When Pay Equity Policy Is not Enough: Persistence of the Gender Wage Gap Among Health, Education, and STEM Professionals in Canada, 2006—2016

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Abstract

This study examines gender, geographic, and earnings inequalities within and across 13 health, education, and STEM (science, technology, engineering, and mathematics and computer science) professions in Canada. Data from the 2006 and 2016 population censuses were pooled and linked to a continuous geospatial remoteness index for assessing trends in occupational feminization and associated employment earnings among degree-holding professionals aged 25–54. Linear regression and Oaxaca-Blinder decomposition methods were used to analyze how personal, professional, and socioenvironmental factors may attenuate or magnify wage differentials by sex. Results show the STEM professions tended to remain male-dominated, heavily urbanized, and subject to significantly lower earnings for women compared to men. Other historically female-dominated professions, notably nursing professionals and secondary school teachers, were characterized with geographic distributions most closely approaching the general population, relatively narrower gender wage gaps, but also lower average annual earnings. A significant gender wage differential was found in each profession, with women earning 4.6–12.5% less than men, after adjusting for traditional human capital measures, social characteristics intersecting with gender, and community remoteness and accessibility. Residential remoteness and census period generally explained little of the gender wage gap. Despite decades of pay equity policies in Canada, women’s earnings averaged 2.3–7.9% less than men’s due to unexplained factors, a finding which may be attributed, at least in part, to persistent (unmeasured) gender discrimination even in highly educated professions.

Keywords Human capital · Wage equity · Gender wage gap · Professional labour markets · Rural and urban labour markets · Population censuses

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RÉSUMÉ
Cette étude examine les disparités de rémunération entre les sexes et selon l’emplacement géographique au sein de 13 professions de la santé, de l’éducation et des STIM (sciences, technologies, ingénierie, mathématiques et informatique) au Canada. Les données des recensements de la population de 2006 et 2016 ont été regroupées et couplées à un indice d’éloignement géospatial continu pour évaluer les tendances de la féminisation des professions et des revenus d’emploi associés chez les professionnels titulaires d’un diplôme âgés de 25 à 54 ans. Des méthodes de régression linéaire et de décomposition d’Oaxaca-Blinder ont été utilisées pour analyser comment les facteurs personnels, professionnels et socio-environnementaux peuvent atténuer ou amplifier les écarts salariaux selon le sexe. Les résultats montrent que les professions STIM ont tendance à rester dominées par les hommes, fortement urbanisées et soumises à des revenus nettement inférieurs pour les femmes par rapport aux hommes. D’autres professions historiquement dominées par les femmes, notamment les infirmières et les enseignants du secondaire, se caractérisaient par des répartitions géographiques se rapprochant le plus de la population générale, des écarts salariaux entre les sexes relativement plus étroits, mais également des revenus annuels moyens inférieurs. Un écart salarial entre les sexes statistiquement significatif a été constaté dans chaque profession, les femmes gagnant 4,6 à 12,5% de moins que les hommes, après ajustement en fonction des mesures traditionnelles du capital humain, des caractéristiques sociales qui se recoupent avec le sexe, et de l’éloignement et l’accessibilité des collectivités. L’éloignement résidentiel et période de recensement expliquent généralement peu l’écart salarial entre les sexes. Malgré des décennies de politiques d’équité salariale au Canada, les gains des femmes étaient en moyenne de 2,3 à 7,9% inférieurs à ceux des hommes pour des raisons inexpliquées, une constatation qui peut être attribuée, du moins en partie, à une discrimination à l’égard des femmes persistante (et non mesurée), même dans les professions hautement scolarisées.

MOTS CLÉS Capital humain · Équité salariale · Disparité salariale entre les sexes · Marchés du travail professionnels · Marchés du travail rural et urbain · Recensements de la population

1 Introduction
Numerous studies have examined and re-examined gender-related wage gaps in Canada to help inform policy solutions to address this form of social inequality (Baker & Drolet, 2010; Brown & Troutt, 2017; Pelletier et al., 2019; Schirle, 2015; Vincent, 2013). Even though most high-income countries have laws that mandate the equal treatment of women and men in the labour market, a gender wage gap is found in almost every OECD nation’s economies, with women working full-time earning an average of 87 cents for every dollar that a man makes (Organisation for Economic Co-operation & Development, 2021). The Canadian female:male earning ratio parallels the OECD rate, also at 87 cents to the dollar (Pelletier et al., 2019). Pay equity
policies have existed in Canada since the 1970s. Although a variety of legislative and regulatory initiatives have been enacted at the federal, provincial, and territorial levels, gender wage disparities persist even among highly educated professionals (Vincent, 2013). While some evidence indicates the Canadian gender wage gap has narrowed over time, this inequality remains despite women having surpassed men in educational attainment, diversified their fields of study, increased their representation in higher-status occupations, and increased their productivity-enhancing characteristics (Ferguson, 2016; Morissette et al., 2013; Moyser, 2019; Pelletier et al., 2019; Schirle, 2015).

Canada’s increasingly knowledge-based economy may have the potential to eliminate gender-based professional inequality in many fields that require higher education, under the speculation that women and men would be employed based on their knowledge and skills rather than gender stereotypes and biases (Osten, 2021; Walby, 2011). Traditional gender divisions of labour are being challenged by the feminization of professions, or increases over time in the number of women practicing in a given occupation (Adams, 2010a). However, even as more women enter traditionally male-dominated occupations, their professional experiences continue to be defined by their gender (Adams, 2010a; Osten, 2021). Gender-based inequalities have been found to persist among women in medicine, university teaching, and other traditionally male-dominated occupations, notably in the science, technology, engineering, and mathematics and computer science (STEM) fields (Brown & Troutt, 2017; Cheryan et al., 2017; Cohen & Kiran, 2020). Among its performance indicators towards gender equality goals, the Canadian government’s Gender Results Framework monitors the sex distribution of postsecondary qualification holders and the difference between women and men in average annual employment income (Women & Gender Equality Canada, 2022). With mounting research evidence of a wage gap comes increased calls for explaining the gap to help inform policy accountability (Guppy & Vincent, 2021). Of special interest are professions that have generally been seen as among the most prestigious in the labour market of the knowledge economy, especially those demarcated by their specific educational requirements (Adams, 2010b).

