

Inter-categorical intersectionality and leisure-based physical activity in Canada

Hayfa Abichahine and Gerry Veenstra

In press at *Health Promotion International*

Abstract

Leisure-based physical activity is socially stratified in Canada. To date, inequalities in physical activity by race or ethnicity, gender, class or sexual orientation, in Canada and elsewhere, have largely been investigated as distinct, additive phenomena. Informed by intersectionality theory, this paper examines whether racial identity, gender, class and sexuality ‘intersect’ with one another to predict physical activity in data from Cycles 2.1 and 3.1 of the Canadian Community Health Survey ($n = 149,574$). In particular, we apply the intersectional principle of multiplicativity which suggests that people’s experiences of their gender identities are raced, classed and sexualized, their racial experiences are gendered, classed and sexualized, and so forth. We find that the positive effect of income on being physically active is strong among visible minority men, of moderate strength among White men and women and weak to non-existent among visible minority women. We also find that an LGB orientation corresponds with a higher likelihood of being physically active among women (especially less educated women) but not among men. These multiplicative findings undermine additive approaches to investigating social inequalities in leisure-based physical activity and pave the way for future intersectional analyses of axes of inequality and their diverse, intersecting effects.

Inter-categorical intersectionality and leisure-based physical activity in Canada

Introduction

Countless studies show that physical activity improves overall physical and mental health and decreases stress. In turn, many studies indicate that physical activity is socially stratified. In Canada, for example, evidence shows that men tend to engage in more physical activity than women (Koezuka *et al.*, 2006; Stephens *et al.*, 1985) and that educational attainment and household income are both positively associated with levels of physical activity (Choiniere *et al.*, 2000; Pan *et al.*, 2009; Stephens *et al.*, 1985; Smith *et al.* 2009). With regard to race and ethnicity, one recent study found that nearly half (49%) of White Canadians but only 38% of Black Canadians and 34% of South Asian Canadians registered moderate to high levels of physical activity (Bryan *et al.*, 2006). In short, evidence from Canada appears to assign regular physical activity to well-educated and wealthy White men above all others and to poorly educated and poor visible minority women least of all. Presumably the social privilege inherent to being of high socioeconomic status, White or male is accompanied by factors such as access to and availability of leisure time, autonomy and flexibility in the workplace and access to childcare that facilitate engaging in leisure-based physical activity in everyday life.

Inequalities in health practices by race, gender or class, in Canada and elsewhere, have typically been investigated as distinct phenomena in quantitative research. Numerous studies examine the effects of race, ethnicity, gender, education or income on a health-related practice while controlling for the others or omitting the others from the models entirely. Some studies examine the effects of an inequality variable such as gender on a health-related practice before and after controlling for others, say, education and income, in an attempt to ‘explain’ gender

inequality in the practice. These approaches to social health inequalities are consistent with monistic theories of social inequality, such as Marxist class theory or feminist theories of patriarchy, that privilege one dimension of social inequality over others (King, 1988). The theoretical and analytical strategy of treating axes of inequality and their accompanying individual-level identities as distinct phenomena represents what intersectionality theorists call an *additive* approach to conceptualizing and investigating forms of inequality and their diverse effects.

In recent decades, however, critical race and feminist scholars have advocated for a fundamental shift in the ways in which inequalities by race, gender and class are theorized and empirically investigated, advocating for the adoption of an *intersectional* approach to social inequalities and their effects. In the 1970s and early 1980s, African American women, many from working class backgrounds, came to critique the discipline of gender studies and certain types of feminism for privileging gender over race and class (Weber, 2007). They argued that these axes of inequality are analytically inseparable, together forming a “matrix of domination” (Collins, 1993; Collins, 2000). By the mid-1980s heterosexism also received consideration, followed by axes of inequality pertaining to nationality, disability and age, among others (Weber, 2007).

Broadly speaking, intersectionality theory seeks to illuminate “interlocking systems of oppression [and] multiples axes of inequality” (Berger and Guidroz, 2009: 1). It examines the “mutually enforcing effects of various social locations and experiences of domination and oppression” (Hankivsky and Christoffersen, 2008: 272). Intersectionality theory attempts to identify connections between macro-level relations of power such as racism, patriarchy and classism and then examine the impacts of these intersecting social structures on the creation,

maintenance and reproduction of social inequalities at lower levels of analysis (Dhamoon and Hankivsky, 2011).

