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Socioeconomic gradient in health in Canada: Is the gap widening or narrowing?

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ABSTRACT

Background: Notwithstanding a general improvement in health status, the socioeconomic gradient in health remains a public health challenge worldwide.
Objective: Using longitudinal data from the National Population Health Survey (NPHS, $n = 17{,}276$), we examined trends in socioeconomic gradients in two health indicators, *viz.* the Health Utility Index (HUI) and the Frailty Index (FI), among Canadian adults (25 years and older) between 1998/9–2010/11.
Methods: The relative and slope indices of inequality (RII and SII, respectively) were employed to summarize income- and education-based inequality in the FI and the HUI in Canada as whole, and in five regions: the Atlantic provinces, Quebec, Ontario, the Prairies and British Columbia.
Results: We found that education- and income-related inequalities in health were present in all five regions of Canada. The estimated RIIs and SIIs suggested that education-related inequalities in the FI and the HUI increased among women. The results also revealed that relative and absolute income-related inequalities in the HUI increased in Canada, especially among women. Both absolute and relative inequalities indicated that income-related inequalities in the HUI increased in Quebec and in the Prairies over time.
Conclusion: Persistent and growing socioeconomic inequalities in health in Canada over the past one and half decades should warrant more attention. The mechanisms underlying socioeconomic-related inequalities in Canada are less clear. Therefore, further studies are required to identify effective polices to reduce the socioeconomic gradient in health in Canada.

1. Introduction

Systematic differences in health among different social groups are a key global public health challenge [1]. Inequality in health status exists for a broad set of health indicators (*e.g.* self-reported health status, mortality, disability, most illnesses, and psychological wellbeing) and for many measures of social position (*e.g.* income, wealth, education, occupation and marital status) [2].

Although disparities in health can result from differences in health seeking behaviours of individuals and/or differential access to health care, social determinants of health (*e.g.* income and education) play an important role in the observed inequalities in health [1,3–5]. Almost all extant work has documented persistent differences by socioeconomic status (SES) around the globe [6]. The pos-

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itive association between SES and health (the SES-health gradient) exists across the entire socioeconomic spectrum worldwide, such that health tends to be worse among the poor and less-educated and then improves gradually up to the highest rungs of the social ladder [7].

In spite of the overall improvement in health over the past four decades, social inequalities in health in Canada exist over an extensive set of health measures and illnesses, including risk factors and behaviours [8]. For example, compared to the non-Aboriginal population, Aboriginal populations in Canada currently experience poorer level of health and their health indicators are often similar to that of developing countries [9].

The prevalence of most chronic conditions in Canada is higher among socioeconomically disadvantaged Canadian than among the better offs [8]. Recent studies in Canada, for example, indicated that the prevalence of adult obesity and diabetes is concentrated among the lower socioeconomic groups [10–12]. Significant socioeconomic disparities have also been observed in the rates of infectious diseases and lung cancer in Canada [13].

There are significant socioeconomic inequalities in health among the general population and across different provinces in Canada [14–17]. Humphries and Van Doorslaer [14] measured the degree of income-related inequality in self-reported health (as a 'subjective' health indicator) and the McMaster Health Utility Index (HUI, a more 'objective' health indictor) in Canada by means of concentration indices and found that significant inequalities in health favour the higher income groups. The extent of inequality in self-assessed health in Canada was considerably higher than in most European countries. Using the same method and measures of health indicators, a study by Safaei [15] also revealed existence of pro-rich inequalities in health across all Canadian provinces. A recent report by the Canadian Institute for Health Information (CIHI) [12] suggested that little or no progress has been made in reducing income-related inequalities in health in Canada over the past decade.

Notwithstanding increased attention to the analysis of the socioeconomic inequalities in health worldwide (*e.g.* Refs. [5,18–22]), relatively little work has been reported in Canada. Therefore, using data from the Canadian longitudinal National Population Health Survey (NPHS), we examined the SES-health gradient in Canada over the period between 1998/99 and 2010/11. This study contributes to the existing literature in several distinct ways. *First*, unlike previous studies that examined socioeconomic inequalities in self-reported health status and/or the HUI in Canada [14,15,17], we extended the analysis of socioeconomic inequalities in health in Canada using the Frailty Index (FI), measured as a proportion of deficits accumulated in individuals. *Second*, using longitudinal data from the NPHS we examined trends in socioeconomic inequalities in the FI and the HUI in Canada over time. *Finally*, to provide a comprehensive analysis of socioeconomic gradients in Canada we quantified education- and income-related inequalities in Canada as whole and across five main regions in Canada: the Atlantic provinces (APs; Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland), Quebec (QC), Ontario (ON), the Prairies (PPs, Alberta, Saskatchewan and Manitoba) and British Columbia (BC). We excluded the three northern territories (*i.e.* Nunavut, Yukon and Northwest Territories) from our analysis because these regions are sparsely populated and culturally distinct compared to the other regions in Canada.

2. Methodology

2.1. Data

To analyse socioeconomic inequalities in health, we used Canada's longitudinal National Population Health Survey (NPHS). As a multistage complex longitudinal survey, the NPHS was designed to collect socio-demographic characteristics and health-related information of nationally representative samples of the Canadian population. The first cycle of data collection began in 1994/95 ($n = 17{,}626$) and continued biennially thereafter until 2010/11 (9 waves). The target population of the NPHS included household residents in all ten Canadian provinces in 1994/95, excluding residents of Canadian Forces Bases, Indian Reserves and some remote areas in Ontario and Quebec. The overall response rate in wave one was 83.6%. The longitudinal response rates for waves two to nine were 92.8%, 88.3%, 84.9%, 80.8%, 77.6%, 77.0%, 70.7%, and 69.7%, respectively. To account for non-response and attrition, sample weights have been adjusted so that the panel continued to represent the original Canadian population in 1994/95 [23]. More details on the survey can be found elsewhere [23–25].

In order to have a consistent measure of income, the first two waves of the survey were excluded from our analysis because they do not have information on the "best estimate" for total household income. To minimize the number of respondents who had not completed their education, the sample was limited to individuals aged 25 and above. After dropping 3435 younger adults (age <25 years) and observations with missing values in the key variables including, education, income, age, sex, ethnicity/race, the FI and the HUI, the final samples for the analysis of education- and income-related inequalities in 1998/99 were 9377 and 8951, respectively. All individuals in the final samples were followed in the subsequent waves. Table A1 in the Supplementary matetial reports the final sample sizes in baseline and 6 follow-up waves included in the analyses after dropping individuals who died between the two waves and observations with missing values in the key variables.

2.2. Measures

The main outcome variables in our study are two 'objective' measures of health indicators: the FI and the HUI. Using self-reported health information collected in the NPHS, we calculated the FI for each respondent by summing the number of health deficits of each individual, which were then divided by the total number of deficits studied [26,27]. The FI ranges between 0 (for the individuals with no deficits) and 1 (for those who have every deficit present) although there is generally observed an empirical limit to the FI is close to 0.7 [28,29]. We used a constructed HUI Mark 3 provided in the NPHS, as a complementary