at follow-up 1 (FU1). We employed Proc GENMOD in SAS (version 9.4) with poisson distribution and log link for calculating the multivariable Relative Risk (RR) and assess the association of all covariates with the outcomes of incidental cough. The analyses were stratified by language (English vs. French).

The CLSA comprehensive cohort included 30,097 participants. A total of 29,972 completed the chronic cough question at baseline, and 22,547 who did not report chronic cough at baseline completed the chronic cough question at follow-up. In the follow-up sample who did not report baseline cough, 17,863 (79.2%) were English speaking and 4,684 (20.8%) French speaking. The majority of participants in Quebec were French speaking (4441/4855, 91.5%), whilst in Ontario they were English speaking (4656/4899, 95.0%). There were no participants who were considered French speaking outside of Quebec and Ontario. Overall, 2506 (11.1%) participants reported chronic cough at follow-up, of whom 2,131 (11.9%) were English speaking and 375 (8.0%) French speaking. The incidence of chronic cough was similar in French speaking participants residing in Quebec and Ontario (7.97% vs. 8.64%, respectively, p=0.71). In contrast, the incidence of chronic cough in English speakers was 13.83% in Ontario, but lower in Quebec at 8.45% (p=0.002).

In English speaking participants, the risk of incident chronic cough was lower in Quebec [RR 0.59 (95% C.I. 0.42-0.83)], Nova Scotia [0.66(0.56-0.78)], Newfoundland and Labrador [0.80 (0.68-0.94)], and British Columbia [0.87(0.77-0.97)] compared with Ontario, after adjusting for other covariates (Figure 1A). The risk of incident chronic cough was similar for Manitoba and Alberta compared with Ontario. Other variables associated with an increased risk of incident chronic cough were older age, being male, smoking (previous and current smokers), being overweight/obese compared to normal weight, poor or fair self-rated genral health compared to good, very good, or excellent, and the presence of any chronic respiratory airways diseases.

In French speaking participants, there was no difference in the risk of incident chronic cough living in Quebec compared with Ontario (Figure 1B). Compared with English speaking

participants, the risk of incident chronic cough did not increase with increasing age, in previous smokers and being male, but the impact of respiratory diseases was higher in French speaking.

This is the largest national longitudinal study globally investigating chronic cough and provides novel insights about the influence of language and location on the incidence of chronic cough. This is a unique study because it recruited participants over a large geographical area across Canada who completed the same questions in either English or French, with a standardized data collection method. The result provide 3 important insights, i) overall, French speakers demonstrated a 4% lower incidence of chronic cough than English speakers, ii) geographical location matters - English speakers living in Quebec, Nova Scotia and Newfoundland and Labrador, and British Columbia have a 41%, 33%, 20% and 13% lower risk of developing chronic cough compared with Ontario, iii) French speakers living in Ontario have a similar incidence of chronic cough to those living in Quebec.

There are a number of possible explanations for these results. Firstly, the French population of Quebec, and English population of Newfoundland and Labrador are known to have a strong founder effect[12, 13]. Genetic factors may explain the lower incidence of chronic cough in French speakers, but also English speakers in Newfoundland and Labrador. Secondly, language represents cultural norms, expectations, values, behaviours, willingness to disclose information which can differ across cultures and location. For example, fluent English speakers in England, North America, Europe, and India may not necessarily share the same beliefs and values and hence their cognitive interpretions and responses to questions may differ[14]. We have previously reported differences in the prevalence of chronic cough in different ethnicities and place of birth[9], but asking the same question in different languages may evoke different interpretation and responses. For example, epidemiological studies from within Europe (Copenhagan, Germany, Rotterdam[15] and Finland) who have conducted questionnaires in their own native languages demonstrate wide variability in the prevalence of chronic cough (4-11%) suggesting measurement using different languages could be a confounder. Third, Canada is large geographically with different weather and environmental exposures. Thus, differences in air quality, pollution, population density and climate across provinces require further exploration. Fourth, French speakers phonate differently to English when speaking with the use

of different parts of the larynx/pharynx. This may reduce laryngeal sensitivity which often occurs in patients with chronic cough. Fifth, language may also represent dietary differences across cultures which may influence chronic cough.

There are limitations to this study. First, some Canadians are bilingual, but we assumed the language the questionnaire was conducted in was the dominant language. Second, if the CLSA interviewer was not French speaking in Ontario, then English was used, hence the possibility of mis-classification. Third, French was not offered outside of Quebec and Ontario. Fourth, these were small samples: 21/243 participants living in Ontario that completed the questionnaire in French reported incident chronic cough and 35/414 participants living in Quebec that completed the questionnaire in English reported incident chronic cough. Fifth, it is possible that between the 3-year follow-up, there may have been movement between Quebec and Ontario which we have not accounted for.

In conclusion, these data suggest language and geographical location independently influence the incidence of chronic cough. Development of questionnaires, patient reported outcomes and recruitment in clinical trials in chronic cough should be cognizant of these factors.

