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Opportunity costs: Underemployment and mental health inequities between immigrant and Canadian-born labour force participants, a cross-sectional study --Manuscript Draft--

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Abstract:	<p>Objectives To examine the association of underemployment (operationalized as unemployment or overqualification) to fair/poor self-rated mental health (SRMH) in: 1. labour force participants, 2. between a. immigrant vs. Canadian-born and b. recent (< 10 years in Canada; arrived 1993-2003) vs. long-term immigrant (³ 10 years in Canada) labour force participants.</p> <p>Methods Data from the Canadian Community Health Survey (CCHS) 2.1 (2003) was used to explore associations within the context of a 1993 national immigration policy shift prioritizing admission of skilled immigrants. Logistic regression analyses were performed to estimate odds ratios associating underemployment with fair/poor SRMH for the full study sample, then stratified by a. immigrant status, and b. length of time in Canada. Data was weighted to reflect the CCHS 2.1 sample design, adjustments for nonresponse, and post-stratification. The study sample included 57 308 labour force participants aged 18–64. Following a listwise deletion of participants with missing values for independent variables, dependent variable, and/or covariates, the resulting sample was 54 064 (94% of the eligible sample).</p> <p>Results Underemployment was positively associated to fair/poor SRMH for labour force participants. Overqualification was positively associated to fair/poor SRMH for immigrant (AOR 1.63; 95% CI 1.16 to 2.27), but not for Canadian-born labour force participants (AOR 1.03; 95% CI 0.90 to 1.20). Unemployment (AOR 3.41; 95% CI 1.79 to 6.48) and overqualification (AOR 1.52; 95% CI 1.04 to 2.21) only had significant positive associations with fair/poor SRMH for long-term immigrants. The magnitude of association of overqualification was greater for recent (AOR 2.04) than long-term</p>	

	<p>immigrants and this may have practical importance.</p> <p>Conclusions</p> <p>The findings suggest the need for tailored interventions to prevent underemployment and fair/poor SRMH for immigrant vs. Canadian-born labour force participants. A whole of government approach is needed to reduce underemployment of immigrants and its mental health impact.</p>
Response to Reviewers:	Please see attached tables including detailed responses to reviewer comments.

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Declarations

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Competing Interests

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Transparency statement

The manuscript's guarantors, Dr. Farah N. Mawani and Dr. Patricia O'Campo, affirm that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

Availability of data and material

Data may be obtained from a third party (Statistics Canada) and are not publicly available.

Code availability

Custom SAS code is available upon reasonable request.

Opportunity costs: Underemployment and mental health inequities between immigrant and Canadian-born labour force participants, a cross-sectional study

ABSTRACT

Objectives

To examine the association of underemployment (operationalized as unemployment or overqualification) to fair/poor self-rated mental health (SRMH) in: 1. labour force participants, 2. between a. immigrant vs. Canadian-born and b. recent (< 10 years in Canada; arrived 1993-2003) vs. long-term immigrant (≥ 10 years in Canada) labour force participants.

Methods

Data from the Canadian Community Health Survey (CCHS) 2.1 (2003) was used to explore associations within the context of a 1993 national immigration policy shift prioritizing admission of skilled immigrants. Logistic regression analyses were performed to estimate odds ratios associating underemployment with fair/poor SRMH for the full study sample, then stratified by a. immigrant status, and b. length of time in Canada. Data was weighted to reflect the CCHS 2.1 sample design, adjustments for nonresponse, and post-stratification.

The study sample included 57 308 labour force participants aged 18–64. Following a listwise deletion of participants with missing values for independent variables, dependent variable, and/or covariates, the resulting sample was 54 064 (94% of the eligible sample).

Results

Underemployment was positively associated to fair/poor SRMH for labour force participants. Overqualification was positively associated to fair/poor SRMH for immigrant (AOR 1.63; 95% CI 1.16 to 2.27), but not for Canadian-born labour force participants (AOR 1.03; 95% CI 0.90 to 1.20). Unemployment (AOR 3.41; 95% CI 1.79 to 6.48) and overqualification (AOR 1.52; 95% CI 1.04 to 2.21) only had significant positive associations with fair/poor SRMH for long-term immigrants. The magnitude of association of overqualification was greater for recent (AOR 2.04) than long-term immigrants and this may have practical importance.

Conclusions

The findings suggest the need for tailored interventions to prevent underemployment and fair/poor SRMH for immigrant vs. Canadian-born labour force participants. A whole of government approach is needed to reduce underemployment of immigrants and its mental health impact.

Keywords: underemployment, unemployment, overqualification, mental health, self-rated mental health, immigrants

INTRODUCTION

Between 1990 and 2010, the burden of mental, neurological, and substance use (MNS) disorders increased by 41% globally (Patel et al. 2016). In the 2015 Global Burden of Disease (GBD) study, mental and substance use disorders contributed 18.4% to global years lost to disability (YLDs), confirming their continuing lead in contribution to global disability (GBD 2015 Disease and Injury Incidence and Prevalence Collaborators 2016). In 2012, 17% of Canadians aged 15 or older reported having had a need for mental health care in the previous 12 months, including people with elevated levels of distress (independent of diagnosis of a mental disorder), and those with diagnosable mental illnesses (Sunderland and Findlay 2013).

Mental health and mental illnesses are largely shaped by people's social environments (Allen et al. 2014), with inequities in mental health and illness largely attributable to disparities in social determinants (Kirmayer and Pedersen 2014; Silove, Ventevogel, and Rees 2017; Mawani 2014; Muntaner et al. 2004; Mawani 2018). Socioeconomic status (SES) is a well-established determinant of health. A direct positive association between higher socioeconomic status and better health has been documented for hundreds of years (Adler et al. 1994; Krieger, Williams, and Moss 1997; Lynch and Kaplan 2000; Singh-Manoux, Clarke, and Marmot 2002; G. D. Smith et al. 1998).

Much of the research establishing that association is based on single SES measures (e.g. income, education, occupation) used as proxies for socioeconomic status as a whole. Using a single indicator to represent SES assumes a positive correlation between different SES measures, i.e. that higher levels of educational attainment lead to higher level occupations and thereby higher income levels. Such positive correlations are not necessarily present, particularly for immigrants.

In 1993, Canada's immigrant selection policy changed to favour the admission of skilled worker class immigrants, resulting in a sharp increase in skilled workers entering Canada after 1993 with a concurrent decline in family class migrants. Skilled workers are selected for their "*education, work experience, knowledge of English or French, and other abilities that will help them to establish themselves successfully as permanent residents in Canada* (Citizenship and Immigration Canada 2008)".

As a result, immigrants arriving in Canada in the 1990s had a higher average level of education than that of any previous cohort, and even higher than that of Canadian-born individuals. Yet there was a dramatic decrease in immigrant and refugee employment and income during this period (Omidvar and Richmond 2003; McIsaac 2003; Ruddick 2003) despite their efforts to select, or relocate to the largest cities of Canada in search of employment (Simich, Beiser, and Mawani 2002; Chui, Tran, and Maheux 2007; Ng et al. 2005). There is a gradient in immigrant unemployment rates by length of time in Canada, with highest rates for those in Canada 5 years or less (Yssaad 2012). Immigrant overqualification (employment in jobs requiring a skill level below their attained education level) proportions also rose dramatically during the 1990s, with almost twice as many immigrants in Canada for 10 years or less (52%) as Canadian-born individuals (28%) classified as overqualified (Li et al. 2006).

Conceptual Framework

It is critical to consider underemployment (unemployment or overqualification) in the context of the migration experience, including: 1. the migration process (journey from pre-migration to post-migration), and 2. multiple levels of social determinants affecting immigrants, including policy contexts governing their migration and resettlement. In Mawani's (2014) multi-level, multi-stage

framework of social determinants of immigrant mental health inequities, individuals are nested within their families and/or households, which are nested within multiple communities (neighbourhood, ethnic communities, religious communities, work communities, school communities, and social/peer communities), which are in turn nested in a broader societal context (Mawani 2014). The dynamic interaction of these factors operating at multiple levels, within the context of the migration process, affects mental health inequities between immigrants and the Canadian-born (Collins and Guruge 2008; Bierman, Ahmad, and Mawani 2009).

Focusing on underemployment within this framework, pre- and post-migration social exclusion/inclusion¹ at the macro-level, and discrimination at the post-migration workplace community-level, can lead to underemployment among immigrants, and affect their mental health via material and psychosocial pathways. Pre-migration social exclusion can push immigrants to migrate seeking inclusion and better opportunities. Then the post-migration disconnect between the Canadian federal government selecting (including) skilled immigrants for their education and work experience, and licensing bodies and employers not recognizing that pre-migration education and experience, results in underemployment that is experienced as discrimination, and leads to a decrease in mental health status (Figure 1) (Simich et al. 2004; Stewart et al. 2008; Premji and Shakya 2017; Simich, Hamilton, and Baya 2006; Mawani et al. 2005; Mawani 2013; Sakamoto, Chin, and Young 2010; Sakamoto et al. 2013). Immigrant and refugee participants, in a national qualitative study, identified lack of recognition of international education and experience leading to unemployment and overqualification, as unjust forms of employment discrimination with more detrimental effects on their mental health than expected challenges to resettlement they trust they will overcome over time (Mawani 2014; Simich et al. 2004; Stewart et al. 2008; Mawani et al. 2005).

The conceptual framework suggests that underemployment is a different experience and may thereby have different impacts on mental health for immigrants vs. Canadian-born labour-force participants. In other words, immigrant status may moderate (act as an effect modifier for) the relationship between underemployment and mental health status (Figure 2).