The main aim of this study is to analyze recent trends in occupational feminization and their impacts on employment income among selected groups of degree-holding professionals in the health, education, and STEM fields across Canada. We revisit a question central to understanding gender-based wage differentials: do women earn less than men because of who they are, what they do, or where they work (Vincent, 2013). We hypothesized that (i) earning differences between women and men will persist in occupations that require a university education, but to a lesser extent than recorded in the overall labour market (i.e., 87 cents to the dollar as reported elsewhere); (ii) the earnings gap will be magnified for women working in male-dominated occupations regardless of any movement towards gender parity in qualifications and other human capital factors; (iii) the earnings gap will be magnified for women working in more rural and remote parts of the country, exacerbating disparities in the spatial distribution of knowledge-based human capital; and (iv) any observed intersections of gender, human capital, and place will not fully explain measured wage differences between women and men. Regression and decomposition
analyses of 2006 and 2016 national population census data are used to help elucidate the personal, professional, and socioenvironmental factors that may affect earnings within and between 13 included knowledge-intensive professions. Given the wide and expanding range of occupations linked to the knowledge economy (Adams, 2010b), we elected to focus on a core set of professions characterized by disciplinary knowledge requirements. We expect to find a statistically significant “unexplained” component in the decomposition models, that is, evidence of levels of compensation or other conditions of employment being based on group averages rather than work performance and thus assumed to capture effects of gender discrimination (Haager, 2000). In other words, it is postulated that policies attempting to remedy pay inequities between women and men need to look beyond conventional human capital variables and further consider the implications of deeply embedded gender inequality in labour practices, cultures, and institutions (Walby, 2011).

2 Background

2.1 Pay Equity Policy and Gender Occupational Segregation

Early Canadian and international gender pay equity conventions tended to focus on the requirement of “equal pay” for “equal work,” meaning that women should get the same pay as men for doing identical jobs (Guppy & Vincent, 2021; Vincent, 2013). Recognition of the shortcomings of such a narrow definition, however, led to the evolution of the policy landscape in Canada distinguishing two principles: wage parity (that is, equal wages of men and women doing the same work) and comparable worth (i.e., equal wages for doing different work with similar skills, qualifications, working conditions, and levels of responsibility) (Gunderson, 2002; Vincent, 2013). This shift was meant to pro-actively address the issue of women being disproportionately clustered in lower-paying positions within sectors and organizations (Gunderson, 2002; Hart, 2002). In Canada and other OECD countries, women’s professional labour historically tended to be concentrated in certain jobs like nursing and lower secondary teaching, which were often perceived in society as less “serious” and less valuable because they were seen to support men’s professions like medicine and postsecondary teaching (Adams, 2010a; Murphy & Oesch, 2016; Schmude & Jackisch, 2019). Many past studies have shown a clear association between occupations’ sex composition and their wages, with female-dominated occupations generally paying less (Boudarbat & Connolly, 2013; England et al., 2007; Murphy & Oesch, 2016).

An outstanding challenge to policy accountability remains the building of consensus- and evidence-based metrics for job and professional classes for comparison, especially given the inherently political nature of policy development and the unique regulatory practices surrounding selected professions (Adams, 2010b; Hart, 2002). It is argued that gender-responsive policies need to look beyond differences in human capital endowments and acknowledge societal devaluation of certain occupations, i.e., that female-stereotypic internalized values (oriented towards caring for others) tend to be less valued in society compared to male-stereotypic values.
(focusing on status, competition, and upward mobility) (Block et al., 2018; England et al., 2007; Witz, 1992). Feminization of professional labour can thus be defined not only in terms of changes in the numbers of women in a given occupation, but the relative attractiveness of female-dominated versus male-dominated occupations which may also affect relative pay by valuative discrimination (Adams, 2010a; England et al., 2007; Murphy & Oesch, 2016).

2.2 Human Capital Specialization and the Gender Wage Gap

While the body of research demonstrating positive returns of education on labour market outcomes is large and robust, the extent to which education impacts employment income for subgroups of the Canadian population has received relatively less attention (Goldmann & Racine, 2021). To date, women’s contributions to the social and scientific development of societies have not been well documented, and true gender equity in higher-paying occupations has been hard to find. For example, in Canada’s fee-for-service medical system, resistance to even admitting gender-based wage gaps among physicians are possible, need to be changed, or warrant more research is widespread (Izenberg et al., 2018). Empiricisms are emerging but remain incomplete. Recent studies at the provincial level based on administrative data found significantly lower earnings among women physicians compared to men in British Columbia after adjusting for patient contacts and other factors (Hedden et al., 2017), and among women surgeons compared to men in Ontario as attributed, at least in part, to women having fewer opportunities to perform the most lucrative surgical procedures (Dossa et al., 2019). In a university teaching context, changes over time to salary structures for professors and instructors reduced but did not eliminate the raw female:male salary differential, as promotion rates remained lower among women (Brown & Troutt, 2017). In STEM fields, the persistence of sex segregation in the choice of university programs, greater skill mismatches in labour market outcomes among women graduates compared with men, and gender wage gaps have been documented in Canada and elsewhere, largely attributed to unmeasured factors such as broader cultural beliefs about gender-based labour market expectations (Cech, 2013; Hango, 2013; Osten, 2021; Sterling et al., 2020).

Despite the growing calls for better evidence on gender bias in resources and incentives to ensure women’s full economic participation, issues of how labour market opportunities and remuneration structures may affect women and men in professions differently have not all been clearly identified. Becker’s classic human capital theory has been widely used to explore gender pay gaps (Becker, 1964) and, in turn, shape guidelines for policy. The theory suggests that individuals who invest in the accumulation of human capital (e.g., advanced education) recover the costs of such investments (e.g., tuition costs) in the form of eventual higher earnings; women who anticipate workforce interruptions (e.g., pregnancy and maternity leaves) may choose jobs where the earnings may be lower but the penalties for labour force interruptions are smaller. Equivalent levels of education and employment in the same occupations among women and men may not fully explain wage gaps and other gendered labour disparities, however, especially given the rise of women participating
in traditionally male fields such as medicine (Moyser, 2019; Nowak & Preston, 2001).

2.3 Spatiality of Human Capital and the Gender Wage Gap

Although it has been contended that living in a rural area is one of the most significant drivers of socioeconomic inequality for women (Leclerc, 2021), little attention has been paid to examining spatial dimensions of disparities in employment conditions and earnings inequalities in Canada, which may be intensified by a persistent sexual division of labour (Ali & Newbold, 2021; Breau, 2015). Smaller geographic areas may reflect local labour market opportunities and organizational cultures that may be associated with wage disparities by gender (Denier & Waite, 2018), but evidence on the relationship between gendered spatialities in work with women’s full inclusion in the knowledge economy is fragmented (Breau, 2015; Walby, 2011). Rural women may be less predisposed to opt for traditionally male-dominated careers like STEM fields, viewed as unfamiliar “urban” jobs rather than producing the occupational skills needed in rural communities (Hango et al., 2021). Simultaneously, men may be more likely to perceive limited career opportunities in already low-prestige professions in rural and remote areas, leading to even greater concentrations in rural milieus of women in female-dominated professions, such as lower secondary teaching (Schmude & Jackisch, 2019). However, the labour market outcomes of residents in the most rural and remote northern parts of Canada have been greatly understudied (Hango et al., 2021). Policy efforts to enhance the contributions of women and men to meet the elevated demands of the knowledge-based economy need to address the acute skills deficits observed in rural regions, including overcoming gendered norms exacerbating rural—urban disparities in human capital (Zarifa et al., 2019). Theory-based assumptions centred on improving levels of education alone are insufficient. An analysis of 2006 Canadian census data revealed that women residing in rural and remote areas were slightly more likely than men to have attained a diploma or degree, but also more likely to be living in lower income situations (Status of Women Canada, 2016). Human capital theory does not explicitly discuss wage differentials by rural versus urban residence; rather, it is often simply presumed that urbanity should be associated with higher compensation given the productive advantage of agglomerated economies and differences in costs of living (Beckstead et al., 2010; Haager, 2000). Some limited research has indicated a statistically and economically significant rural/urban female wage gap in Canada, attributed to “ thinner” rural labour markets (Vera-Toscano et al., 2004).

