

# Investigating the Intersections of Racial Identity and Perceived Income Adequacy in Relation to Dietary Quality Among Adults in Canada

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## ABSTRACT

**Background:** Structural racism and economic marginalization shape dietary patterns in complex ways. Most research examining race and income inequities discount their interactions in shaping dietary intakes. An intersectional approach is needed to identify interconnected sources of social inequities and to more precisely locate dietary inequities.

**Objectives:** We examined whether racial identity and perceived income adequacy independently and jointly shape dietary quality, defined using the Healthy Eating Index (HEI) 2015, among a large sample of adults in Canada.

**Methods:** Cross-sectional data from 2540 adults ( $\geq 18$  years of age) in Canada who participated in the 2019 International Food Policy Study were analyzed. Multivariable linear regression models were executed to test the independent associations and interactions between racial identity and perceived income adequacy with HEI-2015 scores. Models were constructed to examine HEI-2015 total and component scores, adjusting for age, gender, and education.

**Results:** Perceived income adequacy, but not racial identity, was independently associated with HEI-2015 total scores. The interaction between racial identity and perceived income adequacy was significantly associated with HEI-2015 scores. Compared to the reference group (individuals identifying as White and reporting income adequacy), those identifying as Black and reporting income adequacy were associated with lower HEI-2015 scores ( $\beta$ ,  $-7.30$ ; 95% CI,  $-13.07$  to  $-1.54$ ) and those identifying as Black and reporting income inadequacy were associated with lower HEI-2015 scores ( $\beta$ ,  $-6.37$ ; 95% CI,  $-12.13$  to  $-0.60$ ). Individuals who identified as indigenous and reported neither income adequacy nor inadequacy had lower HEI-2015 scores ( $\beta$ ,  $-8.50$ ; 95% CI,  $-13.82$  to  $-3.18$ ) compared to the reference group.

**Conclusions:** Findings suggest that racial identity and perceived income adequacy jointly shape dietary quality. Inequities in dietary quality may be missed when intersecting racial identities and socioeconomic positions are not explicitly investigated. To support healthier dietary patterns, strategies must reduce socioeconomic barriers that impose dietary constraints on some racialized groups. *J Nutr* 2022;152:67S–75S.

**Keywords:** diet quality, inequities, intersectionality, race, income

## Introduction

Poor dietary patterns are a serious public health concern and a leading risk factor for many chronic, noncommunicable diseases, including cardiovascular disease, cancer, and diabetes (1–4). Inequities in nutrition, and other health inequities, are understood to persistently affect members of marginalized communities due to the interactions of social, economic, and environmental circumstances (5). Despite considerable efforts to improve nutrition among the general population, nutritional inequities associated with racial and income disparities are a persistent concern (6–13). In particular, members of racialized groups (e.g., Black, indigenous) disproportionately experience

inequities in obtaining adequate nutrition compared to individuals who are not racialized (i.e., White) (9, 11, 12). Evidence strongly indicates differences in health are due to racism, rather than any underlying biological differences (14). However, the impacts of racism on nutrition are not equivalent across, or within, racial groups.

Compared to the general population, Black and indigenous peoples in Canada face disproportionately high rates of food insecurity and chronic diseases (e.g., type 2 diabetes) (15–18). These discrepancies are understood to be a result of social, economic, and political disadvantages rooted in racism and colonialism (16, 17). Although substantial research

exists to support that health varies by race and socioeconomic position (19–21), the overlap between race and socioeconomic position (i.e., racialized individuals are more likely to be in low socioeconomic positions) interferes with the ability to examine the degree to which inequities in diet quality are shaped by economic marginalization (22–24).

### Intersectionality theory

Compounding various forms and degrees of racism and processes of economic marginalization are the intersecting influences of other systems of power and oppression (e.g., ableism, heterosexism) (25–27). Originating in Black feminist scholarship, intersectionality is a theoretical and analytical tool that emphasizes assessing individuals' experiences in the context of social locations (25, 26). Social locations, as defined by Lynn Weber (28), are the spaces individuals occupy based on socially constructed hierarchies and systems of power and oppression (e.g., racism, capitalism) that are reflected in the social identities and positions individuals hold (29). When applied to understanding nutrition inequities, an intersectional approach highlights the clear need to assess the manner in which multiple social dimensions interact to influence dietary inequities (26, 29, 30). As a result, conventional public health research that simply sums up the effects of multiple dimensions of marginalization may fail to identify those subgroups at the greatest risk of poor diet quality (29–33). For these reasons, an intersectional approach that recognizes and accounts for the mutual contributions of multiple social identities or positions is necessary to enhance the precision of our understanding of dietary inequities (34).