The overall objective of these analyses was to examine the relationship between underemployment and poor mental health status in Canadian labour force participants. This provides an important context to potential differences in the relationship of underemployment to poor mental health status between subgroups of Canadian labour force participants. In particular, the study examines whether respondents, who are underemployed (unemployed or overqualified), are more likely to report fair/poor self-rated mental health; and whether the association between underemployment and poor self-rated mental health differs between a. immigrants and Canadian-born individuals; and b. long-term (in Canada ≥ 10 years) and recent immigrants (in Canada < 10 years) arriving after Canada's immigrant selection policy changed in 1993 to favour the admission of skilled worker class immigrants.

We hypothesized that underemployment is a risk factor for poor mental health, with a greater magnitude of association of underemployment to fair/poor self-rated mental health for immigrants, due to their experience of underemployment within the context of a pre- to post-migration change in employment status. We further hypothesized that there would be an even greater magnitude of association of underemployment and fair/poor self-rated mental health for recent immigrants (those arriving 1993-2003) because of: the increasing lack of recognition of their pre-migration education and

¹ Social exclusion is an expression of unequal relations of power among groups in society, which then determine unequal access to economic, social, political, and cultural resources (Galabuzi 2009). Social inclusion has to be discussed in relationship to social exclusion as the two concepts are dialectical (Labonte 2004)''

work experience when they were selected for their education and experience; their perception of discrimination causing that discrepancy; and the impact of that discrimination on their mental health.

METHODOLOGY

Data Source

The Canadian Community Health Survey (CCHS) is a cross-sectional survey of health determinants, health status and health care utilization of the Canadian population conducted by Statistics Canada. The two-year collection cycle includes a large sample, general population health survey in the first year and a smaller survey focused on specific health topics in the second year. This study employs data from CCHS 2.1, a survey of 135 573 participants aged 12 and older living in private dwellings in 2003 (Statistics Canada 2004). Interviewers with a wide range of language competencies were recruited, and survey questions translated into Chinese, Punjabi, Inuktitut and Cree, to minimize language as a barrier to conducting interviews (Statistics Canada 2005). A national response rate of 80.7% was achieved (Statistics Canada 2005).

CCHS Cycle 2.1, conducted in 2003, enabled a stratified analysis of a recent immigrant cohort, who arrived within the ten-year period after the 1993 policy shift favouring the admission of skilled worker class immigrants with high education levels over family class immigrants with lower education levels. Focus on this cohort and time period provides an opportunity to consider the impact of policies in place at that time, and inform the evaluation of policy and program changes since then. CCHS 2.1 was also the only Statistics Canada survey within that timeframe that included both a common content mental health measure for inclusion as a dependent variable, and sufficient data to construct the underemployment primary independent variable.

Analytic Sample/Study Population

The study sample for this secondary data analysis included 57 308 labour force participants aged 18–64 (excluding full-time students and those with long-term physical or mental conditions limiting work activity). Following a listwise deletion of participants with missing values for independent variables, dependent variable, and/or covariates, the resulting sample used in analyses was 54 064 (Figure 3).

For analyses stratified by immigrant status, the sample of immigrants used was 6 762, and the sample of Canadian-born used was 47 159. For immigrant analyses further stratified by length of time in Canada, the sample of recent immigrants (in Canada <10 years) used was 1 521, and the sample of long-term immigrants (in Canada \geq 10 years) used was 5 241.

The study was approved by the University of Toronto Research Ethics Board.

Dependent Variable/Outcome of Interest

Fair/Poor mental health: Self-rated Mental Health (SRMH) is the only mental health measure that is part of the common content of CCHS 2.1. *Self-rated mental health* was measured by asking respondents, “In general, would you say your mental health is: excellent? very good? good? fair? poor?” The responses were dichotomized: fair/ poor and good/very good/excellent.

All other mental health measures were optional content modules that regions could choose to opt out of, limiting samples for analyses.

Independent Variables

Primary Independent Variable: Underemployment

The primary independent variable was underemployment. Underemployment was operationalized based on the Labour Utilization Framework, to include unemployment and overqualification, reflecting skill use and status mismatch dimensions of inadequate work^{19,20}. An underemployment variable was constructed to include unemployment, and overqualification (education level attained higher than occupational skill level), with the categories unemployed, overqualified, qualified, and underqualified.

The variable was constructed based on methods outlined by Smith and Frank (2005), with modifications necessary to apply them to CCHS 2.1. An **occupational skill level** variable was constructed by categorizing occupations to correspond to National Occupational Classification (NOC) Skill Levels². Each respondent's occupation was categorized according to the 2001 version of the NOC system developed by Employment and Social Development Canada (ESDC). The NOC categorizes occupations according to the minimum skills/education level required for each position, based on comprehensive research including employers, workers, educators and associations (Smith and Frank 2005).

The **occupational skill level** variable was categorized as follows:

1. occupations requiring no training (Skill Level D)
2. occupations requiring secondary school education and/or occupation-specific training (Skill Level C)
3. occupations requiring college education or apprenticeship training (Skill Level B)
4. occupations requiring university education at the bachelors level or higher (Skill Level A)

Then an **underemployment** variable was constructed as follows:

1. Unemployed – unemployed in past week (and looking for work)
2. Overqualified - occupational skill requirements are below educational attainment
3. Qualified (ref) - occupational skill requirements match education attainment
4. Underqualified - educational requirements for the occupation are higher than those possessed by the individual

Covariates

Covariates were selected a priori based on literature and consultation with experts in Statistics Canada's Health Analysis Division. Primary multivariable analyses were adjusted for demographic factors (age, sex, marital status, and children under 5 in the household), as these factors may be associated with an occupational choice due to lifestyle factors (Smith and Frank 2005), and with mental

² The NOC is updated in partnership with Statistics Canada according to 5-year Census cycles. The NOC structure was not modified in 2006 (<http://noc.esdc.gc.ca/English/noc/welcome.aspx?ver=06>).

health (Rotermann 2007). Analyses were also adjusted for health (presence of chronic disease), and access to health care (no regular doctor, and unmet need) (Allin, Grignon, and Le Grand 2010), as these factors may have independent effects on SRMH, possibly confounding the association between underemployment and fair/poor mental health (Smith and Frank 2005).

To operationalize presence of chronic disease, a variable was constructed narrowing the many chronic conditions included in CCHS 2.1 down to sixteen conditions most likely to be comorbid with mental health issues, arrived at via clinical consensus⁷⁷. The sixteen conditions include: Alzheimer's or dementia, arthritis or rheumatism, back problems, cancer, chronic fatigue syndrome, fibromyalgia, chronic pulmonary disease, asthma, diabetes, stroke, epilepsy, heart disease, inflammatory bowel disease, thyroid, high blood pressure, urinary incontinence.

In order to meet the secondary objectives of the study, stratification was used to test for effect modification. Analyses were stratified by: a. immigrant status (immigrants vs. Canadian-born), and b. for immigrants, by length of time in Canada (recent vs. long-term immigrants) to examine whether the strength or direction of association between underemployment and fair/poor self-rated mental health varied by these factors. Length of time in Canada was based on cut-point of 10 years, with recent immigrants defined as those in Canada for less than ten years, and long-term immigrants defined as those in Canada for ten or more years. The ten year demarcation is a standard one used by researchers to distinguish early years of resettlement and impact of time in Canada on health outcomes (Yssaad 2012; Gilmore 2008; Gilkinson and Sauve 2012; Robert and Gilkinson 2012; Dunn and Dyck 2000; Ng et al. 2005; O'Campo and Urquia 2012; Urquia, O'Campo, and Heaman 2012); aligns with policy distinctions that focus government resources on support on immigrants for their first ten years in Canada; and in CCHS 2.1, includes immigrants arriving between 1993 and 2003, within the ten-year period after the 1993 Canadian federal policy shift favouring the admission of skilled worker class immigrants with higher education levels.

Stratified analyses of immigrant respondents were further adjusted for no official language fluency (no official language fluency vs. official language fluency), international education (post-secondary education abroad vs post-secondary education in Canada) (Ewoudou 2011; Schaafsma and Sweetman 2001), racialized status (racialized vs. non-racialized)³ (Simich et al. 2004; Galarneau and Morissette 2004; Galabuzi 2006), region of origin (South, Central America, Caribbean, Africa, Asia; and Europe, North America, Oceania vs. Canada) (Yssaad 2012; Ng 2011; Ng, Omariba, and Omariba 2010; Dunn and Dyck 2000), and length of time in Canada (recent (<10 years in Canada) vs long-term (≥10 years in Canada) (Galarneau and Morissette 2004; Ng 2011; Ng, Omariba, and Omariba 2010), variables constructed using available CCHS 2.1 measures. For region of origin, due to small sample sizes, categories were collapsed into countries with primarily racialized populations, and countries with primarily non-racialized populations.

Due to the lack of CCHS 2.1 survey question asking where respondents' post-secondary education was attained, an international education variable was constructed, based on age at immigration, to capture

³ Based on the 2007-2017 recommendations of the United Nations Committee on the Elimination of Racial Discrimination for the Canadian government to replace "visible minority" with a more precise, accurate, and non-discriminatory term (United Nations Committee on the Elimination of Racial Discrimination 2007, 2012, 2017), this paper uses Ontario Human Rights Commission terminology that "*describes people as "racialized person" or "racialized group" instead of the more outdated and inaccurate terms "racial minority", "visible minority", "person of colour" or "non-White."*" (Ontario Human Rights Commission 2005)

the distinction between immigrants who completed post-secondary education pre-migration, and those who completed post-secondary education in Canada. In an analysis of Canadian census data from three years (1986, 1991, and 1996), Schaafsma and Sweetman (2001) found that the return to education for immigrants varies with age at immigration⁴⁸.