Moreover, most definitions of rurality in the available literature focus on geographic characteristics (e.g., low population density) rather than socioeconomic issues associated with rural living, which can include a wide range of community characteristics such as level of affluence, weather-dependent travel times to access essential services, and other facilitators or barriers to the recruitment and retention of skilled workers (Gessert et al., 2015; Kaneko et al., 2021; Leclerc, 2021). Given the predominance of urban subjects in labour market studies, an evidence gap persists in terms of how women and men in rural and remote areas access higher paying
professions as well as the characteristics of communities with higher or lower proportions of scientific professionals. As such, this study considered spatiality across the rural–urban continuum as a potential contributor to gender wage gaps, considering the complex socioenvironmental contexts of rural places. To achieve this, we linked the individual-level census data to geocoded indicators of community remoteness and accessibility (Statistics Canada, 2020), to investigate whether a greater depreciation of human capital characteristics (e.g., educational attainment) would be seen leading to wider gender wage gaps among professionals in the most rural and remote areas of the country.

3 Data and Methods

3.1 Data Sources and Target Population

This study draws on repeated cross-sectional data pooled from Statistics Canada’s 2006 and 2016 national population censuses. In each of these census rounds, most households received a short-form questionnaire asking a minimum number of questions; a mandatory long-form questionnaire was distributed to a sample of households (20% in 2006 and 25% in 2016) probing for more detailed information on a range of variables such as sociodemographic characteristics and labour market activities. The census captures an essentially complete enumeration of the Canadian population; the response rate for the long-form questionnaire was 97.8% in 2016 (Statistics Canada, 2017a). The household sample excludes citizens living temporarily in other countries, members of the Canadian Forces stationed outside the country, and persons living in collective dwellings (e.g., nursing homes, training centre residences).

The census data from the long-form questionnaire included several variables relevant to measuring and explaining gender-related wage gaps including employment income, occupation, work tenure, and educational attainment. Specifically, 13 occupations across six broad professional groupings were included for comparative analysis based on the statistical standards of the 2006 and 2016 National Occupational Classification (NOC): STEM professionals: physical and life scientists, engineers and mathematicians; health professionals: physicians, nursing professionals; and education professionals: postsecondary educators, secondary school teachers (Table 1) (Employment & Social Development Canada, 2021). The target population included all full-time workers aged 25 to 54 years, having employment earnings in the year preceding each census, and identified by one of the selected occupations according to the main activities in their job. Given the present focus on highly skilled personnel, the study was limited to those having attained at least a bachelor’s degree. Person-level census weights were applied to ensure population representation of the results, with counts subject to controlled rounding in respect of Statistics Canada data privacy protocols. By occupation, between 9055 (mathematics) and 181,135 (computer and information sciences) professionals were enumerated in the 2016 census, with nursing professionals being the fastest growing group since 2006 (Table 1).
| Occupation | 2006 Census | 2016 Census |
|------------|-------------|-------------|
|             | NOC 2006 codes | Count | NOC 2016 codes | Count |
| STEM        |             |         |                |         |
| professionals |             |         |                |         |
| Physical and life science professionals |             |         |                |         |
| Physical science professionals (includes physicists, chemists, geologists, and other physical scientists) | C011, C012, C013, C014, C015 | 23,180 | 2111, 2112, 2113, 2114, 2115 | 20,150 |
| Life science professionals (includes biologists, foresters, agrologists, and other life scientists) | C021, C022, C023 | 18,980 | 2121, 2122, 2123 | 21,020 |
| Engineers and mathematicians |             |         |                |         |
| Civil, mechanical, electrical, and chemical (CMEC) engineers | C031, C032, C033, C034 | 72,355 | 2131, 2132, 2133, 2134 | 107,690 |
| Other engineers (includes metallurgical, geological, aerospace, and other engineers) | C041, C042, C043, C044, C045, C046, C047, C048 | 40,625 | 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148 | 42,435 |
| Architects and land use planners | C051, C052, C053, C054 | 16,615 | 2151, 2152, 2153, 2154 | 20,895 |
| Mathematicians | C061 | 5,435 | 2161 | 9,055 |
| Computer and information science professionals | C071, C072, C073, C074, C075 | 142,135 | 2171, 2172, 2173, 2174, 2175 | 181,135 |
| Health professionals |             |         |                |         |
| Physicians |             |         |                |         |
| Specialist physicians | D011 | 22,100 | 3111 | 27,240 |
| General practitioners | D012 | 26,995 | 3112 | 33,610 |
| Nursing professionals (includes nurse supervisors, registered nurses, and registered psychiatric nurses) | D111, D112 | 56,755 | 3011, 3012 | 102,770 |
| Education professionals |             |         |                |         |
| Postsecondary educators |             |         |                |         |
| University professors and lecturers | E111 | 32,400 | 4011 | 38,415 |
| College instructors | E121 | 35,640 | 4021 | 32,110 |
| Secondary school teachers | E131 | 108,205 | 4031 | 109,855 |

Workforce counts among full-time wage earners aged 25–54 (weighted for population representation). Source: Employment and Social Development Canada & Statistics Canada, Canadian Population Census (authors’ tabulations)

NOC National Occupational Classification
3.2 Outcome Variable: Employment Income

In the absence of a gold standard or singular definition of how wage differentials should be measured from a policy perspective (Baker & Drolet, 2010; Guppy & Vincent, 2021), the present study quantified the outcome of interest as individuals’ annual employment earnings. That said, the terms pay, wages, and earnings are used interchangeably in this report. Employment earnings refer to all income received as wages, salaries, and commission from paid employment and net income from self-employment or professional practice, as captured in each census for the preceding calendar year (Statistics Canada, 2017b). Including only those with positive annual employment income reported in either census, the dollar amounts from the 2006 census (i.e., relating to the 2005 calendar year) were adjusted for inflation to the 2016 census reference year (i.e., the 2015 calendar year).

3.3 Predictor Variables

3.3.1 Human Capital Characteristics

In accordance with human capital theory, we considered selected labour market variables widely postulated as related to professional earnings, including educational attainment (bachelor’s degree versus higher qualification), class of worker (employee versus self-employed), and immigration status (whether or not immigrated to Canada in adulthood, i.e., after age 19). We also divided the population into broad age groups as generally reflective of work experience: 25–34, 35–44, and 45–54 years.