### Intersections of race, income, and diet

There is incontrovertible evidence to indicate the power of social conditions in driving health and nutritional disparities (35, 36). Indicators related to socioeconomic position, such as income, intersect with race to influence dietary quality (9, 31). It is known that insufficient income is associated with inadequate nutrient intake among many populations and subgroups (e.g., women, youth) (37, 38). However, with the exception of a few studies in the United States (9, 39–41), much of this research has focused on examining dietary adequacy (e.g., nutrient deficiencies) and has overlooked the intertwined nature of racial and income disparities in relationship to dietary quality. Investigating race and income in relation to dietary quality provides valuable insight into patterns of disparities across intersections by assessing multiple components of quality

dietary intakes (9, 42, 43), while potentially enriching our understanding of the emergence of dietary inequities.

### Research and evidence gaps

Within the published literature, much remains to be understood about the combined influence of race and income in shaping overall dietary quality. Despite the knowledge that nutrition inequities are rooted in racial and income disparities (9, 11), no published research has investigated the combined influence of race and income on dietary quality in Canada. Nonetheless, there is a critical need to consider the mutual influence of racism and economic marginalization in the construction of dietary inequities. An intersectional approach to studying dietary inequities is therefore imperative to inform public health responses that more equitably address dietary inequities.

### Objectives and hypotheses

The objective of this study was to apply an intersectional approach to assess the associations between racial identity and perceived income adequacy in relation to dietary quality among a large sample of adults in Canada. To acknowledge the dynamic construction of social categories, an intercategorical approach was adopted to assess differences across a range of intersections shaped by racial identity and income (44). This approach to intersectionality creates and examines provisional social categories to permit quantitative comparisons while also acknowledging the fluid nature of social categorization (44, 45). In the present study, social identities or positions serve as proxies for social processes, rather than denoting biological or behavioral attributes of individuals, to better understand dietary inequities in the contexts of historical and contemporary social conditions (29). We hypothesized that: 1) identification with a racialized identity would be associated with poorer dietary quality; and 2) identification with a racialized identity and low perceived income adequacy would be associated with poorer dietary quality.

## Methods

### Sampling and data collection

This study drew upon data from the International Food Policy Study (IFPS), an annual cross-sectional study aimed at evaluating dietary patterns and practices in relation to national and subnational policies across contexts (46). The IFPS includes samples of adults ( $\geq 18$  years of age) residing in Australia, Canada, Mexico, the United Kingdom, and the United States. For the present study, cross-sectional data from the 2019 sample of adults living in Canada were used. Participants were recruited from the Nielsen Consumer Insight Global Panel (46). Participants who were 18–100 years of age and residing in Canada were randomly selected and emailed an invitation with a unique link to complete the online eligibility screener. Quota sampling was performed to meet quotas for age and sex and to recruit panelists with lower educational attainment (46). Respondents were remunerated with monetary or points-based rewards following the panel's usual incentive structure, which has been demonstrated to increase response rates and decrease response bias in underrepresented subgroups in survey research (46). The study received ethical approval from a University of Waterloo Research Ethics Committee (ORE # 30829). Further information on the IFPS is available elsewhere (<http://foodpolicystudy.com/>).

Following screening, eligible participants were provided with study information and the opportunity to provide informed consent. Respondents were directed to the main survey and, upon completion, were redirected to the 24-hour dietary recall component (46). Dietary data were collected using the Canadian adaptation of the Automated Self-Administered 24-Hour Dietary Assessment Tool (ASA24) (47).

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Abbreviations used: ASA24, Automated Self-Administered 24-Hour Dietary Assessment Tool; FPED, Food Patterns Equivalent Database; HEI, Healthy Eating Index; IFPS, International Food Policy Study.