A dichotomous variable was created including post-secondary education in Canada (age at immigration < 20 years) and international post-secondary education (age at immigration ≥ 20 years), with the cut-point of 20 years selected based on literature^{48, 78} and plotting age at immigration against underemployment. The variable was dichotomized to avoid collinearity of age at immigration with age and length of time in Canada, when they are entered into the same model^{48, 79}. A common approach of addressing collinearity is to drop one variable, but given the link between age at immigration and return to education⁴⁸, that was not an ideal solution for addressing the study objectives.

Data Analysis

Descriptive univariate analyses, including simple descriptive statistics, frequencies/rates (dichotomous and categorical variables) and means (continuous variables), were first conducted to examine their distributions, outliers and extent of missingness within the full sample included in this study, and sub-samples stratified by immigrant status and length of time in Canada. Unlikely values, and constructed variables missing partial data, were reset to missing. Cross-tabulations of covariates and the dependent variable with underemployment categories were conducted to examine the distribution of missing data, and to describe the baseline characteristics of study participants.

Then bivariate analyses including ANOVAs (for continuous variables with categorical variables), and t-tests (for continuous with dichotomous variables), and chi-square tests (for pairs of categorical variables), were conducted to examine the relationships among variables, determine whether any independent variables were correlated with each other or the dependent variable, and select variables for inclusion in multivariable models.

In order to address the primary objective, binary logistic regression analyses were performed to estimate odds ratios associating underemployment with fair/poor self-rated mental health. The link was the default logit link (log odds function for a binary logit model). Then, in order to meet the secondary objectives, further binary logistic regression analyses were conducted stratified by a. immigrant status, and b. length of time in Canada. Analyses accounted for the complex sampling design of the CCHS 2.1. Data was weighted to reflect the CCHS 2.1 sample design, adjustments for nonresponse, and post-stratification.

All estimates and analyses were based on weighted data that reflect the age and sex distribution of the household population aged 15 or older in the 10 provinces in 2003. To account for survey design effects, standard errors and coefficients of variation were estimated with the bootstrap technique (Rao, Wu, and Yue 1992; Rust and Rao 1996; Yeo, Mantel, and Lin 1999; Statistics Canada 2004)⁴.

SAS software was used for all analyses.

⁴ CCHS 2.1 documentation notes, "The bootstrap re-sampling method used in the CCHS involves the selection of simple random samples known as replicates, and the calculation of the variation between the estimates from replicate to replicate." (Statistics Canada 2004)

Model 1 assessed the direct association of underemployment and fair/poor self-rated mental health, and Model 2 adjusted for demographic factors (age, sex, marital status, children <5yrs in household), and access to health services (no regular doctor, unmet need). For stratified analyses of immigrant respondents, multivariable models were elaborated to include migration factors (no official language, foreign education, racialized status, region of origin, length of time in Canada). Post-hoc statistical tests for the significance of differences between logistic coefficients for stratified groups were conducted based on methods described by Allison (1999) and Austin & Hux (2002) (Allison 1999; Austin and Hux 2002). Results from these tests are equivalent to results from testing interactions specified between modifying variables, independent variables, and other covariates, in a single regression model (Austin and Hux 2002; Ramkissoon, Smith, and Oudyk 2019)

RESULTS

Descriptive Analyses

Table 1 describes the distribution of unemployed, overqualified, qualified, and underqualified labour force participants in the study sample. Immigrants are very slightly more likely to be unemployed than Canadian-born respondents. Standard socioeconomic status measures (income, education, occupational skill level) show a gradient, with those at each lower level, more likely to be unemployed. Unmarried respondents and immigrants who are racialized, from South or Central America, Caribbean, Africa, or Asia, or speak no official language, were more likely to be unemployed.

Labour force participants in all age groups were from four to almost ten times more likely to be overqualified than unemployed, with younger participants more likely to be overqualified than older participants. Women were 7.15% more likely to be overqualified than men. Labour force participants with unmet health care needs were 20.39% more likely to be overqualified than those who had their health care needs met, while those with poor SRMH were 13.13% more likely to be overqualified than those with excellent SRMH (Table 1).

Immigrants were 7.77% more likely to be overqualified than Canadian-born respondents, with recent immigrants (in Canada for less than ten years) 11.72% more likely to be overqualified than long-term immigrants (in Canada for ten years or more). There was an income gradient, with those in each lower quintile more likely to be overqualified. Those with postsecondary education were most likely to be overqualified. Immigrants who were 20 years of age or greater at immigration, and thereby more likely to have postsecondary education abroad, were 12.31% more likely to be overqualified, than immigrants who migrated to Canada when they were under 20 years of age. Racialized immigrants are 10.76% more likely to be overqualified than non-racialized immigrants. Immigrants from South, Central America, Caribbean, Africa, Asia were 12.53% more likely to be overqualified than immigrants from Europe, North America, Oceania (Table 1).

Association of Unemployment and Overqualification to Fair/Poor Mental Health

Unemployed individuals had 2.64 times the odds, overqualified individuals had 1.21 times the odds, and underqualified individuals had 1.28 the odds of reporting fair/poor self-rated mental health relative to qualified individuals, when adjusting for age, sex, marital status, child under 5, chronic disease, no regular doctor, and unmet health care needs (Table 2).

The odds ratios of the full sample for unemployed and overqualified were attenuated slightly from the unadjusted to fully adjusted models, but the relationships persisted (Table 2).

Analyses Stratified by Immigrant Status and Length of Time in Canada

In the analyses stratified by immigrant status, unemployed Canadian-born respondents had 2.60 times the odds of reporting fair/poor mental health, while unemployed immigrants had 2.42 times the odds of reporting fair/poor mental health relative to qualified respondents, when adjusting for age, sex, marital status, child under 5, chronic disease, no regular doctor, and unmet health care needs, and additionally for immigrants, no official language, foreign education, racialized status, region of origin, and length of time in Canada (Table 3). Post-hoc statistical tests for the significance of differences (Allison 1999; Austin and Hux 2002) found the differences in association of unemployment to fair/poor SRMH between the groups were not statistically significant at a p level of 0.05 (Table 3).

Overqualified Canadian-born respondents did not have significantly higher odds of reporting fair/poor mental health relative to qualified Canadian-born respondents, while overqualified immigrant respondents had 1.63 the odds of reporting fair/poor mental health relative to qualified immigrant respondents, when controlling for age, sex, marital status, child under 5, chronic disease, no regular doctor, and unmet health care needs, and additionally for immigrants, no official language, foreign education, racialized status, region of origin, and length of time in Canada (Table 3). Post-hoc statistical tests for the significance of differences (Allison 1999; Austin and Hux 2002) found the differences in association of overqualification to fair/poor SRMH between the groups were statistically significant ($p < 0.05$) (Table 3).

In the analyses stratified by length of time immigrants have lived in Canada, unemployed long-term immigrants (in Canada for 10 or more years) had 3.41 times the odds of reporting fair/poor mental health, while unemployed recent immigrants had 1.15 times the odds of reporting fair/poor mental health relative to qualified immigrants (Table 3). For recent immigrants, the association of unemployment to fair/poor SRMH was not statistically significant ($p < 0.05$). Post-hoc statistical tests for the significance of differences (Allison 1999; Austin and Hux 2002) found the differences in association of unemployment to fair/poor SRMH between the groups were not statistically significant ($p < 0.05$).

Overqualified long-term immigrants had 1.52 times the odds of reporting fair/poor mental health relative to qualified long-term immigrants, while overqualified recent immigrants had 2.04 times the odds of reporting fair/poor mental health relative to qualified recent immigrants (Table 3). The association of overqualification to fair/poor SRMH did not achieve statistical significance for recent immigrants. Post-hoc statistical tests for the significance of differences (Allison 1999; Austin and Hux 2002) found the differences in association of overqualification to fair/poor SRMH between the groups were not statistically significant ($p < 0.05$).

DISCUSSION

For the overall sample, underemployment was positively associated with fair/poor mental health. This finding has important implications given that the number of people with university education, who were underemployed, increased by one third from 1993 – 2001 (C. Li et al. 2006). From the two categories of underemployment in this study (unemployment and overqualification), unemployment had a greater magnitude of association to fair/poor self-rated mental health (SRMH) than overqualification. Unemployment is well known to have a negative impact on mental health, via socioeconomic (loss of income), social support (loss of social networks and relationships), and psychological (loss of self-esteem) pathways, based on extensive research over many years (M Beiser, Johnson, and Turner 1993; Breslin and Mustard 2003; Lavis et al. 2001). In addition, research has

shown that people with mental health issues/illnesses are more likely to become unemployed (M Beiser, Johnson, and Turner 1993; Breslin and Mustard 2003). Given the cross-sectional design of CCHS 2.1, the direction of the observed association of unemployment and fair/poor SRMH cannot be determined.

The magnitude of association of the overqualification component of underemployment was smaller than that Smith and Frank (2005) found in their analysis of overqualification and self-rated health (SRH) (Smith and Frank 2005). This may be because: SRH encompasses both physical and mental health; their analyses were based on the longitudinal National Population Health Survey (NPHS) (1994-2001); or slightly different construction of overqualification due to different available education measures in CCHS 2.1. It might also reflect overadjustment due to controlling for health conditions and healthcare access that may be mediators between our primary exposure and outcome; or an additional lagged impact of overqualification on health status, as their analyses were longitudinal, and the analyses in this paper are cross-sectional.