3.3.2 Sex/Gender

Information on sex was captured in the 2006 and 2016 censuses as male or female, based on the available data according to each person’s closest associated category. We further considered several social identity factors that may intersect with sex and gender, including primary household maintainer (identified as the person who generally pays the rent or mortgage, taxes, utilities, and other household bills), marital status (whether or not in a marital or common-law living arrangement), family status (whether or not children are present in the household), visible minority status (whether or not the respondent self-identified as being non-Caucasian or non-white), and Indigenous identity (whether or not the respondent self-identified as First Nations, Métis, or Inuit) (Statistics Canada, 2017b).

3.3.3 Remoteness

Individuals’ place of residence at the time of the census was linked to geospatial information from Statistics Canada’s Index of Remoteness (IR) (Statistics
Canada, 2020). This continuous index ranges in value from zero to one, reflecting the country’s 5125 inhabited census subdivisions. It was based on a spatial gravity model to capture dimensions of remoteness and accessibility for all communities, from Canada’s most urbanized regions (lowest IR values, such as found in southern Ontario and southern Quebec) to communities with the least physical access to infrastructure and services for daily interaction (highest IR values, such as those not connected year-round to a population centre by a main road network) (Alasia et al., 2017; Statistics Canada, 2020). For the present analysis, the index was grouped into deciles, with all areas ordered from lowest to highest index score (i.e., decile 1 = most urbanized 10% of areas, decile 10 = least urbanized 10% of areas).

3.4 Analytical Approaches

Following a descriptive analysis of the target population, we conducted bivariate analyses to assess the (unadjusted) gender wage gap using the Student t-test for employment income, applying the log-transformation of the continuous variable to address data skewness (Eq. 1). We then used multiple linear regression to gauge trends and differentials in professional earnings, and applied the Oaxaca-Blinder decomposition method to estimate the “unexplained” component of wage gaps. Specifically, the multivariate linear regression analysis followed Eq. 2:

\[
\ln(\text{empin})_i = F_i \alpha + \varepsilon_i
\]

\[
\ln(\text{empin})_i = F_i \alpha + X_i \beta + \varepsilon_i
\]

That is, individuals’ logged employment income was modelled first for sex (including a dummy variable with female = 1 and male = 0), and second for sex and all other predictors of interest, and this for each of the 13 occupations.

Next, using the Oaxaca-Blinder decomposition method (Blinder, 1973; Oaxaca, 1973), we examined the difference between men and women in mean logged earnings, recognizing associations with their average labour market, sociodemographic, and residential characteristics, also known as the “explained” portion of observed wage gaps. Any “unexplained” portion that cannot be attributed to men’s and women’s observed characteristics is often referred to as the “discriminatory” effect yielding gender wage gaps. The wage equations for this decomposition technique based on two single-sex regressions are as follows:

\[
\ln(\text{empin}_M) = X_M \beta_M + \varepsilon_M
\]

\[
\ln(\text{empin}_F) = X_F \beta_F + \varepsilon_F
\]

where \(X_i\) represents each of the predictors of interest for males and for females, \(\beta\) its estimated parameter, and \(\varepsilon\) the associated error. The mean outcome difference can
be expressed as the difference in the linear prediction at the group-specific means of the regressors:

\[
\ln(\text{empin}_M) - \ln(\text{empin}_F) = (X_M)\hat{\beta}_M - (X_F)\hat{\beta}_F
\]

where \( E(\epsilon_i) = 0 \) by assumption.

The standard counterfactual decomposition approach was used on the pooled sample to determine the contribution of gender-based differences in the predictors, informing about (unobserved) discrimination in favour of men and estimating the wage they receive above what would be expected according to their characteristics at a non-discriminatory wage structure, and about the wages women receive below that expected in the absence of discrimination. The decomposition analysis was implemented using the Stata statistical software (Jann, 2008).

4 Results

4.1 Descriptive Results

Across the 13 occupations under observation, most STEM professions were observed to continue to be predominantly male workforces, with only life scientists achieving gender parity in 2016 (Fig. 1). Nursing professionals remained characterized with the highest sex segregation (90% women in 2016). Not surprisingly, other female-dominated professions included secondary school teachers.
(60%) and college instructors (59%). The physician workforce was feminizing over time, with increasing numbers of women general practitioners (53% in 2016) although specialists remained male-dominated (55% men). The most male-dominated occupations continued to be civil, mechanical, electrical, and chemical (CMEC) engineers (83% men), other engineers (83% men), and computer and information science professionals (77% men).

The female-dominated professions of life scientists, nursing professionals, and secondary school teachers were also those characterized with geographic distributions most closely approaching the general population, as assessed by community remoteness and accessibility (Fig. 2). The male-dominated mathematician and computer scientist workforces were the most concentrated in highly urbanized areas of the country. In particular, while 11.0% of Canada’s household population resided in the 60% most rural and remote areas (i.e., deciles 5–10 of the IR scores) in 2016, only 3.3% of STEM professionals resided in similarly characterized areas; the proportions were 10.9% among secondary school teachers, 6.2% among physicians, and 5.4% among postsecondary educators (not shown).

Women professionals tended to be younger than their male counterparts, that is, more often in the early-career age group (defined here as 25–34 years), a reflection of the feminization of professional occupations (Table 2). Among the highly sex-segregated nursing professional workforce, women were somewhat less often observed to have attained a graduate level qualification compared to men (11.7% and 14.9%, respectively, in 2016). Conversely, women STEM professionals were somewhat more likely than men to have a graduate education (55.9 versus 55.3% among physical and life scientists, and 37.1 versus 33.1% among engineers and mathematicians). In terms of the proportion of professionals who had immigrated to Canada in adulthood, a factor that may reflect differences in the pipeline to advanced qualifications and labour market access, this was highest among engineers and mathematicians, and even more so among women compared with men (41.4 versus 39.7% in 2016). The share of adult migrants was lowest among secondary school teachers. On the other hand, the latter

![Fig. 2 Mean remoteness score among STEM, health, and education professionals aged 25–54, by sex](image)

Note: Scores based on Index of Remoteness (IR) value by census subdivision of residence among full-time wage earners aged 25–54. Scored between 0 and 30, the bars represent remoteness scores among the total household population (2006: 0.14, 2016: 0.142). Source: 2006 and 2016 Canadian Population Census (authors’ calculations).
Table 2  Selected characteristics of STEM, health, and education professionals aged 25–54, by sex