The ASA24 was developed by the National Cancer Institute to enable self-administered dietary recalls and adapted by Health Canada to reflect the Canadian food supply (47). Based on an adaptation of the Automated Multiple-Pass Method (47), respondents were directed to provide detailed information on their food and beverage intakes from midnight to midnight the previous day.

In total, this data set contains health and dietary information from 4225 adults living in all 10 Canadian provinces. In total, 2606 (63.5%) respondents completed the 24-hour dietary recall component. For this study, respondents with missing data or who reported “don’t know” for racial identity ( $n = 62$ ; 1.51%), perceived income adequacy ( $n = 16$ ; 0.4%), or 1 or more other covariates ( $n = 18$ ; 0.4%) were removed. Individuals who indicated a gender identity other than man (including trans male or trans man) and woman (including trans female or trans woman) were excluded from the analytic sample (i.e., gender queer or nonconforming or another identity) because the sample sizes were too small to enable reliable estimates when these identities were treated as distinct gender categories in the models ( $n = 20$ ; 0.5%). The final analytic sample was comprised of data from 2540 respondents.

## Measures

### Healthy Eating Index 2015.

Since an index of dietary quality relative to the 2019 Canada’s Food Guide (48) had not yet been published at the time the analyses were conducted, the US Healthy Eating Index (HEI) 2015 (49) was used to characterize dietary quality. The HEI-2015 assesses alignment with the 2015–2020 Dietary Guidelines for Americans (43). This index is made up of 13 components, 9 that assess adequacy (total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, and fatty acids) and 4 that assess moderation (refined grains, sodium, added sugars, saturated fats) (49). Scores for the moderation components are reverse scored. Total scores can range from 0 to 100, with higher scores indicating better alignment with dietary guidance and, therefore, a higher dietary quality (49).

Estimation of the quantities needed to calculate HEI-2015 scores was afforded by a linkage between Canadian Nutrient File codes used in the ASA24 and the USDA’s Food Patterns Equivalents Database (FPED) 2011–2012 and supplemented with the FPED 2013–2014 (50). In addition to performing the linkages, the index was adjusted to conform to food-based dietary recommendations included in the 2007 Canada’s Food Guide (43, 50). The FPED converts foods and beverages reported in the Food and Nutrient Database for Dietary Studies into 37 components in units consistent with federal Canadian dietary guidance (43, 50). Person-level scores were calculated using the simple algorithm available from the National Cancer Institute (51).

### Racial identity.

Racial identity was queried using an item that asks respondents “which race category best describes you?” (52), with response options including White (European descent), East or Southeast Asian (Chinese, Korean, Japanese, Taiwanese descent; Filipino, Vietnamese, Cambodian, Thai, Indonesian, other Southeast Asian descent), South Asian (South Asian descent; e.g., East Indian, Pakistani, Bangladeshi, Sri Lankan, Indo-Caribbean), Black (e.g., African, Caribbean, African-Canadian descent), indigenous (e.g., First Nations, Inuit descent), Latino (e.g., Latin American, Hispanic descent), Middle Eastern (e.g., Arab, Persian, West Asian descent; e.g., Afghan, Egyptian, Iranian, Lebanese, Turkish, Kurdish), another race category [“(please specify): \_\_\_\_\_],” don’t know, and refuse to answer. For analysis, responses were collapsed into 1) Black, 2) indigenous, 3) Latino or Hispanic, 4) Asian (East, South, Southeast, Middle Eastern), 5) White, and 6) other. This method of categorization was informed based on the recommended standard for collecting and reporting race-based data and on previous research in Canada (53, 54). For all models, the reference group for racial identity was set to the current dominant racial group in Canada (i.e., White).

### Perceived income adequacy.

To assess perceived income adequacy, respondents were asked: “thinking about your total monthly income, how difficult or easy is

it for you to make ends meet?” Possible response options were very difficult, difficult, neither easy nor difficult, easy, very easy, don’t know, or refuse to answer. Based on previous research, the responses for this variable were collapsed into 3 analytical levels: 1) difficult (very difficult or difficult); 2) neither easy nor difficult (neither); and 3) easy (easy or very easy), with easy (adequate) coded as the reference group (55).