In analyses stratified by immigrant status, though the association of unemployment to fair/poor mental health was similar for Canadian-born and immigrant respondents, there were differences apparent in the association of overqualification to fair/poor self-rated mental health between Canadian-born and immigrants. The finding of a significant positive association of overqualification to fair/poor mental health for immigrants, but not for Canadian-born individuals may be due to the different nature and experience of overqualification for each group. Prior to 2003, overqualification for Canadian-born individuals may have represented a temporary expected experience, primarily of people transitioning from post-secondary education to the work force, that they trusted would change. For immigrants arriving in Canada prior to 2003, however, underemployment represented a lack of recognition of hard won international education and experience, based on institutionalized discrimination “*on Code grounds such as race, ancestry, colour, place of origin and ethnic origin*” (Ontario Human Rights Commission 2013), that they did not have control over. In addition to causing underemployment, such discrimination also deskilled them (Bhuyan et al. 2017), making it progressively more challenging for them to find work in their fields at their appropriate skill level. In their analysis of the Longitudinal Survey of Immigrants to Canada, conducted between April 2001 and November 2005, Chen, Smith, & Mustard (2010) found that over-qualification was associated with the probability of declining self-perception of “*mental or emotional problems (persistent feelings of sadness, depression, loneliness, etc.)*”, with “*general dissatisfaction with current employment and occupational situation*” mediating the relationship.

This study’s descriptive findings (Table 1) support the hypothesis that underemployment, particularly overqualification of immigrants in Canada, is racialized, echoing findings from analyses of 1991, 1996, and 2001 census data (Galarneau and Morissette 2004, 2008). Racialized respondents, were 10.76% more likely to be overqualified than non-racialized respondents: internationally-trained immigrants were 12.31% more likely to be overqualified than immigrants educated in Canada; and immigrants from South, Central America, Caribbean, Africa, Asia were 12.53% more likely to be overqualified than immigrants from Europe, North America, and Oceania.

Racism and discrimination have a profound impact on mental health. In their meta-analysis of racism and health across multiple populations, national outcomes, and health outcomes, Paradies et al. (2015) found racism to be significantly related to poor health, with a stronger relationship to poor mental health, echoing findings of multiple previous systematic reviews and meta-analyses (Paradies et al., n.d.). The trauma of post-migration discrimination may explain the significant association of underemployment to fair/poor self-rated mental health for immigrants. Immigrants and refugees who

have experienced pre-migration trauma due to persecution based on their race, ethnicity or religion may be re-traumatized by systemic and workplace discrimination in Canada (Beiser and Hou 2016; Kirmayer et al. 2011; Mawani 2014).

Underemployment may also affect mental health by substantially reducing income (Krieger 2012; P. S. Li 2008), at a time when the pressures and costs of resettlement (seeking housing, learning systems, building social networks, supporting family abroad, etc.) are great (Simich et al. 2004; Stewart et al. 2008; Chen, Smith, and Mustard 2010), and cost of living may be higher than in their countries of origin. Racialized immigrants, and immigrant women receive especially low returns to their foreign education and experience, resulting in even lower income than non-racialized immigrants, and immigrant men (Galarneau and Morissette 2004; Guo 2015; P. S. Li 2008). In addition, due to limited knowledge of Canadian laws and systems and limited social and professional networks (Simich et al. 2004; Stewart et al. 2008; Premji and Shakya 2017), it may be more difficult for immigrants to find and get the support they need to address issues of employment discrimination, and/or seek training and experience that may help them to increase their employment level, and income, and thereby mitigate the effects of underemployment on mental health.

Length of time in Canada

Analyses stratified by length of time immigrants have lived in Canada, showed the unemployment and overqualification dimensions of underemployment to be significant determinants of fair/poor mental health for long-term immigrants (in Canada ≥ 10 years), while neither were significant determinants of fair/poor mental health for recent immigrants (in Canada < 10 years). The failure to achieve statistical significance at $p < 0.05$ may be due to the small sample size of recent immigrants (1 521). Given that power for assessing effect modification/interaction is frequently poor in epidemiologic studies designed for evaluation of main effects, some researchers use a Type 1 error rate as high as 20%, rather than the usual 5%, to ensure important effect modifiers/interactions are not missed⁸⁰. For recent immigrants, the p-values for the association of unemployment, and overqualification to fair/poor self-rated mental health were 0.83 and 0.08 respectively, suggesting the association of overqualification to fair/poor SRMH should be considered.

The magnitude of association of overqualification to fair/poor SRMH was greater for recent (AOR 2.04) than long-term immigrants (AOR 1.52), and this may have practical importance. Again, though the estimates for each group are qualitatively different, post-hoc statistical tests for the significance of differences (Allison 1999; Austin and Hux 2002) found the differences between the groups were not statistically significant. This may be due to the small sample size of immigrants, yet differences may have practical importance, so it remains important to consider the reasons for the differences.

Recent immigrants surveyed in CCHS 2.1 arrived in Canada from 1993 – 2003. Though it is not possible to distinguish between time and cohort effects in a cross-sectional study, this finding suggests that overqualification may affect them in the context of the 1993 change in Canada's immigrant selection policy to favour skilled worker class immigrants with higher levels of education. Given that skilled workers are selected for their education and experience (Citizenship and Immigration Canada 2008; Houle and Yssaad 2010), it is understandable that immigrants assume their skills and experience are valued and needed in Canada, and that they will be employed in their fields at their appropriate occupational levels. When these expectations are thwarted, immigrants and refugees describe the systemic discrimination responsible as closing doors and dashing their hopes for a better future (Simich et al. 2004). The large proportion of their immigrant cohort peer group experiencing similar underemployment may contribute to their discouragement that their circumstances will change.

The qualitative differences in AOR estimates for long-term vs. recent immigrants may also be due to length of time in Canada. Unemployment may be a more important determinant of mental health for long-term immigrants because they expect to be employed after living in Canada for ten or more years, learning the system, and developing their networks. They may feel more hopeless that they will gain employment, and more despair about experiencing discrimination³⁹, the longer they are in Canada. Overqualification may have a higher magnitude of association to fair/poor SRMH for recent immigrants because their expectations of gaining employment at their skill level are highest, and the impact of the complexity of systemic barriers facing them greatest, in their first ten years in Canada.

For recent immigrants, the lack of significant association between underemployment (unemployment or overqualification) and fair/poor SRMH at a p-level < 0.05 may be due to survey design and measurement issues, including the inability to: capture the duration of underemployment, and latency period between underemployment and fair/poor self-rated mental health; distinguish skilled workers, who would be more impacted by perceived discrimination and thwarted expectations associated with underemployment than other immigrant classes; and/or distinguish between immigrants with international education and immigrants with education in Canada.

Strengths

The study's strengths include its large, national population sample, representative of the Canadian labour force. At the time the study was conducted, CCHS 2.1 was the only Statistics Canada national survey that included both the labour force measures required to construct an objective measure of underemployment, self-rated mental health, and a large enough sample of immigrants to enable the investigation of the secondary study objectives, while adjusting for a number of possible confounders. It provided a particular opportunity to capture the recent immigration experience of immigrants arriving in Canada from 1993-2003, after the 1993 policy shift to prioritizing the admission of skilled worker immigrants. It is the only quantitative study of which we are aware, that compares the association of underemployment (operationalized as unemployment and overqualification) to self-rated mental health between immigrant and Canadian-born labour force participants, enabling the examination of mental health inequities between the two sub-populations within Canada.

The use of a general mental health measure (SRMH) may be especially relevant for the study of social determinants, including socioeconomic status and discrimination, as social science and medical sociology theory suggest that they have a generalized impact on well-being rather than on single health outcomes (O'Campo and Urquia 2012). In addition, Mawani and Gilmour's (2010) construct validity analyses of SRMH found that though SRMH cannot approximate specific mental morbidities, it captures general mental health, including sub-threshold conditions and diagnoses (Mawani and Gilmour 2010). Respondents classified as having a mental morbidity (WMH-CIDI-measured disorder, self-reported diagnosis of a mental disorder, and/or psychological distress) consistently reported lower mean self-rated mental health (SRMH), and had significantly higher odds of reporting fair/poor mental health than did those not classified with mental morbidity (Mawani and Gilmour 2010). Disease-specific models may mis- or underestimate the impact of social determinants on health (O'Campo and Urquia 2012), especially as they don't capture sub-threshold conditions (Mawani and Gilmour 2010).

Limitations

Study limitations should be considered when interpreting findings. First, though the large-scale sample is considered representative of the Canadian labour force, the study is based on a cross-sectional design. It is thereby not possible to determine direction of causality. The association of

underemployment to fair/poor mental health may be partly due to mental health issues and illnesses resulting in underemployment. The cross-sectional design also makes it impossible to disentangle cohort effects from the effect of time since immigration. Any observed cohort effects may reflect the impact of length of time in Canada and associated changes on fair/poor self-rated mental health.

In addition, there may be misclassification of the underqualified and qualified categories of the underemployed independent variable, because years of relevant work experience were not measured in CCHS 2.1, and were thereby not included in constructing skill level and underemployment. NOC documentation indicates that two or more years of specific on-the-job training or work experience can replace pre-employment education for individuals working in occupations requiring post-secondary college education or apprenticeships (Smith and Frank 2005). Such misclassification would not have changed the paper's key findings as it does not affect the unemployed and overqualified categories of underemployment, and would occur across all stratified groups compared.

Thirdly, since self-rated mental health was the only CCHS 2.1 common content mental health measure, it was not possible to examine the national level associations of underemployment to other mental health measures stratified by immigrant status.

Given that higher education is more likely to lead to overqualification, and education has a negative association to fair-poor self-rated mental health, it may confound the association of underemployment to self-rated mental health. The impact of including covariates that are also used to define the primary exposure of interest in models is not, however, straightforward. Given that higher education is associated with a higher likelihood of having the exposure of interest, but a lower likelihood of having the outcome, its exclusion most likely results in more conservative estimates of the relationship between the exposure and outcome.