Many scholars have called for the application of intersectionality theory to health inequalities in particular (Hankivsky *et al.*, 2011; Hankivsky and Christoffersen, 2008; Schulz and Mullings, 2006; Weber and Parra-Medina, 2003). For instance, Weber and Parra-Medina (2003) argue that intersectionality “provides promising avenues for expanding our knowledge of health disparities and of identifying new ways of going about eliminating the persistent and pervasive social inequalities [...] as well as the health disparities that accompany them” (p. 221). These scholars essentially argue that intersectionality theory possesses the potential to better and more fully explicate the nature of social inequalities and their effects than has been accomplished to date by the monistic approach which has long dominated health inequalities research.

Despite a growing clamour regarding the insufficiency of current approaches to studying social health inequalities (e.g., Dhamoon and Hankivsky, 2011; Hankivsky and Cormier, 2009) and the emergence of templates for implementing inter-categorical intersectionality theory in health research (Bauer, 2014; Bowleg, 2012; Rouhani, 2014), very little quantitative research examining the degree to which health or health practices inheres to intersections between race, gender and class has been produced to date (see Black and Veenstra, 2011; Hinze *et al.*, 2012; Kobayashi and Prus, 2011; Rosenfield, 2012; Seng *et al.*, 2012; Veenstra, 2011; Veenstra, 2013; Warner and Brown, 2011). Accordingly, this paper contributes to the small body of extant quantitative intersectional health research by investigating the applicability of intersectionality theory for explicating leisure-based physical activity in Canada. By considering the mutually constituted nature of axes of inequality pertaining to racism, sexism and classism (as well as heterosexism) and the degree to which regular physical activity reflects the interconnectedness of

race, gender and class (and sexuality) in the lives of Canadians, our study has the potential to illuminate the complex nature of social inequality in Canadian society and one of its particularly important effects. In the following section we describe intersectionality theory and its principles and tenets in more detail after which we summarize the insights generated by the few North American studies that have attempted to implement intersectionality theory in quantitative health inequalities research.

Background

The overarching objective of intersectionality theory is to understand the nature and consequences of multiple systems of inequality (Weber, 2006). Intersectionality is primarily concerned with the race-class-gender matrix of interlocking systems of oppression but has expanded its focus in recent years to include consideration of axes of inequality pertaining to sexuality, nationality and disability among others. Sexuality in particular has been examined so extensively as to represent a fourth preeminent axis of inequality in intersectional thought. Intersectionality contextualizes systems of oppression and guides social analyses towards investigating “mutually enforcing effects of various social locations and experiences of domination and oppression” (Hankivsky and Christoffersen, 2008: 272). Research studies informed by intersectionality theory examine the complicated nature of interconnected systems of oppression and subsequent implications for social identities and experiences at the level of the individual (Jackson and Williams, 2006; Weber, 2006).

Intersectionality theory comprises a constellation of tenets and principles that serve to guide empirical investigations of social phenomena. These include three key principles that speak to the mutually constitutive natures of preeminent axes of inequality, namely, *simultaneity*,

multiplicativity and *multiple jeopardy*. The principle of simultaneity suggests that axes of inequality, and the individual-level social identities to which they correspond, must all be investigated in any given empirical study because all of these social identities are present and potentially meaningful in all social interactions (Collins, 1993). The principle of simultaneity is foundational to intersectionality theory in that it guides researchers to conduct analyses that necessarily include multiple axes of inequity (Hankivsky and Christoffersen, 2008). Simultaneity insists that intersectionality scholars refrain from assuming a priori that any given axis of inequity is any more or less important than others in a given social context or analysis (Hankivsky and Christoffersen, 2008).