### Covariates.

Sociodemographic characteristics, including age, gender, and educational attainment, were included as covariates because of their established relationships with racial identity and diet quality (35, 36). All models included self-reported age (continuous) and educational attainment [high school or less, including *collège d’enseignement général et professionnel* (there is no grade 12 in Québec, and this public-school program provides students in Québec with entry-level postsecondary education), or postsecondary or above (trades, college, university degree or above)]. Gender identity, rather than sex, was selected for inclusion in the model construction because gender is recognized to be a sociocultural determinant of health, as opposed to biological sex, and more closely corresponds with our research questions (56). Respondents were asked to indicate their gender identity (man, woman, trans male or trans man, trans female or trans woman, gender queer or nonconforming, or another identity). Individuals identifying as gender queer or nonconforming or another gender identity were removed from the analytical data set because the sample sizes were too small to enable reliable estimates when these gender identities were treated as distinct gender categories in the models. For gender identity and educational attainment, the reference groups were the “man” and “postsecondary or above” categories, respectively. Respondents who selected “don’t know” or “refuse to answer” for any of the covariate measures were removed from the analytical data set ( $n = 27$ ), as noted above.

### Statistical analysis

All analyses were conducted using SAS Studio (SAS Institute) (57). Descriptive analyses were conducted to characterize the sample. Data were weighted using poststratification weights derived based on national census estimates for age group, sex, region, and education (46). Weighted, multivariable linear regressions designed to handle sample survey data were used to examine the associations between racial identity and dietary quality. The results of 2 primary regression models are reported. In the first regression model, the associations between racial identity, perceived income adequacy, and total HEI-2015 scores were examined, adjusting for age, gender identity, and educational attainment. In the second regression model, racial identity and perceived income adequacy, along with an interaction term (racial identity  $\times$  income adequacy) were included to assess their estimated associations with total HEI-2015 scores, adjusting for the same covariates. “Effect,” in this paper, is used in relation to the statistical association (58, 59), and not to infer a causal relationship (60). To test the overall significance of a variable in the constructed models, *F*-statistics were assessed. Adjusted beta coefficients and corresponding confidence limits were used to identify statistically significant pairwise differences at an  $\alpha$  of 0.05. All reported betas and statistically significant values reflect differences in HEI-2015 scores when compared to this reference group (individuals who identified as White and reported an adequate perceived income), rather than when all groups are compared to each other.

A series of post hoc regression analyses was conducted to test the associations between the interaction effects of racial identity and perceived income adequacy and each of the 13 components of the HEI-2015. Given that measures of dietary quality reflect densities, rather than absolute amounts, Krebs-Smith et al. (49) recommend assessing HEI-2015 component scores to interpret low total scores.

## Results

### Sociodemographic characteristics

Among the weighted analytic sample, over three-quarters (79%) of respondents identified as White, 13% as Asian, 3% as Black, 2% as indigenous, 1% as Latino or Hispanic, and 2% as

**TABLE 1** Descriptive statistics by racial identity among adults in the 2019 International Food Policy Study ( $n = 2540$ )<sup>1</sup>

	White $n = 2002$	Asian $n = 332$	Black $n = 66$	Indigenous $n = 63$	Latino or Hispanic $n = 33$	Another $n = 44$	%
Perceived income adequacy, $n$ (%)							
Easy	744 (37.2)	116 (34.9)	20 (30.3)	15 (23.8)	8 (24.2)	11 (25.0)	36
Neither	708 (35.4)	161 (48.5)	22 (33.3)	16 (25.4)	20 (60.6)	17 (38.6)	37.2
Difficult	550 (27.5)	55 (16.6)	24 (36.4)	32 (50.8)	5 (15.5)	16 (36.4)	26.9
Age, <sup>2</sup> year	48.2 (15.9)	37.2 (13.5)	34.5 (11.7)	43.2 (17.6)	32.2 (11.7)	49.0 (16.5)	—
Gender identity, $n$ (%)							
Man	978 (48.9)	177 (53.3)	31 (47.0)	28 (44.4)	16 (50)	12 (27.3)	48.9
Woman	1024 (51.2)	155 (46.7)	35 (53.0)	35 (55.6)	16 (50)	32 (72.7)	51.1
Educational attainment, $n$ (%)							
High school or less	999 (49.9)	77 (23.2)	29 (43.9)	40 (63.5)	10 (30.3)	26 (59.1)	46.5
Postsecondary or more	1003 (50.1)	255 (76.8)	37 (56.1)	23 (36.5)	23 (69.7)	18 (40.9)	53.5

<sup>1</sup>Income adequacy was categorized as easy (very easy or easy), neither easy nor difficult, or difficult (very difficult or difficult). Educational attainment was categorized as high school or less (high school or less, including *collège d'enseignement général et professionnel*) or postsecondary or above (trades, college, university degree, or above). Gender identity was categorized as man (man, trans man) or woman (woman, trans woman).