There were additional data limitations that limited the inclusion of potential covariates. For example, no data was available to distinguish between immigrants and refugees, nor specific immigrant class (skilled worker, family, etc.), nor to determine where education was received. For the latter, an international education variable was constructed based on age at migration.

Finally, CCHS 2.1 sampling methodology that involved oversampling in rural areas and resulted in a lower proportion of immigrants than in the underlying population, because immigrants live primarily in urban areas, limited the potential to examine the association of underemployment and SRMH for immigrant sub-groups by racialization and/or sex/gender, though such analyses are critical due to race and gender disparities in underemployment (Galarneau and Morissette 2004; Premji and Shakya 2017), gender differences in experience of underemployment (Premji and Shakya 2017; Galarneau and Morissette 2008), and race and gender inequities in mental health for immigrants (Mawani 2014).

Future research directions

The design, findings, strengths, and limitations of this study suggest a number of future research directions. First, the conceptual framework, findings of empirical analyses, and study limitations can inform the Canadian Community Health Survey, and other health survey designs (sampling and content) to improve their usability for investigations of social determinants of immigrant mental health inequities. Surveys need to include rigorous, comprehensive, and validated measures of social determinants and mental health to enable such analyses. The ability to examine the heterogeneity of immigrants' experience based on sex/gender, age, length of time in Canada, age at immigration, etc., and the intersection of these factors, is especially important for revealing inequities, policy, service and support gaps faced by particular immigrant sub-groups in comparison to Canadian-born individuals

(Beiser 2005), so that policy and program interventions can be targeted appropriately. For example, additional research could examine differences in the association of underemployment and fair/poor mental health between immigrant cohorts affected by different policy contexts. Mixed methods research that combines policy analysis with quantitative analyses could advance our understanding of the role of policy changes and gaps.

Longitudinal analyses are needed to clarify the time sequence of the association between underemployment and fair/poor self-rated mental health; the chronicity of underemployment, and its association to fair/poor self-rated mental health; elucidate mediators and pathways by which underemployment affects fair/poor self-rated mental health (material and/or psychosocial). The ability to measure temporal change in social determinants and mental health status, throughout the process of migration, from pre- to post-migration, is especially important for research on immigrant health (Dunn and Dyck 2000).

Given increasing levels of education, and associated increases in overqualification, particularly among immigrants, research is needed that develops and incorporates improved measurement of underemployment. For example, an overqualification score that distinguishes between one, two, and three levels at which occupational skill requirements are below educational attainment, could demonstrate the impact of degree of overqualification on mental health.

Future research could examine the association of immigrant underemployment to additional mental health measures, including mental distress, measured disorders, and mental well-being. The association of underemployment to depression is especially important to investigate given that it is *a major contributor to the overall global burden of disease, and the leading cause of disability worldwide* (World Health Organization 2017). For immigrants, it is important to further investigate the role of racism and discrimination as post-migration trauma that potentially triggers pre-migration trauma, and contributes to a cumulative effect on mental health (Beiser and Hou 2016; Porter and Haslam 2005).

Policy Implications

The findings of this study suggest a need for policy focused on labour force participants in Canada, that: 1. reduces underemployment; 2. and recognizes and addresses the mental health impact of underemployment. The findings also suggest addressing mental health inequities between immigrants and Canadian-born labour force participants with targeted policy approaches for: a. immigrants, and b. sub-groups of immigrants based on cohort and/or length of time in Canada.

CONCLUSIONS

There has been progress in tracking social and health inequities in Canada²⁰, including much documentation of national disparities in underemployment by immigrant status, length of time in Canada, and racialized status, but little research focused on the impact of those disparities on mental health inequities. Monitoring health inequities and their determinants is a key step in reducing inequities, but often doesn't provide sufficient evidence to inform intervention at individual, organizational, and societal/systemic levels^{20,21}.

Given that underemployment is a persistent issue affecting a large proportion of immigrants in Canada, and across OECD countries (OECD and European Commission 2018), and is associated to poor mental health in the context of systemic discrimination, it requires urgent intervention.

The conceptual framework, and findings of this study, indicate that a whole of government approach, involving coordination and integration of efforts across multiple government levels and departments, is required to address the association of underemployment to fair/poor self-rated mental health for immigrants. The multiple levels and departments of government involved in the immigration system, those with roles to play in addressing discrimination and reducing underemployment of immigrants, and those involved in the mental health system need to work collaboratively. In their collaborative approach, it is critical that they work with a multi-level framework, such as the one presented in this study, that considers the impact of macro- and meso-level contexts on immigrants' mental health, rather than focusing on individual immigrants as the source of their challenges gaining employment at their appropriate skill level.

6975 words

BOX

What is already known on this topic

- Previous quantitative and qualitative research in multiple national and community settings has shown there is an association of underemployment (unemployment and/or overqualification) to poor health and mental health
- Previous Canadian national research has shown an association between underemployment and poor self-rated health and mental health
- In an analysis of a national longitudinal survey of immigrants to Canada, over-qualification was associated with the probability of declining self-perception of “*mental or emotional problems*”

What this study adds

- This is the first Canadian national study to compare the association of underemployment and self-rated mental health between immigrant and Canadian-born labour force participants
- This study contributes a method of constructing underemployment of particular relevance to immigrants
- It includes stratified analyses of the association of underemployment and poor self-rated mental health between a. immigrants and Canadian-born individuals; and b. long-term (in Canada ≥ 10 years) and recent immigrants (in Canada < 10 years) arriving after Canada’s immigrant selection policy changed in 1993 to favour the admission of skilled worker class immigrants.
- Study findings showed a significant positive association of overqualification to fair/poor mental health for immigrants, but not for Canadian-born individuals
- Analyses showed the unemployment and overqualification dimensions of underemployment to be significant determinants of fair/poor mental health for long-term immigrants, while neither were significant determinants of fair/poor mental health for recent immigrants. The failure to achieve statistical significance at $p < 0.05$ may be due to the small sample size of recent immigrants.

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Reviewer comments	Responses		
Reviewer 1 (27.02.21)			
Authors have made remarkably revision and met a high quality paper			
Reviewer 2 (27.02.21)	01.03.21	27.05.21	14.07.21
Very minor revisions			
<p>The author/s should clearly emphasize within Data source or Analytic Sample/Study Population part that this research involves secondary data analyses of Statistics Canada data, based on the findings of a national qualitative study, and that in-depth interviews with immigrant and refugee participants were made by the staff of Statistics of Canada.</p>	<p>The phrase “conducted by Statistics Canada” added to the first sentence in Data Source section, and phrase “for this secondary data analysis” added to Analytic Sample section to make it more explicit.</p> <p>The sub-heading “Data Source” indicates that it is a secondary data analysis of the source identified. Statistics Canada documentation is cited throughout that section.</p> <p>In-depth interviews were not conducted by Statistics Canada staff. The references cited indicate that.</p> <p>To further clarify, “Immigrant and refugee participants, in a national qualitative study, identified lack of recognition of international education and experience leading to unemployment and overqualification, as unjust forms of employment discrimination with more detrimental effects on their mental health than expected challenges to resettlement they trust they will overcome over time (Mawani 2014; Simich et al. 2004; Stewart et al. 2008; Mawani et al. 2005)” moved</p>		

	from Discussion section to Conceptual Framework section.		
You use the term: “racialized” in the parts of Covariates, Descriptive Analyses as well as within DISCUSSION part. I think you should be clearer and to explain at the very first section you use this term, i.e. to explain more precisely what you exactly mean by this term or at least to put a footnote about the meaning of this term for the Canadian society.	Footnote added to first mention of word on p.6		
Too many limitations listed. Maybe you should focus on the most relevant, i.e. key limitations. Or, think about maybe some of the limitations to redirect somehow in a form of future directions for the research (within those you already have mentioned there).	Abbreviated section. The paper was already under the 7500 word limit and is now 6630 words, well under the limit.		
Reviewer 2 (22.05.21)			
Additional minor revisions, please see the comments			
Data Analysis This sub-heading may be changed into Data Analysis and Methods.		The sub-heading is “Data Analysis” under the Methods heading. Adding “and Methods” to the sub-heading would be redundant. We are happy to make heading and sub-heading changes suggested by a copy-editor to align with the standard headings used by the journal.	
Now I note more clearly, you mention more analyses here, but you do not mention any		Added “binary” in 2 places on p. 7 for clarity. We thought it was implicit in our	