| Characteristic                        | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 | 2006 | 2016 |
|--------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Age: 25–34 years (%)                | 46.0 | 27.5 | 37.7 | 28.9 | 42.4 | 35.5 | 38.1 | 35.2 | 35.4 | 21.7 | 40.8 | 29.2 | 34.4 | 34.4 | 47.1 | 41.6 | 34.4 | 34.4 | 39.4 | 30.2 | 29.0 | 21.3 |
| Graduate level education (%)        | 51.0 | 52.9 | 55.9 | 55.3 | 33.3 | 31.9 | 37.1 | 33.1 | 97.2 | 97.7 | 97.5 | 99.0 | 17.8 | 22.7 | 11.7 | 14.9 | 63.8 | 75.3 | 72.7 | 82.3 | 38.2 | 39.8 | 31.4 | 32.6 |
| Class of worker: Employee (%)       | 95.5 | 90.7 | 97.3 | 94.3 | 94.0 | 90.6 | 95.8 | 92.7 | 54.5 | 45.8 | 56.8 | 54.1 | 99.4 | 98.8 | 99.6 | 99.3 | 97.3 | 98.0 | 98.5 | 99.0 | 100.0 | 100.0 | 100.0 |
| Immigrated in adulthood (%)         | 26.0 | 24.3 | 25.6 | 28.4 | 35.5 | 33.4 | 41.4 | 39.7 | 18.0 | 23.8 | 16.0 | 28.4 | 15.9 | 23.8 | 16.0 | 28.4 | 16.7 | 26.3 | 20.5 | 34.4 | 6.5 | 5.3 | 5.2 | 5.3 |
| Primary household maintainer (%)    | 46.8 | 76.4 | 48.8 | 73.8 | 45.4 | 76.6 | 46.0 | 76.4 | 49.6 | 81.4 | 50.8 | 77.8 | 46.2 | 81.4 | 48.8 | 69.7 | 51.9 | 76.5 | 53.4 | 74.7 | 45.8 | 71.6 | 48.3 | 71.8 |
| Married/in union (%)                | 68.4 | 79.4 | 71.4 | 78.2 | 68.8 | 74.7 | 71.3 | 74.7 | 72.1 | 82.1 | 71.9 | 78.6 | 68.9 | 69.7 | 69.8 | 68.8 | 69.1 | 75.8 | 71.6 | 78.6 | 706 | 753 | 739 | 790 |
| Family status: children in household (%) | 47.2 | 60.2 | 52.1 | 59.2 | 50.0 | 55.4 | 53.3 | 56.2 | 55.5 | 68.0 | 55.8 | 62.6 | 56.3 | 47.7 | 55.7 | 50.0 | 53.2 | 57.6 | 59.3 | 60.9 | 54.4 | 57.8 | 63.5 | 65.6 |
| Visible minority (%)                | 21.7 | 19.7 | 26.2 | 25.4 | 35.5 | 32.3 | 46.5 | 43.0 | 23.0 | 26.3 | 30.8 | 39.3 | 20.7 | 25.8 | 28.2 | 40.3 | 12.1 | 16.7 | 18.4 | 23.9 | 8.6 | 8.6 | 12.1 | 12.1 |
| Indigenous identity (%)             | 0.6  | 0.8  | 1.7  | 1.4  | 0.5  | 0.3  | 0.9  | 0.7  | 0.3  | 0.5  | 1.0  | 0.9  | 1.7  | 1.4  | 3.0  | 2.2  | 1.3  | 0.8  | 2.2  | 1.3  | 1.5  | 1.5  | 2.8  | 2.7  |

Workforce shares among full-time wage earners aged 25–54 (weighted for population representation). Source: 2006 and 2016 Canadian Population Census (authors’ calculations)
occupation was characterized with among the highest proportions of professionals of Indigenous identity.

4.2 Occupational Earnings by Gender

Across the 13 groups of university-educated professionals under observation, women earned on average $0.80 for every dollar that a man earned based on the 2016 census data. This was up somewhat from the earlier 2006 census, when the female: male earnings ratio was $0.76 to the dollar (not shown). Average annual wages tended be lower among female-dominated and more rapidly feminizing occupations (college instructors, secondary school teachers, life scientists, and nursing professionals) compared with male-dominated STEM occupations (physical scientists, engineers, and mathematicians) and the highest-paid physicians (Fig. 3). According to the bivariate models, all 13 occupations were marked by significant (unadjusted) gender-based wage differentials, with women’s annual earnings in relation to men’s ranging between 8% less (among college instructors) and 19% less (among physical scientists and mathematicians) in 2016 ($p < 0.05$). The biggest relative gains over time were found in the physician workforce: the female: male wage gap among general practitioners went from 32% less in 2006 to 10% less 10 years later, while among specialists, it narrowed from 28% less to 14% less over the same period.

4.3 Multivariate Analysis of Earnings Differentials

After adjusting in the multiple regression models for census year, residential remoteness, human capital factors, and social identity factors, the gender wage differential remained significant across all 13 occupations ($p < 0.05$) (Fig. 4). Women were found to earn between 4.6% less (nursing professionals) and 12.5% less (architects), controlling for the set of covariates.

While some associations of residential remoteness were observed by occupation, clear inverse gradients between rurality and annual wages were only found for mathematicians and computer scientists (i.e., the two most urban professions under observation), with wage differentials for those residing in the 60% most rural and remote communities of 36.0% less and 20.0% less, respectively, compared to their counterparts in the most urbanized communities (see Table 3 in the appendix). Conversely, health professionals residing in the 60% most rural and remote communities tended to earn more than their counterparts in the most urbanized communities: 13.5% more for specialist physicians, 9.4% more for general practitioners, and 2.1% more for nursing professionals. Later-career professionals (aged 45–54) were found to have earned more than their younger counterparts across all 13 occupations, as expected, while adult migrants earned consistently less than their counterparts who were either Canadian-born or who migrated in childhood or adolescence. In terms of social identity factors, family status, visible minority status, and Indigenous identity were inconsistently associated with risk of lower earnings across occupations. Effects of the time period were also inconsistent by occupation; for example, engineers’ wages gained
significantly between censuses (14.8% higher in 2016 among CMEC engineers and 9.5% higher among other engineers), whereas annual wages among physicians (i.e., a rapidly feminizing workforce) lost in value against inflation over the decade, all else being equal.

Based on the Oaxaca-Blinder decomposition as seen in Fig. 5, many important differences in the compositions of the male versus female populations explained the observed wage differentials across the 13 occupations. Human capital factors offered the most explanatory insight into the gender wage gap among life scientists, mathematicians, physicians, and secondary school teachers. Conversely, the gender wage gap was more closely associated with differences in the average social characteristics of men and women among physical scientists, engineers, architects, computer scientists, nursing professionals, university professors, and college instructors. Somewhat unexpectedly, little of the occupation-specific wage gaps could be accounted for by sex differences by time period (except among health professionals) or by residential remoteness. Rather, much of the gender wage gap remained unexplained, with between 35.0% (among specialist physicians) and 68.8% (among computer scientists) of the differences between men and women in the observed covariates unable to explain the gender wage gap. These results translate to meaning that women’s occupational earnings averaged 2.3% less (among college instructors) to 7.9% less (among architects) than their male counterparts due to unexplained factors.