<sup>2</sup>Statistics reported are the estimated means and SDs for age.

another racial category (Table 1). There were around one-third of respondents in each category of perceived income adequacy (very easy or easy, 36%; neither easy nor difficult, 37%; and very difficult or difficult, 27%). Respondents were approximately halved by gender identity (man, 49%; woman, 51%), as well as educational level (high school education or less, 46%; at least some postsecondary education, 54%). The proportions of subpopulations in the IFPS sample were slightly higher compared to those in nationally representative surveys regarding the proportion of participants who identified as Black (2.0%), with a slightly lower proportion of people who identified as indigenous (4.7%) and a slightly higher proportion of those with higher levels of education (e.g., college or university certificate, 42.7%) (46, 61, 62).

### Unitary model

Table 2 presents the  $\beta$  and 95% CI estimates for the weighted linear regression models. The unitary model, which tested the main effects only, revealed that perceived income inadequacy, compared to perceived income adequacy, was associated with lower HEI-2015 scores ( $\beta$ , -2.39; 95% CI, -4.05 to -0.73). Identifying as a woman ( $\beta$ , 2.97; 95% CI, 1.69–4.26), having a postsecondary or higher level of education ( $\beta$ , 2.97; 95% CI, 1.69–4.26), and increasing age ( $\beta$ , 0.13; 95% CI, 0.02–0.18) were associated with higher HEI-2015 scores. Racial identity was not independently associated with HEI-2015 scores.

### Intersectional model

Table 3 provides the parameter estimates of the interactions between racial identity and income adequacy in relation to HEI-2015 scores. The interactions between racial identity and income adequacy were significantly associated with HEI-2015 scores. Pairwise comparisons revealed 3 significant interactions, between 1) being Black and having perceived income adequacy ( $\beta$ , -7.30; 95% CI, -13.07 to -1.54); 2) being Black and having perceived income inadequacy ( $\beta$ , -6.37; 95% CI, -12.13 to -0.60); and 3) being indigenous and having neither adequate nor inadequate perceived income adequacy ( $\beta$ , -8.50; 95% CI, -13.82 to -3.19).

### HEI-2015 component analyses

Post hoc HEI-2015 component analyses revealed that respondents identifying as Black and reporting high perceived income adequacy scored lower for the total fruits, whole fruits, total

dairy, total proteins, and seafood and plant protein components (see Supplemental Table 1 for estimates). Individuals who identified as Black and reported the lowest level of perceived income adequacy scored lower for the total vegetables, whole fruits, and seafood and plant protein components, compared to respondents who identified as White and reported the highest level of perceived income adequacy. Respondents who identified as indigenous and reported neither adequate or inadequate perceived income adequacy scored lower on the total vegetables, whole fruits, seafood and plant proteins, and refined grains components, compared to respondents who identified as White and reported the highest level of perceived income adequacy. No other significant differences were observed for any other HEI-2015 components.

## Discussion

Diet-related diseases are understood to disproportionately impact members of racialized and socioeconomically disadvantaged groups (9), yet the distribution of inequities in diet quality within highly heterogeneous groups is not well understood from an epidemiological perspective. To address this critical knowledge gap, this study sought to examine the independent and joint associations between racial identity, perceived income adequacy, and dietary quality among adults in Canada. Contrasting with prior research, an intersectional approach was adopted to investigate whether, to what extent, and where dietary inequities were located across, and within, populations. Specifically, we attempted to locate dietary inequities at social intersections shaped by racial and income identities or positions. We found that racial identity and perceived income adequacy jointly shaped overall dietary quality. By using an intersectional approach, we located inequities in overall dietary quality and component scores within some racialized groups that differed with respect to perceived income adequacy.