<p>method. For example in Logistic Regression, which method did you use? ML or Binary Logit method?, whatever. You have listed the SAS software, specify the method as well. That is very important. You can also display a Logistic Regression equation and explain it clearly, and you can put it in front of the tables. Yes, you have tables, but you have no equation for this model, and this model is not as simple as let say the descriptive statistics. In addition, you mention the bootstrap technique; you need to further clarify this technique with one to two sentences, after you mentioned it or to put a footnote so that other readers who are not sufficiently familiar with this technique can understand you.</p> <p>ANOVA is a statistical method and here you can also set the null and the alternative hypotheses for your case and within the results to point clearly which hypothesis was rejected? You have presented only tables for logistic regression but you have not any results presented for ANOVA?</p>		<p>description of the binary dependent variable and are happy to make it explicit if that adds clarity.</p> <p>Also added: “The link was the default logit link (log odds function for a binary logit model).”</p> <p>We feel the description doesn’t require an equation, as this is the default logistic regression model which readers will be familiar with. However, if the editor feels that an equation is required for readers to better understand the model, we can add this to the manuscript.</p> <p>Added <i>footnote</i>: CCHS 2.1 documentation notes, “The bootstrap re-sampling method used in the CCHS involves the selection of simple random samples known as replicates, and the calculation of the variation between the estimates from replicate to replicate.” (Statistics Canada 2004)</p> <p>Re. ANOVA comment, bivariate analyses were conducted to select variables for inclusion in multivariable models that this paper focuses on. Including all that data, description, and discussion would clutter the paper and take away from its focus. Added clarification on p. 7, “were conducted to examine the relationships among variables, determine whether any independent variables were correlated</p>	
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		<p>with each other or the dependent variable, and select variables for inclusion in multivariable models.” We are also open to removing that section of methods if it would make the paper’s focus clearer.</p>	
<p>My idea here was not to cut parts in that section, but to offer something that could be creative that you think should be done in future research in this area. Obviously during your research on this topic you have seen many omissions and you have listed them in the limitations. That is well done. So, here I mean adding the quality of the study but not on the quantity, i.e. to count literally the number of words.. A few words more or less from the limit mean nothing. I think you understand my point now. However, if you think, it can stay like this; it is not a problem.</p>		<p>In our previous responses, we responded to your previous comment “Too many limitations, Maybe you should focus on the most relevant, i.e. key limitations.”</p> <p>It is important to note limitations to our research – to understand limits to how it can be interpreted, and to highlight the impact of Canadian national data system limitations. Future research directions emerging from those limitations are recommended on p.13-14.</p> <p>We didn’t add to them as another reviewer requested that we reduce the Future Research Directions section.</p> <p>We have now added <i>the following to Future Research Directions:</i> “Surveys need to include rigorous, comprehensive, and validated measures of social determinants and mental health to enable such analyses.” “Mixed methods research that combines policy analysis with quantitative analyses could advance our understanding of the role of policy changes and gaps.”</p>	

<p>Interesting topic and well-organized research study. The connection and compactness between the theoretical and empirical part of the research is evident.</p>		<p>Thank you.</p>	
<p>Reviewer 3 (22.05.21)</p>			
<p>All comments are addressed. May be published.</p>			
<p>Reviewer 10 (22.05.21)</p>			
<p>The authors study the relationship between underemployment and mental health status using a single cross section of data from the CCHS. It is not clear to me why they chose a single cross section of data for the analysis since it gives rise to numerous identification and confounding issues that the authors themselves note as limitations. In particular I am not sure about the choice of the CCHS 2.1 when it is now 18 years old and numerous more recent survey years are available. Are there elements in the 2.1 version of the CCHS that are not in subsequent years? Was this year chosen because it is 10 years after immigration reform and if so (and the authors allude to this in their motivation) then the study is an attempt to examine differential effects on immigrant outcomes of the policy change?</p>		<p>Added: "CCHS Cycle 2.1, conducted in 2003, enabled a stratified analysis of a recent immigrant cohort, who arrived within the ten-year period after the 1993 policy shift favouring the admission of skilled worker class immigrants with high education levels over family class immigrants with lower education levels. Focus on this cohort and time period provides an opportunity to consider the impact of policies in place at that time, and inform the evaluation of policy and program changes since then. CCHS 2.1 was also the only Statistics Canada survey within that timeframe that included both a common content mental health measure for inclusion as a dependent variable, and sufficient data to construct the underemployment primary independent variable."</p>	

<p>Regarding the use of a single cross section, the authors detail various limitations of the paper arising from a single cross section. Some of these would have been resolvable had the authors adopted a synthetic cohort analysis with pooled cross sections of data. this would have allowed cohort and years since migration effects to be disentangled (with certain identifying assumptions) and it would also have resolved the limited power of the estimation arising from small sample sizes.</p>		<p>Great suggestion that we considered. Unfortunately other CCHS cycles did not include sufficient data to construct the underemployment variable and enable this.</p> <p>*Added this clarification: “CCHS 2.1 was also the only Statistics Canada survey within that timeframe that included both a common content mental health measure for inclusion as a dependent variable, and sufficient data to construct the underemployment primary independent variable.</p> <p><i>This is why we included this statement in Future Research Directions “First, the conceptual framework, findings of empirical analyses, and study limitations can inform the Canadian Community Health Survey, and other health survey designs (sampling and content) to improve their usability for investigations of social determinants of immigrant mental health inequities.” For further clarity, added “Surveys need to include rigorous, comprehensive, and validated measures of social determinants and mental health to enable such analyses,” though a previous reviewer wanted us to abbreviate this section.</i></p>	
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<p>The authors mention the policy change and its implications on page 3 of the paper, but they cannot derive any meaningful implications about policy impact given the impossibility of disentangling policy effects from years in Canada effects with the data they are using, not to mention possible cohort effects and the fact that 1993 was also a recession year in Canada. The pre/post arrival corresponds exactly with recent compared to earlier arrivals. A much more careful analysis would be required to study the effects of this policy than what the authors have conducted in the present paper. For example, studying outcomes of immigrants arriving before and after 2003 at the same number of years in Canada. I acknowledge the authors are not making causal claims but even in terms of correlations little can be concluded with a single cross section of data, so I'm not sure why it is mentioned except as background.</p>		<p>Acknowledged in limitations. And it's not possible to replicate analyses with surveys that don't include adequate data to construct underemployment variable. We've included an explanation of the CCHS data limitations in the paper (see above) though didn't add this to the limitations as another reviewer repeatedly stated that we identified "too many limitations." Recommendations are offered for improved national data that would enable a more careful analysis. Added more re. options for future research addressing this: "Mixed methods research that combines policy analysis with quantitative analyses could advance our understanding of the role of policy changes and gaps."</p>	
<p>On page 3 the authors note pre-immigration social exclusion as a push factor for individuals deciding to migrate but in contrast there is extensive evidence that immigrants are a positively selected group who are healthier and wealthier on average than their non-migrating peers.</p>		<p>Yes, immigrants and refugees to Canada are selected by the Canadian government based on their health status. Social exclusion can still be a push factor. This paper focuses on underemployment as a post-migration factor that may affect deterioration of their mental health status.</p>	

<p>The authors note that causality cannot be inferred but they are compounding the problem by including a host of endogenously determined covariates for health conditions and health service access. It would be worth estimating the models with and without these health measures to see what effect their inclusion has on the estimates of the impact of underemployment on mental health.</p>		<p>They were included as covariates due to the evidence of their associations with underemployment and mental health. Causality cannot be inferred due to the cross-sectional design of the survey.</p> <p>Great idea. We took a different approach in our analyses. And added to the Discussion section: “It might also reflect overadjustment due to controlling for health conditions and healthcare access that may be mediators between our primary exposure and outcome.”</p> <p>Unfortunately it’s not possible to conduct additional analyses at this point due to no longer having access to the Statistics Canada data.</p>	
<p>Reviewer 10 (03.07.21)</p>			
<p>In the authors' response to my comment on positive selectivity of immigrants to Canada, they note that immigrants and refugees are selected by Government on the basis of their health status. There are two problems with this response. First, while there is some screening for health conditions that might constitute a threat to the Canadian health system, these requirements, they are not onerous and can also be waived for refugees in some circumstances. Second, any effects arising from selection on the basis of health are far outweighed by selection on the basis of</p>			<p>We thank the reviewer for their engagement with our paper. We respectfully disagree with the reviewer’s perspective, which we feel doesn’t take into account the extensive evidence of Canada’s colonial history and engagement in global capitalism. It is well beyond the scope of this scientific paper to address these issues in the detail they warrant. If the editor feels we should add something, we are willing to do so.</p> <p>We agree that selection on the basis of education and occupation is a factor and</p>

<p>human capital characteristics for skilled-based immigrants. That is the selection that I was referring to, and the authors should consider how positive selectivity on the basis of education, language and occupation might inform their hypotheses about underemployment and mental health. This actually helps support the implications for mental health of credential non-recognition as skilled immigrants will likely expect to be able to work in their field of training since they were selected on the basis of that training and education.</p>			<p>have addressed it in these several places in the manuscript:</p> <ul style="list-style-type: none"> ▪ p. 2 & 3 (Introduction & Conceptual Framework) ▪ p. 11 <i>“Given that skilled workers are selected for their education and experience (Citizenship and Immigration Canada 2008; Houle and Yssaad 2010), it is understandable that immigrants assume their skills and experience are valued and needed in Canada, and that they will be employed in their fields at their appropriate occupational levels. When these expectations are thwarted, immigrants and refugees describe the systemic discrimination responsible as closing doors and dashing their hopes for a better future (Simich et al. 2004).”</i>
<p>Regarding the inclusion of endogenous covariates, the authors reply that they no longer have access to the data. Journal revision data access contracts for RDC access are easily obtained should additional analysis be required to address revisions to journal articles.</p>			<p>Analyses were conducted at Statistics Canada’s headquarters and the authors no longer have access to data there.</p> <p>RDC access has been heavily limited due to COVID-19, as has the time taken to process to data access requests. We feel the additional gains by running models with and without health factors are outweighed by the potential time it would take to gain access to the data, and access to the RDCs to conduct the analyses.</p>