![Fig. 3 Women’s mean annual wages and (unadjusted) female/male wage gap among STEM, health, and education professionals aged 25–54](image-url)
5 Discussion

Despite a widespread recognition of gendered and geospatial imbalances in knowledge-based labour market outcomes including occupational earnings, evidence is limited on gender wage gaps among highly skilled professionals by degree of residential rurality. Using two cycles of census data (2006 and 2016) linked to geocoded data on community remoteness and accessibility, we were able to identify and report on progress with and barriers to women’s advancements in social and scientific professions requiring a university degree across Canada. The results demonstrated considerable disparities between women’s and men’s participation and earnings across different health, education, and STEM professions. The STEM professions tended to remain male-dominated, heavily urbanized, and subject to significantly lower wages for women compared to men; an exception was life scientists, among whom numerical sex parity was observed by the time of the 2016 census (although not wage equity). Other historically female-dominated professions, notably nursing professionals and secondary school teachers, were simultaneously characterized with geographic distributions most closely approaching the general population, as well as relatively narrower gender wage gaps, but also lower average annual earnings. For none of the 13 occupations under observation could the measured gender wage gaps be fully explained by human capital factors, social identity factors, rurality, or changes in characteristics over time.

Specifically, our first research hypothesis was not confirmed. A female: male earning ratio of $0.80 to the dollar was found across university-educated professionals, somewhat larger than the average level as reported elsewhere in the
general labour force ($0.87 to the dollar). After adjusting for advanced qualifications and other professional and personal variables, the earnings gap was found to be less acute in the most female-dominated professions of nursing and secondary teaching (with women earning 4.6–6.7% less than men) and more acute in the most male-dominated engineering professions (8.3–10.5% less). However, magnified gender wage differences were also seen in certain rapidly feminizing professions, including physicians and life scientists (8.7–11.7% less). While the results did not confirm our third research hypothesis of exacerbated wage disparities by spatial distribution, the finding that the most rural and remote communities across the country are also home to the highest concentrations of professionals (of both sexes) in the most female-dominated or feminizing occupations (life scientists, nursing professionals, and secondary teachers) warrants further investigation.

The gender wage gaps across professions were found to remain largely unexplained, with the unexplained residual representing 35–69% of the gap, echoing findings from other studies also using decomposition techniques and thus supporting our fourth research hypothesis. Statistical evidence of unexplained wage differentials between men and women with the same average characteristics working within the same profession, or across professions characterized with similar skill levels and demands, may include effects of systemic gender bias and discrimination (Baker & Drolet, 2010; Brown & Troutt, 2017; England et al., 2007; Moyser, 2019; Nowak & Preston, 2001; Pelletier et al., 2019). They may also include gendered effects of other attributes not measured within the available data or included in the present analysis, such as training and promotion.
opportunities, career interruptions for parenthood or caregiving, workplaces and industrial sector, wage negotiations and sectoral inertia, union coverage, flexibility of work hours, non-cognitive skills, sexual identity minority status, personal preferences or expectations of discrimination, and other (unobserved) social conventions (Boudarbat & Connolly, 2013; Denier & Waite, 2018; Hou & Coulombe, 2010; Moyser, 2019; Schirle, 2015). While we were unable to assess explicitly the effectiveness of pay equity laws, monitoring the national situation in terms of progress (or lack thereof) towards gender wage equality remains important since legislation alone remains insufficient to ensure equal valuation of work traditionally performed by men versus that traditionally done by women (Boudarbat & Connolly, 2013; Denier & Waite, 2018).

In many ways, the present results were not entirely surprising, as persistent wage inequalities between women and men have been widely found in Canada and around the world (Moyser, 2019). Previous Canadian studies have attributed a large portion of the overall wage gap to sex differences in industry and/or occupation, including shifts in women’s representation in managerial and professional occupations (Baker & Drolet, 2010; Moyser, 2019; Schirle, 2015). Some time-trend analyses have seen few signs of significant improvements in the raw wage gap in higher-paying job categories (Boudarbat & Connolly, 2013), including among professors at one university after adjusting for discipline and rank (Brown & Troutt, 2017) or among information and computer technology graduates from another (Finnie et al., 2018). Others have focused on spatial dimensions of the wage gap, modelling dichotomous rural/urban differences (Vera-Toscano et al., 2004), or variations across provinces (Schirle, 2015). Significant wage premiums from post-secondary education have been found among Indigenous Canadians at the national level, but with women still earning substantially less than men (Goldmann & Racine, 2021). Studies elsewhere have examined interacting effects of gender with other social identity characteristics among the highly educated, such as gender and race in the United States (Black et al., 2008). Few studies consider a parsimonious set of determinants capturing human capital, social identity, rurality and remoteness as a continuous construct, and time period, and this across a range of health, education, and STEM occupations.

5.1 Study Strengths and Limitations

As with all observational research, this study was characterized by certain strengths and a few limitations. Differences in the collection methodology for employment income across census rounds may have hampered the time-trend analyses. In 2016, income information was gathered in the census for the first time relying solely on data integrated from administrative federal tax and benefits records (Statistics Canada, 2017b). The linkage rate of tax records to long-form respondents was very high in the 2016 census (97.1%), but it had been less so 10 years prior (73.4% in 2006) (Statistics Canada, 2017c). While enhanced use of administrative data offers numerous advantages including reduced response burden and increased quality and quantity of income data available, comparability may be affected. This may be especially relevant for the physician workforce, a group distinguished by higher
rates of self-employment under the fee-for-service medical remuneration model, which may impact estimates of net income (payments minus self-reported overhead). Future approaches to better assess time-trends in the pay gap could include the implementation of routine gender-based pay audits (Cohen & Kiran, 2020). Putting the spotlight on increased transparency of pay and workforce composition would be the next innovative turn of pay equity policy (Guppy & Vincent, 2021).

Another limitation to using census data for evaluating wage gaps was discordance in the reference periods between different labour force variables; in particular, questions on the kind of work performed in a job for pay or in self-employment generally referred to the census reference week (in the month of May), whereas income data covered the preceding calendar year. It is possible that some respondents’ employment income may not have corresponded to their reported main occupation, which in turn may not have precisely reflected provincial regulations for the practice of certain professions (e.g., architects, engineers, registered nurses). While this analysis was limited to full-time workers (a variable with the same reference year as employment income, and a common approach in the literature), given that more women are in part-time work compared with men, a differential selection by sex may have resulted (Antonie et al., 2020). Moreover, given the present focus on specific groups of professionals, sample size limitations and privacy controls surrounding the data precluded our ability to disaggregate results for women and men across the component groups of Indigenous identity. We were unable to differentiate the visible minority population into distinct ethnic and racial groups for the same reason; research elsewhere covering the whole Canadian-born population has found differences in relative earnings across specific visible minority groups (Hou & Coulombe, 2010). Future analyses could also expand the number of occupations under investigation, such as considering law professionals and management positions.

That said, a key strength of this study was the database linkage of the individual-level census responses with information on geographical proximity and accessibility of all communities from the national Index of Remoteness (Statistics Canada, 2020). Our analysis thus looked beyond simple geographic delineations based on administrative boundaries or population size to further capture measures of service availability (Alasia et al., 2017). Previous examinations of regional earnings differences in Canada have tended to focus on cross-provincial or rural versus urban variations, which can be large (Beckstead et al., 2010), but which fail to appreciate that rurality is highly heterogeneous. Given the lack of a consensual framework for discrete categories of remoteness based on the continuous index, we used a straightforward interval classification by dividing all census subdivisions equally into deciles; more research is needed on approaches for analyzing and classifying the cut-off points between remoteness categories to meet different research needs and user requirements (Subedi et al., 2020).