A second central principle of intersectionality, *multiplicativity*, can be directly contrasted with additive approaches to axes of inequality and their corresponding social identities. Multiplicativity suggests that axes of inequality intersect to create complex social identities which are not merely a sum of their parts, i.e., which are not merely a sum of distinct racialized, gendered, class-based or sexualized identities. In this vein, an intersectional approach does not reduce axes of inequities to distinct independent variables nor does it advance additive analyses of them (e.g., in the form of the additive ‘effects’ of race *and* gender *and* class *and* sexuality in regression models). Rather, guided by the principle of multiplicativity, intersectionality theory directs researchers toward multiplicative analyses (Berger and Guidroz, 2009; Hankivsky and Cormier, 2009). Collins (1993) argues that researchers should “see the connections between the categories of analysis [and] shift discourse away from additive analyses of oppression” (p. 26). In quantitative analyses in particular, researchers are directed towards examining interactions between variables rather than their ‘main effects.’ That is to say, researchers are directed to

examine the degree to which experiences of race are gendered and/or classed and/or sexualized, experiences of gender are racialized and/or classed and/or sexualized, etc.

A third principle, *multiple jeopardy*, is an evolved version of double or triple jeopardy. The term ‘double jeopardy’ has been used to describe the dual discriminations of racism and sexism experienced by Black women in the United States and ‘triple jeopardy’ to describe discriminations that additionally incorporate class subjugation (King, 1988). From these standpoints, people with multiple subordinate-group identities (e.g., Black, female, poor) are the most disadvantaged, experiencing the distinctive forms of oppression associated with each subordinated identity as separate phenomena. Multiple jeopardy represents the new notion that when disadvantaged identities are experienced simultaneously they tend to produce inordinate—even more than additive—amounts of marginalization or disadvantage (King, 1988; Jackson and Williams, 2006; Williams, 2008). Conversely, advantaged identities held in tandem lead to inordinate amounts of privilege and advantage. Multiple jeopardy is rooted in the principle of multiplicativity but expands upon it by specifying the nature and direction of the multiplicative effect. This principle further reiterates the idea that additive analyses cannot account for the complexities of social identities and power relations.

In this study, we explore ways in which race, gender, class, and sexuality intersect to predict regular leisure-based physical activity in Canada using data from Cycles 2.1 and 3.1 of Statistics Canada’s nationally representative *Canadian Community Health Survey*. Informed by the principles of intersectionality theory described above, we compare the differential abilities of the additive and intersectional approaches to explicate variability in physical activity. This is accomplished by investigating main effects of, and multi-way interactions between, racial identity, gender, class and sexuality as predictors of physical activity in multivariate binary

logistic regression models. We hypothesize that intersections of racism, patriarchy, classism and heterosexism at macro levels of Canadian society influence the adoption of regular and sustained physical exercise at the individual level: the degree to which interaction models (intersectional models) explain variability in physical activity above and beyond main effect models (additive models) speaks to this hypothesis reflective of the principles of simultaneity and multiplicativity. We also hypothesize that poorly educated and poor lesbian or bisexual visible minority women will be inordinately unlikely to engage in large amounts of regular physical activity and that highly educated and wealthy heterosexual White men will be inordinately likely to do so: comparisons of predicted probabilities from additive and intersectional models will enable us to test this hypothesis stemming from the principle of multiple jeopardy.

Methods

Survey sample

We combine data from cycles 2.1 and 3.1 of the *Canadian Community Health Survey* (CCHS) collected by Statistics Canada in 2003 and 2005, respectively. The CCHS is a nationally representative cross-sectional survey that targets house dwellers in Canada twelve years of age or older. The population does not include people living on Indian Reserves, Crown Lands or remote regions of the country, homeless persons and people affiliated with the Canadian Armed Forces. Data are collected using a complex multistage sampling design which randomly selects a sample of households followed by random selection of one person from each dwelling. A total of 131,535 responses were obtained in 2003, representing a response rate of 80.6%, and 135,573 responses were obtained in 2005, representing a response rate of 79.0%. Our analysis is

restricted to survey respondents who were aged 25 and older at the time of the survey ($n = 218,726$) in order to provide stable estimates of household income and educational attainment. Of these respondents, 37,513 were not asked about their sexual orientation and so were removed from the analysis. Of the remaining cases ($n = 181,213$) there was additional missing data for all of the variables utilized in our models excepting age and gender, namely, household income ($n = 22,694$), sexual orientation ($n = 9,735$), racial identity ($n = 7,614$), immigrant status ($n = 4,493$), educational attainment ($n = 3,809$), physical activity ($n = 3,471$) and marital status ($n = 316$). A list-wise deletion strategy applied to this sample produced a working sample of 149,574 cases (82.5% of the original sample). Table 1 describes characteristics of this sample.