<p>I would like to see the regression results from the full and stratified analyses from Table 3, as variables such as racialized minority status and international education have strong theoretical connections to mental health status and underemployment. Does the 'all' specification include the full sample of immigrants and non-immigrants plus all of the covariates? Within such a specification interactions of employment status with immigrant characteristics would have allowed the significance of differential effects among these groups to be tested. It is difficult to assess the statistical significance of any differences in estimated effects across the groups based on the specifications estimated in Table 3.</p>			<p>This is an unusual request, and we are unclear why the reviewer needs to see regression results and which components of the results are concerning.</p> <p>We included racialized status and international education in our models to adjust for them because of their “<i>strong theoretical connections to mental health status and underemployment.</i>”</p> <p>Table 3 focuses on comparing AORs between the full sample analysis and stratified analyses.</p> <p>Added: (Full Sample) under “All” in Table 3 to further clarify</p> <p>p. 5-6 and Table 3 footnotes outline the covariates included in the full sample model, and additional covariates included in the stratified models</p> <p>Added: Revised “<i>Models adjusted for...</i>” to “All models adjusted for...” in first Table 3 footnote. Revised “<i>Immigrant models</i>” in Table 3 footnote to “Stratified models (Canadian-born vs. immigrants; long-term vs. recent immigrants)”</p> <p>We conducted post-hoc tests for the significance of differences across groups using a method equivalent to testing for multiplicative interactions (as suggested by</p>
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			<p>the reviewer) and have referenced this in our manuscript text and a table footnote. p.8: <i>“Post-hoc statistical tests for the significance of differences between logistic coefficients for stratified groups were conducted based on methods described by Allison (1999) and Austin & Hux (2002) (Allison 1999; Austin and Hux 2002)”</i></p> <p>Added: “These results are equivalent to results from testing interactions specified between modifying variables, independent variables, and other covariates, in a single regression model (Austin and Hux 2002; Ramkissoon, Smith and Oudyk 2019).”</p>
Reviewer 2 (03.07.21)			
Most revision have been addressed. Paper may be accepted			<p>Thank you. We noted the reviewer’s additional comments in their attachment and made additional revisions.</p>

Reviewer comments	Responses
Reviewer 1	
<p>First, the author raises an interesting and timely topic. This, however, is marred by the lack of an explicit argument about Underemployment and mental health inequities between immigrant and Canadian-born: e.g. how and why an issue can be securitized and be part of a the discourse. Yes, there are arguments, but it is implicit and deeply buried in the discussion, as mentioned the article as follows:- "We hypothesized that underemployment is a risk factor for poor mental health, with a greater magnitude of association of underemployment to fair/poor self-rated mental health for immigrants, due to their experience of underemployment within the context of a pre- to post-migration change in employment status. We further hypothesized that there would be an even greater magnitude of association of underemployment and fair/poor self-rated mental health for recent immigrants (those arriving 1993-2003) because of: the increasing lack of recognition of their pre-migration education and work experience when they were selected for their education and experience; their perception of discrimination causing that discrepancy; and the impact of that discrimination on their mental health."</p> <p>It should be reconstructed and relocated at the end of introductory section. And should be narratively cleared.</p>	<p>Abbreviated mental health and underemployment sections of Introduction, moving up section on immigrant underemployment.</p> <p>Moved detailed description of Figure 1 to footnote in figure to improve flow to objectives.</p> <p>The Conceptual Framework section of the Introduction explicitly outlines the theoretical context for a difference in the association of underemployment to mental health between immigrants and Canadian-born. The 4 paragraphs immediately preceding that discuss Canadian research on immigrant underemployment and health.</p> <p>The quoted paragraph re. hypotheses is not in the discussion section, but rather immediately following the objectives, as is standard for epidemiology research papers.</p> <p>Unclear what the reviewer means by:</p> <ul style="list-style-type: none"> • <i>"How and why an issue can be securitized."</i> • <i>"should be narratively cleared"</i>
<p>No need to make one more section to deal with objective along hypothesis.</p> <p>It is suggested to merge the objective section in introductory section.</p>	<p>Objectives sub-heading removed</p> <p>The Conceptual Framework section is part of the Introduction section and provides rationale for the objectives.</p>
<p>In the discussion section, the authors must reconstruct with an interesting sub-heading not just display 'result and discussion' section.</p>	<p>The Results and Discussion sections are separate as is standard for research papers.</p> <p>Revised and added sub-headings in both sections.</p>
<p>References should be standardised.</p>	<p>Reference manager software was used to ensure standardization of references according to the journal submission guidelines.</p> <p>For all references noted by the reviewer, reference entries were checked and revised as necessary. Since the reviewer simply listed the references, in some cases it was unclear what issue the reviewer identified with the reference.</p>

Overall, the article should be reconstructed especially in the abstract, introduction, and discussion sections that I have mentioned in the previous sentences. Authors must pay more attention on the proposed main argument as the anchor of the discussion.	Revisions were made to clarify and strengthen the main argument, as noted above. Reference to objectives/analyses stratified by immigrant status as secondary removed.
It is strongly recommended to author to include 'migration and integration discussion' so that meet the journal topic. The proposed article seen to close to public health discussion and a very minor discussion on migration and integration.	The article contains considerable focus on migration – starting from the introduction, and throughout all sections of the paper. The introduction was abbreviated to further feature the migration context;
Reviewer 2	
No further comments.	
Reviewer 3	
Title: Inequalities may be dropped	“Inequities” was intentionally used, rather than “inequalities” It is essential to the meaning of the title and the study objectives
Define the terms used in paper; unemployed, overqualified etc	The terms are defined in the objectives and methods sections. Definitions were added to the introduction section.
table 1: count and % differentiate	Count and % are differentiated in different columns in the table.
reduce length of limitations and further research	The paper was under the 7500 word limit, so it is unclear why reviewer is asking for these sections to be reduced. It has now been reduced to 6693 words, well under the limit. Being clear and comprehensive about limitations is important. Future Research Directions follow directly from the limitations and inform readers of research gaps that need to be filled.

Figure 1: Underemployment as a determinant of immigrant mental health status

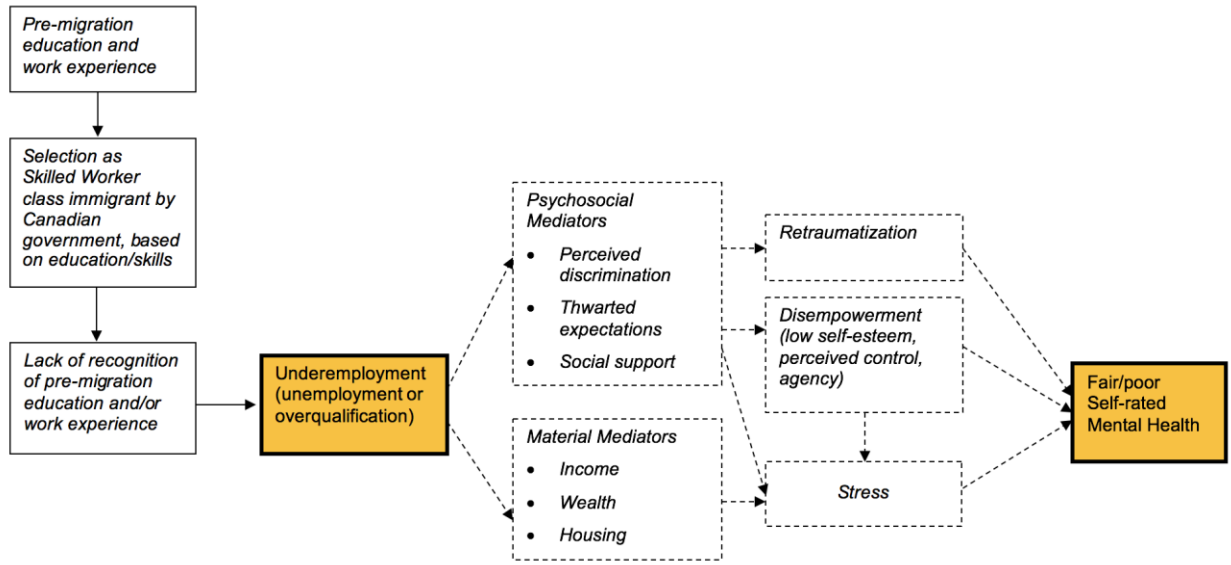


Figure 2: Immigrant status as an effect modifier for association of underemployment to self-rated mental health