### Black identity, perceived income adequacy, and dietary inequities

Contrary to our initial hypothesis, racial identity was not independently associated with differences in dietary quality. Our results, however, did reveal that racial identity and perceived income adequacy were jointly associated with variations in dietary quality, particularly lower dietary quality, among some

**TABLE 2** Betas from multivariable linear regression models testing the associations between racial identity, perceived income adequacy, and total HEI-2015 scores among adults in the 2019 International Food Policy Study ( $n = 2540$ )<sup>1</sup>

Measure	Model 1 $\beta$ (95% CI)	Model 2 $\beta$ (95% CI)
Racial identity		
White (ref.)	—	—
Asian	1.01 (−0.99 to 3.01)	−2.40 (−5.38 to 0.58)
Black	−2.12 (−5.78 to 1.55)	−7.30 (−13.07 to −1.54)
Indigenous	−1.85 (−5.24 to 1.55)	−0.93 (−8.84 to 6.99)
Latino or Hispanic	1.54 (−3.39 to 6.47)	1.28 (−9.54 to 12.10)
Another	−1.16 (−7.02 to 4.70)	−2.40 (−9.40 to 4.59)
Perceived income adequacy		
Easy (ref.)	—	—
Neither	−1.27 (−2.79 to 0.25)	−1.89 (−3.64 to −0.15)
Difficult	−2.39 (−4.05 to −0.73)	−3.49 (−5.35 to −1.63)
Age	0.13 (0.02–0.18)	0.13 (0.09–0.17)
Gender identity		
Man (ref.)	—	—
Woman	2.91 (1.62–4.20)	2.86 (1.59–4.16)
Educational attainment		
High school or less (ref.)	—	—
Postsecondary or more	2.97 (1.69–4.26)	2.91 (1.62–4.20)
Racial identity x perceived income adequacy		
Asian, neither	—	3.88 (−0.17 to 7.93)
Asian, difficult	—	8.35 (3.17–13.53)
Black, neither	—	11.57 (3.62–19.51)
Black, difficult	—	4.43 (−3.67 to 12.53)
Indigenous, neither	—	−5.68 (−15.18 to 3.83)
Indigenous, difficult	—	1.63 (−7.59 to 10.85)
Latino or Hispanic, neither	—	−1.24 (−11.18 to 13.65)
Latino or Hispanic, difficult	—	4.80 (−7.13 to 16.74)
Another, neither	—	−1.58 (−13.70 to 10.54)
Another, difficult	—	4.80 (−7.13 to 16.74)

<sup>1</sup>Model 1 adjusted estimates (main effects only) for a 1-point difference in total HEI-2015 scores. Model 2 adjusted estimates (main and interaction effects) for a 1-point difference in total HEI-2015 scores. In calculating racial identity x perceived income adequacy, White race and easy perceived income adequacy were used as the references. Gender identity was categorized as man (man, trans man) or woman (woman, trans woman). HEI, Healthy Eating Index.

racialized groups (i.e., Black, indigenous). These findings provide support for the conceptual premise that the capacity to use racial categories to statistically discriminate between and identify points of dietary inequity is hindered by high within-group heterogeneity (44). As a general guideline,  $\pm 5$  points on the HEI-2015 is considered a potentially clinically meaningful difference in dietary quality scores (49), providing support that the dietary differences we observed between groups may indicate important differences in diet quality. The racial differences in the total vegetables and whole fruits scores that were distinguishable on

the basis of perceived income adequacy, specifically perceived income inadequacy, are consistent with other studies that demonstrate diets high in vegetables and fruit tend to be more expensive (per unit energy) than those higher in fat and sugar (e.g., highly processed food) (63). It is therefore possible that the cost of high-quality diets compounds racial inequities to produce the differences observed, highlighting the potential multiplicative effects of economic marginalization and racialization in driving dietary inequities among this segment of the population. Nonetheless, this is likely only a partial explanation.