<Table 1 here>

Survey measures

Age in years is continuous. Marital status distinguishes between married, common-law, widowed, separated, divorced and single respondents. Immigrant status distinguishes between born in Canada, immigrated to Canada twenty years ago or more, immigrated to Canada between 10 and nineteen years ago and immigrated to Canada nine or fewer years ago.

To assess racial identity, respondents were asked: “People living in Canada come from many different cultural and racial backgrounds. Are you: White? Chinese? South Asian (e.g., East Indian, Pakistani, Sri Lankan)? Black? Filipino? Latin American? Southeast Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)? Arab? West Asian (e.g., Afghan, Iranian)? Japanese? Korean? Aboriginal (North American Indian, Métis or Inuit)? Other - specify.” Interviewers were instructed to read all of the possible responses and record all of them that

applied. From these data we created a dichotomous variable that distinguishes between respondents who selected White only ($n = 136,993$) and respondents who selected at least one non-White identity ($n = 12,581$), the latter of whom we label as ‘visible minorities.’ This is not entirely consistent with the original definition of visible minority, Canada’s *Employment Equity Act*, where Aboriginal people are not defined as visible minorities. It is, however, a strategy that facilitates an explicit focus on White privilege (Amankwah *et al.*, 2009; De Maio and Kemp, 2010).

Statistics Canada asked a series of survey questions pertaining to educational attainment to generate the education variable described in Table 1. We dichotomized this variable for use in our models by distinguishing respondents with and without a university degree. To assess household income, respondents were asked: “What is your best estimate of the total income, before taxes and deductions, of all household members from all sources in the past 12 months?” Follow-up questions determined the range within which their household income fell for respondents unable or unwilling to provide a precise dollar value. We dichotomized this variable to distinguish between household incomes equal to or greater than \$80,000 and less than \$80,000.

Sexual orientation was assessed as follows: “Do you consider yourself to be: Heterosexual? (If necessary: sexual relations with people of the opposite sex); Homosexual, that is lesbian or gay? (If necessary: sexual relations with people your own sex); Bisexual? (If necessary: sexual relations with people of both sexes).” We combined the latter responses to distinguish between heterosexual and lesbian, gay or bisexual (LGB) respondents.

Physical activity was assessed according to the CCHS's Physical Activity Index (PAI). The CCHS defines physical activity in terms of average daily energy expenditure and is calculated using body weight and participation in various activities. The PAI was measured through a succession of questions regarding types of physical activities respondents engage in and length of time in each activity. Respondents were asked the following: "Have you done any of the following in the past three months: walking for exercise, gardening or yard work, swimming, bicycling, popular or social dance, home exercises, ice hockey, ice skating, in-line skating or rollerblading, jogging or running, golfing, exercise class or aerobics, downhill skiing or snowboarding, bowling, baseball or softball, tennis, weight-training, volleyball, basketball, soccer, any other?" Respondents were asked how frequently they participate in each activity and the average length of time spent on one activity in a single episode of activity. The PAI is calculated using these data which are weighted according to the metabolic equivalent task (MET) value assigned to each activity (Courneya *et al.*, 2008). An average daily energy expenditure—measured as kilocalories per kilogram of body weight per day—is calculated and the following categories are derived: 3.0+ kilocalories per kilogram of bodyweight (KKD) is considered 'active,' 1.5 - 2.9 KKD is considered 'moderately active' and less than 1.5 KKD is considered 'inactive.' We dichotomized the PAI to distinguish between 'inactive' or 'moderately active' ($n = 114,479$) and 'active' ($n = 35,095$).

Statistical modelling

The final person estimation weights provided by Statistics Canada were merged and transformed to produce a mean of one in the working sample. Binary logistic regression modelling was

applied to the dichotomous physical activity dependent variable. We used cross-product terms in hierarchically well-ordered models to examine statistical interactions (Jaccard, 2001). The test of significance for the highest-order cross-product term in a hierarchically well-ordered model indicates the statistical significance of the multi-way interaction as a whole. The coefficient for X_i in a hierarchically well-ordered model with a multiplicative term that includes X_i represents the effect of X_i on Y for those cases in which all of the other variables in the interaction are equal to zero; judicious recoding of the other variables in the interaction facilitates examination of the effects of X_i on Y in subgroups of the sample. Predicted probabilities were generated using the *margins (atmeans)* command in Stata 12.