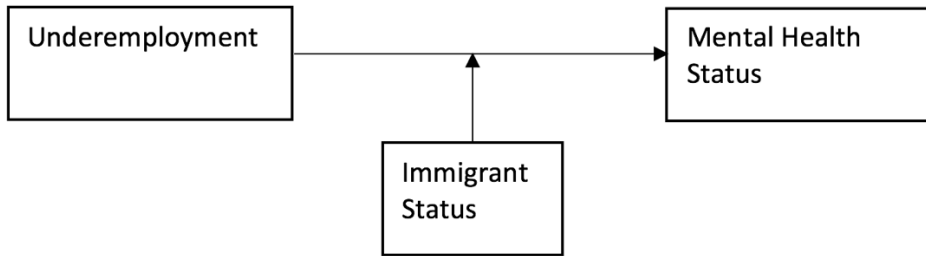


Figure 3: Sample Flowchart

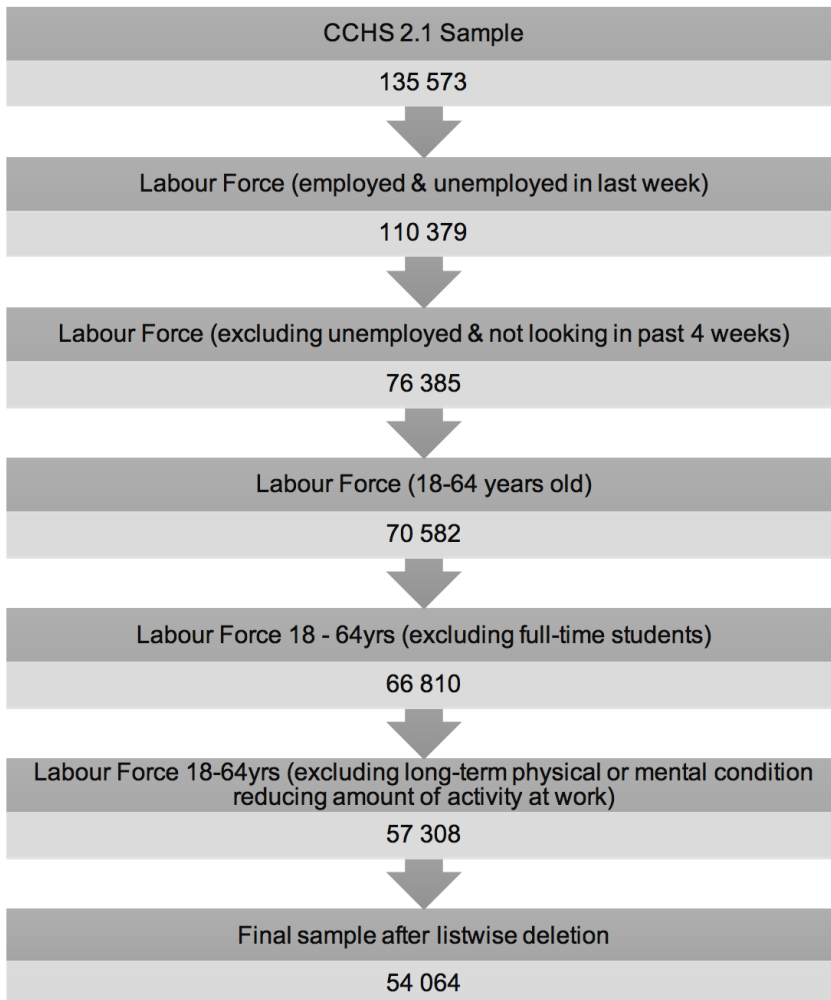


Table 1: Underemployment by selected characteristics, labour force aged 18-64, Canada, 2003. (Bootstrap weighted)

	Underemployment											
	Unemployed			Overqualified			Qualified†			Underqualified		
	Count	Number	%	Count	Number	%	Count	Number	%	Count	Number	%
Total												
Age (years)												
Mean (SD)		36.13 (178.04)			38.79 (169.33)			40.09 (166.42)			41.54 (166.81)	
Sex												
Male†	1070	248.33	3.70	6509	1620.75	24.14	12938	3089.00	46.03	7911	1754.50	26.13
Female	921	189.52	3.44	7992	1724.60	31.29	11226	2339.98	42.46	6225	1257.56	22.82
Marital Status												
Never married	797	174.22	6.35	3874	845.92	30.86	5785	1140.00	41.62	3000	580.44	21.17
Widowed/separated/divorced	279	40.90	4.06	1839	275.49	27.32	2908	421.19	41.77	1930	270.73	26.85
Married/common law†	913	222.39	2.63	8776	2222.26	26.25	15443	3862.85	45.63	9184	2157.59	25.49
Children <5 in household												
No†	1657	369.45	3.67	11664	2719.97	27.00	19501	4430.39	43.98	11926	2552.80	25.34
Yes	334	68.40	3.18	2837	625.38	29.05	4663	999.59	46.44	2210	459.26	21.34
Chronic Condition (1 or more)												
No†	1199	281.55	3.62	9136	2184.95	28.10	15204	3490.70	44.90	8311	1817.49	23.38
Yes	781	153.36	3.47	5336	1153.40	26.10	8903	1925.61	43.57	5783	1186.71	26.85
Regular Medical Doctor												
No	506	334.03	3.28	2496	2813.60	27.65	4454	4529.26	44.51	2767	2500.07	24.57
Yes†	1482	102.67	5.03	12001	530.37	25.96	19701	899.61	44.04	11358	510.09	24.97
Unmet Health Care Need												
No†	1692	375.56	3.40	12967	3015.56	7.33	21581	4894.16	44.35	12795	2749.74	24.92
Yes	296	62.02	5.24	1528	327.93	27.72	2569	533.39	45.08	1326	259.79	21.96
Immigrant Status												
Canadian-born†	1720	324.90	3.36	12206	2490.47	25.77	21156	4382.82	45.35	12672	2466.33	25.52
Immigrant	266	111.45	4.38	2284	853.27	33.54	2987	1039.54	40.86	1451	539.95	21.22
Length of Time in Canada												
Long-term Immigrants (≥10yrs)†	157	56.95	3.05	1626	568.85	30.43	2382	806.46	43.14	1234	437.17	23.39
Recent Immigrants (<10 yrs)	109	54.50	8.08	658	284.42	42.15	605	233.08	34.54	217	102.78	15.23
Official Language												
Yes†	1970	429.57	3.56	14407	3304.32	27.38	24024	5381.82	44.59	14009	2952.58	24.47
No	21	8.28	5.28	94	41.02	26.14	140	48.16	30.69	126	59.46	37.89
International Education												
Canadian Education (age at immigration <20 yrs)†	94	40.91	4.27	778	247.87	25.86	1287	437.63	45.67	690	231.94	24.2
International Education (age at immigration ≥20yrs)	172	70.55	4.45	1506	605.4	38.17	1700	601.91	37.95	761	308.01	19.42
Racialized Status												
Non-racialized†	1655	345.25	3.35	12589	2648.88	25.69	21867	4705.87	45.64	12738	2611.69	25.33
Racialized	333	91.17	4.8	1893	692.90	36.45	2268	717.52	37.74	1393	399.55	21.02
Region of Origin (collapsed)												
Canada	1714	323.30	3.38	12108	2463.20	25.73	21009	4339.81	45.34	12595	2445.82	25.55
Europe, North America, Oceania	116	45.02	3.94	1079	298.93	26.18	1832	526.52	46.11	931	271.48	23.77
South, Central America, Caribbean, Africa, Asia	152	65.85	4.52	1281	564.20	38.71	1294	550.06	37.74	585	277.54	19.04
Self-rated Mental Health												
Fair/poor	159	29.95	8.72	402	97.22	28.30	631	127.66	37.17	409	88.65	25.81
Good/Very Good/Excellent†	1818	403.23	3.43	13985	3216.54	27.34	23330	5253.06	44.65	13577	2891.12	24.58

† Reference category **Source:** 2003 Canadian Community Health Survey 2.1

Table 2: Logistic Regression Analysis of self-rated mental health (SRMH), labour force 18-64 years, Canada, 2003

Variable	Model 1 - Unadjusted				Model 2 - Fully Adjusted					
	β	SE	OR	95% CI	β	SE	AOR	95% CI		
Underemployment										
Underqualified	0.212	1.220	1.24	1.23 1.25 *	0.243	0.067	1.28	1.12 1.45 *		
Qualified†			1.00 (ref)				1.00 (ref)			
Overqualified	0.217	0.004	1.24	1.23 1.25 *	0.189	0.065	1.21	1.06 1.37 *		
Unemployed	1.141	0.007	3.13	3.09 3.17 *	0.971	0.103	2.64	2.16 3.23 *		
Age (years)										
Mean (SD)					-0.004	0.003	0.996	0.99 1.00		
Sex										
Female					0.183	0.054	1.20	1.08 1.34 *		
Male†							1.00 (ref)			
Marital Status										
Married†							1.00 (ref)			
Common Law					-0.151	0.096	0.86	0.71 1.04 *		
Widowed					1.230	0.165	3.42	2.48 4.73 *		
Separated					1.025	0.111	2.79	2.24 3.46 *		
Divorced					0.361	0.114	1.44	1.15 1.80 *		
Single/Never Married					0.306	0.078	1.36	1.17 1.58 *		
Children <5 in household										
No†							1.00 (ref)			
Yes					-0.079	0.079	0.92	0.79 1.08		
Chronic Condition (1 or more)										
No†							1.00 (ref)			
Yes					0.554	0.055	1.74	1.561 1.94		
Regular Medical Doctor										
No					-0.077	0.075	0.93	0.80 1.07		
Yes†							1.00 (ref)			
R ²	0.362				0.024					

† Reference category

* Significantly different from reference category ($p < 0.05$)

E coefficient of variation 16.6% to 33.3% (use with caution)

F coefficient of variation greater than 33.3% (suppressed because of extreme sampling variability)

Source: 2003 Canadian Community Health Survey 2.1

Table 3: Adjusted Odds Ratios relating underemployment to fair/poor self-rated mental health, stratified by immigrant status, and length of time in Canada, labour force 18-64 years, Canada, 2003

	All (Full Sample)		Canadian-born		Immigrants						
	AOR	95% CI	AOR	95% CI	Total		Long-term (≥ 10yrs)		Recent (<10 yrs)		
Underemployment											
Underqualified		1.118		1.047							
Qualified [†]	1.275	1.454 *	1.206	1.388 *	1.467	2.140 *	1.374	2.081	1.741	4.515	
	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)		
Overqualified		1.063		0.895		1.164 *		1.044		0.922	
	1.208	1.374 *	1.034	1.195	1.625	2.267	~ 1.518	2.205	* 2.040	4.512	
Unemployed		2.158		2.090		1.367		1.793		0.327	
	2.64	3.230 *	2.600	3.235 *	2.419	4.281 *	3.409 *	6.483 *	1.145 *	4.004	

All models adjusted for age, sex, marital status, child under 5, chronic disease, no regular doctor, unmet need
 Stratified models (Canadian-born vs. immigrants; long-term vs. recent immigrants) also adjusted for no official language, international education, racialized status, region of origin, length of time in Canada

[†] Reference category

* Significantly different from reference category ($p < 0.05$)

~ Significantly different from comparison category (Total immigrants to Canadian-born; Recent to Long-term Immigrants) ($p < 0.05$)

Source: 2003 Canadian Community Health Survey 2.1