6 Conclusions

Enhancing opportunities for women and men to pursue and prosper (in terms of intrinsic and extrinsic values) in a range of professional careers may help ensure a more diverse and geographically balanced workforce in line with population
representation and needs. Controlling for a number of human capital, social identity, and residential community factors, we found a significant and persistent gender wage differential across 13 health, education, and STEM occupations, with women earning 4.6—12.5% less than men. Residential remoteness and period effects generally explained little of the gender wage gap by occupation; women’s earnings averaged 2.3—7.9% less due to unexplained factors, a finding which may be attributed, at least in part, to persistent (unobserved) gender discrimination even in highly educated professions.

Results of this study suggested that in addition to transparent reporting of gender-based pay to help tackle wage gaps while mitigating unintended consequences of reduced average earnings, policy efforts need to address occupational segregation. This may entail initiatives such as changes to university policies, admission criteria, or scholarships to support young women and young men to diversify their educational and professional choices and to overcome gender stereotypes in career trajectories. Increased diversity is one way to address problematic societal perceptions of highly sex-segregated professions. Widespread perceptions of some professions and subfields as being more “chilly” towards women, as lacking prestige and sufficient pay (such as nursing versus other health practitioners, or biological versus physical scientists), or of being more or less hospitable to work-family balance (e.g., family medicine and pediatrics versus surgical specialties) must be acknowledged (Cheryan et al., 2017; Cohen & Kiran, 2020; Mann & DiPrete, 2013; Nowak & Preston, 2001; Vincent, 2013). While pay equity policy may be a valuable lever to address compensation differentials for work of comparable value, there is little documented evidence that such policy initiatives have independently affected aggregate wages in predominantly female jobs or the gender pay gap overall (Baker & Fortin, 2004). One of the identified obstacles to implementation is deficient compliance among smaller establishments (Baker & Fortin, 2004), which are themselves more likely to be found in smaller population centres (Beckstead et al., 2010). At the same time, while employment in the public sector has been associated with a narrowing of gender wage gaps in Canada compared with private sector jobs (Pelletier et al., 2019), the responsibility to examine and address gender-related inequalities extends beyond any given sector or organization (Women & Gender Equality Canada, 2021). Given the vital role that professionals in the health, education, and STEM fields play in Canada’s socioeconomic development, explaining trends and patterns in gender wage gaps within and between skilled professions and across the rural—urban continuum — as a marker of women’s and men’s full labour market inclusion — remains an important area for research to support evidence-informed policy decisions.
### Table 3 Regression parameters (and 95% confidence intervals) for predictors of log annual wages, by occupation

| Characteristic | 1. Physical scientists | 2. Life scientists | 3. CMEC engineers | 4. Other engineers | 5. Architects | 6. Mathematicians | 7. Computer and info scientists |
|---------------|-----------------------|-------------------|-------------------|-------------------|--------------|------------------|-------------------------------|
| **Sex:** Female (ref: Male) | −0.126* (−0.166 to −0.086) | −0.122* (−0.155 to −0.088) | −0.111* (−0.132 to −0.090) | −0.087* (−0.118 to −0.056) | −0.134* (−0.166 to −0.102) | −0.123* (−0.168 to −0.078) | −0.088* (−0.102 to −0.075) |
| **Areal remoteness:** Decile 2 (ref: Decile 1) | −0.121* (−0.178 to −0.063) | −0.048* (−0.090 to −0.006) | 0.016 (−0.003 to 0.036) | −0.078* (−0.115 to −0.041) | −0.026 (−0.071 to 0.019) | −0.105* (−0.156 to −0.055) | −0.128* (−0.146 to −0.110) |
| **Areal remoteness:** Decile 3 (ref: Decile 1) | −0.072* (−0.131 to −0.014) | −0.006 (−0.054 to 0.004) | −0.037* (−0.064 to 0.010) | −0.117* (−0.162 to −0.072) | −0.090* (−0.156 to −0.024) | −0.210* (−0.307 to −0.113) | −0.171* (−0.194 to −0.147) |
| **Areal remoteness:** Decile 4 (ref: Decile 1) | −0.019 (−0.083 to 0.044) | 0.033 (−0.020 to 0.085) | −0.052* (−0.089 to 0.016) | −0.051 (−0.111 to 0.009) | −0.167* (−0.276 to 0.058) | −0.217* (−0.361 to 0.074) | −0.205* (−0.253 to 0.157) |
| **Areal remoteness:** Deciles 5 + (ref: Decile 1) | −0.020 (−0.095 to 0.054) | 0.032 (−0.008 to 0.073) | 0.010 (−0.028 to 0.048) | 0.088* (−0.032 to 0.144) | −0.070 (−0.159 to 0.019) | −0.446* (−0.878 to 0.013) | −0.223* (−0.269 to −0.177) |
| **Age group:** 25–34 years (ref: 35–44 years) | −0.425* (−0.471 to −0.379) | −0.409* (−0.450 to −0.368) | −0.323* (−0.342 to −0.304) | −0.292* (−0.320 to −0.263) | −0.348* (−0.388 to −0.309) | −0.291* (−0.366 to −0.215) | −0.264* (−0.278 to −0.250) |
| **Age group:** 45–54 years (ref: 35–44 years) | 0.187* (0.146–0.228) | 0.151* (0.116–0.186) | 0.135* (0.116–0.154) | 0.126* (0.097–0.155) | 0.196* (0.155–0.238) | 0.219* (0.146–0.293) | 0.090* (0.076–0.103) |
| **Education:** Graduate level (ref: Bachelor’s at most) | 0.002 (−0.035–0.039) | 0.042* (0.010–0.074) | 0.024* (0.007–0.041) | 0.014 (−0.002–0.039) | −0.028 (−0.061–0.004) | −0.159* (−0.210 to 0.017) | 0.026* (0.013–0.039) |
| **Immigrated in adulthood:** Yes (ref: No) | −0.303* (−0.377 to −0.282) | −0.293* (−0.356 to −0.230) | −0.330* (−0.350 to −0.230) | −0.307* (−0.338 to −0.275) | −0.306* (−0.319 to −0.218) | −0.268* (−0.233 to −0.098) | −0.215* (−0.229 to −0.201) |
| **Family status:** With children (ref: No) | 0.019 (0.026–0.064) | −0.007 (−0.044 to 0.031) | 0.040* (0.022–0.058) | 0.070* (0.043–0.097) | 0.024 (−0.016–0.064) | 0.080 (0.002–0.161) | 0.046* (0.032–0.060) |
| **Visible minority:** Yes (ref: No) | −0.189* (−0.296 to −0.143) | −0.042 (−0.103 to −0.018) | −0.088* (−0.107 to −0.070) | −0.123* (−0.151 to −0.095) | −0.105* (−0.151 to −0.059) | −0.060* (−0.077 to −0.051) | −0.064* (−0.077 to −0.051) |
| **Indigenous identity:** Yes (ref: No) | 0.246* (0.034–0.458) | 0.075 (0.043–0.193) | 0.051 (0.018–0.119) | 0.142 (0.005–0.290) | −0.0035 (−0.209–0.103) | −0.0260* (−0.206 to −0.101) | −0.0990* (−0.099 to −0.095) |
| **Census year:** 2016 (ref: 2006) | −0.020 (−0.015–0.045) | 0.009 (−0.023 to 0.041) | 0.138* (0.123–0.154) | 0.091* (0.068–0.113) | 0.047* (0.013–0.080) | 0.040* (0.015–0.094) | 0.031* (0.019–0.042) |
### Table 3 (continued)