Analytical strategy

We applied a two-stage analytical strategy. In the first stage, we generated a logistic regression model on physical activity with racial identity, gender, educational attainment, household income, sexual orientation, age, marital status and immigration status as independent variables. This main effects model represents an additive approach to modelling physical activity and serves as a referent for the intersectional analyses that follow. In the second stage, we modelled statistical interactions between racial identity, gender, educational attainment or household income, and sexual orientation on physical activity. We accomplished this by separately examining the four-way interactions between racial identity, gender, educational attainment and sexual orientation and between racial identity, gender, household income and sexual orientation. If a given four-way interaction was statistically non-viable or statistically non-significant we separately examined each of the three-way interactions that can be generated from them. The

degree to which interactions between racial identity, gender, class and sexual orientation are statistically significant addresses the applicability of the principle of multiplicativity. For each statistically significant interaction, we plotted and compared the predicted probabilities for the complex locations of interest generated by the additive and multiplicative models. The comparison of predicted probabilities from the additive and intersectional approaches enables us to address the applicability of the intersectional principle of multiple jeopardy. The larger project to which this study belongs was approved by the Behavioural Research Ethics Board at <anonymous>.

Results

Additive model

Table 2 summarizes the additive model on physical activity. Controlling for the other variables in the model, visible minority respondents are less likely than White respondents to be physically active. The odds of being physically active are lower for women than they are for men, higher for respondents with a university degree than for those with less education and higher for respondents with a household income of \$80,000 or more compared to less wealthy respondents. Lastly, the odds of being physically active are higher for respondents who identified as LGB than for heterosexual respondents. Overall, the additive model indicates that, of these four axes of inequality, social class has the strongest effect on physical activity. It also indicates that, from an additive perspective, highly educated, wealthy, gay or bisexual White men are the most likely and less educated, poor, heterosexual visible minority women are the least likely to be physically active. The results pertaining to racial identity, gender and class are consistent with the notion of

a triple jeopardy produced by processes associated with racism, patriarchy and classism that systematically disadvantage non-Whites, women and lower-class people. The result pertaining to sexual orientation, according more leisure-based physical activity to LGB respondents than to heterosexual respondents, is perhaps not so straightforwardly linked to systematic disadvantage.

<Table 2 here>

Interaction models

The four-way interaction term between racial identity, gender, educational attainment and sexual orientation is not statistically significant. We examined each of the three-way interactions generated from these four independent variables to find that the three-way interaction between racial identity, gender and household income makes a statistically significant contribution ($p < 0.01$) to the additive model of Table 2. We designate income as the focal variable to examine how the ‘effect’ of income on physical activity varies by racial identity and gender. Among men, income has a somewhat stronger effect on physical activity among visible minority respondents (OR = 1.603, 95% CI = 1.317-1.951) than among White respondents (OR = 1.387, 95% CI = 1.307-1.471). Among women, income has a moderately strong and positive effect on physical activity among White respondents (OR = 1.336, 95% CI = 1.254-1.432) and no discernible effect among visible minority respondents (OR = 0.997, 95% CI = 0.793-1.252). This means that the income effect on physical activity is strongest among visible minority men, of moderate strength among White men and women and non-existent among visible well-educated minority women. Figure 1 depicts predicted probabilities for the complex social locations formed at the intersection of racial identity, gender and income generated by the additive and multiplicative

models. The plot indicates that visible minority women of all incomes are the least likely and White and visible minority men with incomes greater than \$80,000 are the most likely of these complex social identities to be physically active. It also shows that visible minority men with incomes greater than \$80,000 are more likely to be physically active and visible minority women with incomes greater than \$80,000 are less likely to be physically active than predicted by the additive model. There is, it appears, something unique to these two particular complex social locations that fosters or inhibits regular, leisure-based physical activity.