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Guarantor Statement: P.R. had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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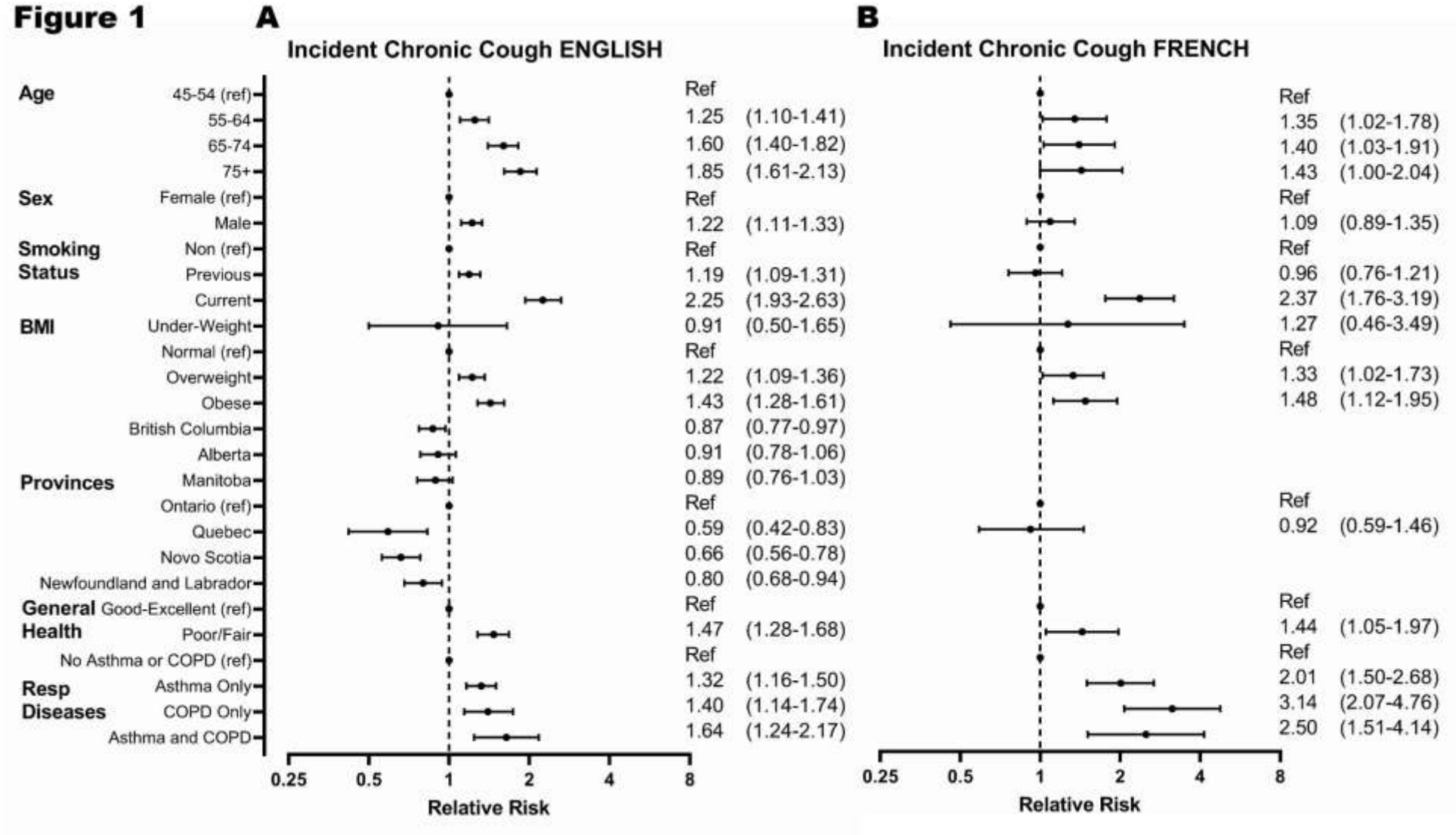
FIGURE LEGENDS

Figure 1: Factors influencing the incidence of chronic cough stratified by (A) English and (B) French. Core incidence model adjusted for time to follow-up 1 [RR 1.08 (0.94-1.25)], age, sex, smoking status, BMI, provinces, self-reported general health, respiratory airways diseases. Point estimate and error bars show the mean estimated relative risk (RR) with 95% confidence intervals. Numerical values also shown.

Figure 1


A
Incident Chronic Cough ENGLISH
Age
45-54 (ref)
55-64
65-74
75+
Sex
Female (ref)
Male
Smoking Status
Non (ref)
Previous
Current
BMI
Under-Weight
Normal (ref)
Overweight
Obese
Provinces
British Columbia
Alberta
Manitoba
Ontario (ref)
Quebec
Novo Scotia
Newfoundland and Labrador
General Health
Good-Excellent (ref)
Poor/Fair
Resp Diseases
No Asthma or COPD (ref)
Asthma Only
COPD Only
Asthma and COPD
Ref
1.25 (1.10-1.41)
1.60 (1.40-1.82)
1.85 (1.61-2.13)
Ref
1.22 (1.11-1.33)
Ref
1.19 (1.09-1.31)
2.25 (1.93-2.63)
0.91 (0.50-1.65)
Ref
1.22 (1.09-1.36)
1.43 (1.28-1.61)
0.87 (0.77-0.97)
0.91 (0.78-1.06)
0.89 (0.76-1.03)
Ref
0.59 (0.42-0.83)
0.66 (0.56-0.78)
0.80 (0.68-0.94)
Ref
1.47 (1.28-1.68)
Ref
1.32 (1.16-1.50)
1.40 (1.14-1.74)
1.64 (1.24-2.17)
0.25
0.5
1
2
4
8
Relative Risk
B
Incident Chronic Cough FRENCH
Ref
1.35 (1.02-1.78)
1.40 (1.03-1.91)
1.43 (1.00-2.04)
Ref
1.09 (0.89-1.35)
Ref
0.96 (0.76-1.21)
2.37 (1.76-3.19)
1.27 (0.46-3.49)
Ref
1.33 (1.02-1.73)
1.48 (1.12-1.95)
Ref
0.92 (0.59-1.46)
Ref
1.44 (1.05-1.97)
Ref
2.01 (1.50-2.68)
3.14 (2.07-4.76)
2.50 (1.51-4.14)
0.25
0.5
1
2
4
8
Relative Risk

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