| Characteristic                          | 8. Specialist physicians | 9. General practitioners | 10. Nursing professionals | 11. University professors | 12. College instructors | 13. Secondary school teachers |
|-----------------------------------------|--------------------------|--------------------------|---------------------------|---------------------------|-------------------------|-----------------------------|
| **Sex:**                                |                          |                          |                           |                           |                         |                             |
| Female (ref: Male)                      | −0.091*                  | −0.124*                  | −0.047*                   | −0.096*                   | −0.050*                 | −0.069*                     |
|                                         | (−0.137 to −0.045)       | (−0.162 to −0.086)       | (−0.067 to −0.027)        | (−0.125 to −0.068)        | (−0.074 to −0.027)      | (−0.079 to −0.059)          |
| **Areal remoteness:** Decile 2 (ref: Decile 1) | 0.017                    | −0.015                   | 0.031*                    | 0.045*                    | −0.004                  | 0.006                       |
|                                         | (−0.080 to −0.074)       | (−0.062 to −0.033)       | (0.015 to −0.048)         | (0.013 to −0.076)         | (−0.041 to −0.033)      | (−0.019 to −0.007)          |
| **Areal remoteness:** Decile 3 (ref: Decile 1) | (−0.116 to −0.020)       | (−0.082 to −0.036)       | (−0.006 to −0.029)        | (−0.070 to −0.006)        | (−0.067 to −0.004)       | (−0.046 to −0.014)          |
| **Areal remoteness:** Decile 4 (ref: Decile 1) | (−0.043)                 | (−0.080)                 | −0.024                    | −0.025                    | 0.042*                  | −0.035*                     |
|                                         | (−0.178 to −0.091)       | (−0.176 to −0.016)       | (−0.048 to −0.001)        | (−0.069 to −0.019)        | (0.004 to −0.081)       | (−0.056 to −0.015)          |
| **Areal remoteness:** Deciles 5+ (ref: Decile 1) | 0.127*                   | 0.090*                   | 0.021*                    | −0.115*                   | −0.017                  | −0.022*                     |
|                                         | (0.033 to 0.220)         | (0.016 to 0.163)         | (0.001 to 0.041)          | (−0.178 to −0.052)        | (−0.057 to −0.022)      | (−0.036 to −0.009)          |
| **Age group:** 25–34 years (ref: 35–44 years) | −0.523*                  | −0.513*                  | −0.244*                   | −0.634*                   | −0.370*                 | −0.352*                     |
|                                         | (−0.579 to −0.466)       | (−0.567 to −0.460)       | (−0.261 to −0.228)        | (−0.685 to −0.582)        | (−0.403 to −0.337)      | (−0.366 to −0.339)          |
| **Age group:** 45–54 years (ref: 35–44 years) | 0.160*                   | 0.047*                   | 0.116*                    | 0.311*                    | 0.132*                  | 0.116*                      |
|                                         | (0.106 to 0.211)         | (0.002 to 0.092)         | (0.101 to 0.131)          | (0.285 to 0.337)          | (0.108–0.157)           | (0.106–0.126)               |
| **Education:** Graduate level (ref: Bachelor’s at most) | 0.754*                   | 0.890*                   | 0.006                     | 0.311*                    | 0.090*                  | 0.059*                      |
|                                         | (0.613 to 0.894)         | (0.714 to 0.867)         | (−0.013 to 0.025)         | (0.244 to 0.377)          | (0.068 to 0.113)        | (0.048 to 0.069)            |
| **Imigrated in adulthood:** Yes (ref: No) | −0.346*                  | −0.269*                  | −0.081*                   | −0.085*                   | −0.316*                 | −0.339*                     |
|                                         | (−0.404 to −0.287)       | (−0.323 to −0.214)       | (−0.102 to −0.090)        | (−0.116 to −0.053)        | (−0.376 to −0.256)      | (−0.379 to −0.299)          |
| **Family status:** With children (ref: No) | 0.078*                   | 0.097*                   | −0.116*                   | 0.112*                    | 0.034*                  | −0.017*                     |
|                                         | (0.023–0.134)            | (0.047–0.147)            | (−0.130 to 0.102)         | (0.081–0.143)             | (0.010–0.058)           | (−0.029 to −0.006)          |
| **Visible minority:** Yes (ref: No) | −0.112*                  | −0.086*                  | 0.048*                    | −0.241*                   | −0.040                  | −0.059*                     |
|                                         | (−0.162 to −0.062)       | (−0.130 to −0.042)       | (0.031 to 0.066)          | (−0.287 to −0.196)        | (−0.088 to −0.099)      | (−0.086 to −0.033)          |
| **Indigenous identity:** Yes (ref: No) | −0.048                   | −0.102                   | −0.061*                   | 0.068                     | −0.004                  | 0.015                       |
|                                         | (0.355 to 0.260)         | (−0.307 to −0.104)       | (−0.099 to −0.024)        | (−0.049 to −0.186)        | (−0.092 to −0.084)      | (−0.026 to −0.055)          |
| **Census year:** 2016 (ref: 2006) | −0.438*                  | −0.342*                  | 0.124*                    | −0.022                    | 0.080*                  | 0.090*                      |
|                                         | (−0.479 to −0.397)       | (−0.380 to −0.305)       | (0.111 to 0.137)          | (−0.048 to −0.003)        | (0.058–0.103)           | (0.080–0.099)               |

Results based on multiple linear regressions predicting mean log annual wage, in inflation-adjusted dollars among full-time professionals aged 25–54. Models further adjusted for class of worker (except among university professors and secondary school teachers), primary household maintainer status, and marital status. Source: 2006 and 2016 Canadian Population Census (authors' calculations). Decile of residential community based on the Index of Remoteness. *p < 0.05
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Author Contribution NG conceptualized the study and led the writing of the manuscript. PS performed the data management and formal analysis. NG, SAB, and PS contributed to interpreting the results. All authors approved the final version.

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Availability of Data and Materials The datasets presented in this paper are not readily available because data privacy and confidentiality are protected by national legislation. Requests to access the datasets should be directed to Canadian Research Data Centre Network (crdcn.org/data).

Declarations

Disclaimer All views expressed in this work are those of the authors alone.

Research Ethics Involving Human Participants and Informed Consent Ethics review and written informed consent to participate were not required for this study using existing statistical sources, in accordance with institutional requirements of the University of New Brunswick Research Ethics Board.

Competing Interests The authors declare no competing interests.

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