**TABLE 3** Multivariable linear regression estimates for the interaction between racial identity and perceived income adequacy in relation to total HEI-2015 scores<sup>1</sup>

Racial identity	Easy $\beta$ (95% CI)	Neither easy nor difficult $\beta$ (95% CI)	Difficult $\beta$ (95% CI)
White	(ref)	−1.95 (−3.69 to −0.21)	−3.48 (−5.35 to −1.62)
Asian	−2.40 (−5.38 to 0.58)	−0.41 (−3.38 to 2.56)	2.46 (−1.82 to 6.74)
Black	−7.30 (−13.07 to −1.54)	2.37 (−3.18 to 7.91)	−6.37 (−12.13 to −0.60)
Indigenous	1.28 (−9.54 to 12.10)	−8.50 (−13.82 to −3.18)	−2.79 (−7.50 to 1.93)
Latino or Hispanic	1.28 (−9.54 to 12.10)	0.62 (−5.59 to 6.84)	−5.33 (−17.61 to 6.95)
Another	−2.40 (−9.40 to 4.59)	−5.88 (−15.80 to 4.04)	−1.09 (−10.75 to 8.56)

<sup>1</sup>Interaction estimates were adjusted for the independent effects of racial identity, perceived income adequacy, age, gender identity, and educational attainment. HEI, Healthy Eating Index.

Compared to the reference group, those identifying as Black and reporting high perceived income adequacy had lower dietary quality scores, which suggests that income does not confer the same dietary advantages for all racialized groups. Research has accumulated to provide evidence that the protective effects associated with a higher socioeconomic position are not uniform (64–66). In particular, the protective effect associated with a socioeconomic advantage is diminished among racialized populations, most profoundly Black populations and, to a lesser extent, Asian or Latino populations (64, 66). Taken together, our findings extend previous research suggesting that perceived income adequacy is associated with fewer dietary advantages for individuals who identify as Black, in comparison to individuals who identify as White.

### **Indigenous identity, perceived income adequacy, and dietary inequities**

In the present study, lower dietary quality scores were observed among individuals who identified as indigenous and reported neither perceived income adequacy nor inadequacy. Specifically, the results demonstrated lower intakes of vegetables and fruit and higher density of refined grains among individuals located at this intersection. In Canada, indigenous peoples reside both on and off reserves (67). Since the data used do not exclusively or purposefully sample persons residing on reserves or in other aboriginal settlements, the findings can be applied to affirm the presence of dietary inequities impacting indigenous peoples not necessarily living on reserves. This extends previous research that documents persistent food insecurity and nutritional disparities impacting First Nations, Inuit, and Métis communities in Canada (68–70).

The findings from this study also suggest that diets consisting of relatively low amounts of vegetables and fruits and higher amounts of refined grains may be a particular issue of nutritional concern among a segment of indigenous populations that perceive their incomes as neither adequate nor inadequate. Previous scholarship has highlighted the detrimental impacts of colonialism on the consumption of traditional cultural foods among indigenous peoples (71, 72). As a result of the increasing reliance on commercial foods, indigenous peoples are consuming more energy-dense and nutrient-poor foods and beverages (71), which is potentially reflected in these findings. It is unclear why only indigenous individuals who perceived their income as neither adequate nor inadequate reported diets of lower quality; however, the relatively small sample size of individuals who identified as indigenous may have hindered the ability to detect smaller effects among the other perceived income adequacy groups. Analyzing data from a larger sample size of individuals who identify as indigenous may help clarify the findings observed.

### **Racism, capitalism, and colonialism**

The significant interactions between racial identity and perceived income adequacy can be understood in the context of the relationships between racism, colonialism, and capitalism (73). As noted above, in this study, racial identity and perceived income adequacy served as proxies for social processes to better understand dietary inequities rooted in racism and economic marginalization. Following this line of reasoning, the inequities identified at the intersection of racial identity and perceived income adequacy could be understood to reflect the complex ways in which racism, capitalism, and colonialism interact to shape dietary inequities (74, 75). This is in line with previous scholarship that identifies the ways in which

capitalist ideals (e.g., market economy, privatization) have been leveraged to marginalize racialized individuals, particularly African Americans and other Black populations (73). The effects of racial capitalism on individuals racialized as Black are pervasive (73) and are likely reflected in the dietary inequities observed among individuals who identified as Black and reported inadequate incomes.

Nevertheless, Black individuals who perceived their incomes as adequate also had a poorer diet quality than White individuals who perceived their incomes as adequate, suggesting that racism may have particularly negative consequences for dietary quality regardless of the material advantages conferred by a higher income. Further, under colonial agendas, capitalist ideologies have been used to legitimize the ongoing social, political, and economic exploitation of indigenous peoples (73). It has been well documented that food insecurity (an indicator of dietary inequities) disproportionately affects indigenous peoples, and research has highlighted that colonial and capitalist practices (e.g., environmental degradation) detrimentally influence various components of indigenous food systems (71, 76–78). The results from this study suggest that economic marginalization may be 1 of several pathways contributing to dietary inequities fueled by racism, colonialism, and capitalism; however, the influences of other interconnected mechanisms through which racism operates, such as psychosocial and biobehavioral pathways (79–83), must not be overlooked. In addition to race and income, place has been demonstrated to be critical in shaping dietary inequities (79). Further research in this domain is needed to identify characteristics of the food environment that are intertwined with systems of racial and economic marginalization in driving dietary inequities.

### **Strengths and limitations**

Corroborating other scholarship (9, 39–41), this study suggests that racial identity and perceived income adequacy are jointly associated with dietary inequities in Canada. Structural and systemic changes will be essential to reduce dietary inequities among Black and indigenous populations in Canada who are experiencing socioeconomic disadvantages. However, perceived income adequacy does not fully explain racial inequities, and there remains a need to consider the intersectional complexity that underlies dietary inequities. The intersectional approach adopted here was useful in identifying and more precisely locating dietary inequities (29, 30, 44). By analyzing data from a relatively large sample and leveraging comprehensive, 24-hour recall dietary data, we were able to study both overall dietary quality and individual components emphasized in dietary guidance. We used a single recall, which is appropriate when assessing mean intakes. The estimation of person-level HEI-2015 scores based on a single recall is not ideal but is the method available for generating scores for regression models (51).

Nonetheless, we were reliant on self-reported data, including the dietary recall component (84, 85). All self-reported dietary intake data are prone to systematic measurement error (86). Previous research has identified several contributors to this systematic error, including social desirability and errors in recall (87–90). To combat social desirability, the IFPS utilized an online survey design to provide respondents greater anonymity for sensitive topics as compared to in-person and phone surveys (89, 91, 92). Nevertheless, errors related to measurement performance across subgroups may result in biased estimates. Specific to the contexts of this study, the measure used to assess dietary quality also has limitations related to differences in

eating patterns that are related to custom and culture (e.g., traditional eating patterns, dietary restrictions). The limited consideration of custom and culture in the Dietary Guidelines for Americans 2015–2020 (upon which the HEI-2015 is based) reflects 1 of many areas for researchers to directly target in efforts to decenter Whiteness in public health nutrition.

The sample is not nationally representative and therefore does not reflect the racial, income, and educational characteristics of the larger population residing in Canada. Although sampling weights for age group, sex, and region were applied to improve representation, sampling weights for race and income were not available. Furthermore, the low population rates of various racialized groups inhibited more granular analyses of within-group differences shaped by ethnic identity and other social identities (e.g., gender identity). The low sample sizes of individuals identifying with a racialized identity, especially Black, indigenous, and Latino or Hispanic identities, suggest the models may be inadequately powered to detect smaller differences in dietary quality located at these intersections. Future research should oversample the population groups often underrepresented in survey research.

## Conclusion

The findings from this study suggest that racial identity and perceived income adequacy jointly shape dietary quality. While preliminary, the findings from this study locate inequities in dietary intakes among segments of the population identifying as Black and indigenous, in conjunction with segments reporting perceived adequacy of income. Public health strategies aimed at ameliorating dietary inequities must address the structural and systemic barriers that marginalize some members of racialized and socioeconomically disadvantaged groups, while not overlooking racial disparities that persist even among individuals who are not necessarily socioeconomically disadvantaged. Although this study provides insight into dietary quality in the contexts of racism and economic marginalization, there are a confluence of factors, beyond the scope of this study, that warrant consideration when interpreting the findings. Further research is required to better understand the complex ways in which social identities and positions shape dietary quality and to clarify the mechanisms underlying these associations and identify potential policy interventions to address them. It will also be important to consider the complexity introduced when considering the additional intersecting influences of social dimensions, such as nativity, cultural acculturation, and educational attainment, in shaping dietary patterns. By studying dietary inequities with an intersectional approach, locations of advantages and disadvantages can be identified and leveraged to inform appropriate public health responses to socially driven dietary inequities.

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