<Figures 1 and 2 here>

The four-way interaction between racial identity, gender, household income and sexual orientation is not statistically significant. We examined each of the three-way interactions generated from these four independent variables to find that the three-way interaction between gender, educational attainment and sexual orientation makes a statistically significant contribution ($p < 0.05$) to the additive model of Table 2. The odds ratio for sexual orientation on physical activity is significantly greater than one among women with less than a postgraduate education (OR = 1.685, 95% CI = 1.197-2.372) and women with postgraduate education (OR = 1.301, 95% CI = 1.016-1.665). Sexual orientation is not significantly related to physical activity among men with postgraduate education (OR = 1.240, 95% CI = 0.993-1.547) and men without postgraduate education (OR = 0.874, 95% CI = 0.674-1.135). This means that an LGB orientation is associated with a greater likelihood of regular physical activity among women, especially less educated women, but not among men. Figure 2 indicates that less educated lesbian or bisexual women are much more likely and well-educated gay or bisexual men much less likely to be physically active than are predicted for them by the additive model.

Discussion

Intersectionality theory contends that macro-level systems of oppression interlock to create complex social locations which are accompanied by unique everyday lived experiences at the micro level. In this study, we attempted to determine whether leisure-based physical activity is implicated in intersections between racism, sexism, classism and heterosexism in Canada. With regard to overall amounts of leisure physical activity, we find that Canadians experience their incomes differently by the unique combinations of their racial and gender identities and their sexual identities differently by unique combinations of their gender and class identities. In other words, the individual-level effects of racial identity, gender, class and sexuality on leisure-based physical activity cannot be disentangled from one another. This demonstrates the usefulness of intersectionality theory for explicating leisure-based physical activity in Canada.

However, only two of the three tenets of intersectionality that informed our study were empirically supported by it, namely, simultaneity and multiplicativity. We find evidence for the applicability of both simultaneity and multiplicatively to physical activity in Canada in the form of several statistically significant three-way interactions in our regression models: when it comes to leisure-based physical activity, people's experiences of one inequality identity are shaped by their other inequality identities. The third principle of intersectionality, multiple jeopardy, received little support: holding multiple disadvantaged identities was not associated with an inordinately low likelihood of being physically active nor was holding multiple advantaged identities associated with an inordinately high likelihood of being physically active. Future searches for explanation in quantitative research on intersectionality and physical activity may wish to adopt a more flexible approach to the directionality of multiplicativity. For example, Purdie-Vaughn and Eibach (2008) argue that people with multiple subordinate-group identities

are often relegated to positions of “acute social invisibility” (p. 381) and that there are disadvantages *and* advantages of invisibility. This elastic approach to directionality has the potential to accommodate a wider range of social experiences than multiple jeopardy and as such may be more helpful in understanding health-related practices such as engaging in leisure-based physical activity.

Our study has implications for health promotion in Canada. First, the means by which health promotion researchers identify who is physically inactive is made more difficult by an inter-categorical intersectional worldview. This is because the use of additive regression modelling to predict people at elevated risk of physical inactivity, a common strategy in the field, is not sufficient to the task. By failing to account for complexity and, more specifically, intersecting axes of inequities, additive modelling on the effects of race, gender, class and/or sexuality on health-related practices is likely to generate misleading results. Instead, large datasets to which regression models containing multi-part interaction terms are applied are probably needed in order to identify the specific complex social identities to which health promotion programs should be targeted. These kinds of models are demanding of data and difficult to interpret.

But identifying target populations for health promotion interventions is only a first step; programs specially designed to address their unique needs and social circumstances are needed also. If the social conditions that contribute to physical activity are unique to complex social locations then health promotion efforts to promote physical activity should account for this uniqueness. For instance, our findings indicate that well-educated gay or bisexual men are unexpectedly unlikely to be physical active, some of the reasons for which may be specific to the social experiences that accrue to this particular complex social location. A health promotion

campaign targeting gay and bisexual men that attends to the underlying reasons for their inactivity is more likely to be successful than one that does not. A failure to attend to this level of particularity may explain why many previous health promotion efforts targeting specified at-risk populations have been unsuccessful – promotion efforts seemingly targeted at *all* members of these populations may have only meaningfully applied to a subset of them. Unfortunately this means that an even wider range of tailored health promotion programs than currently exists may be called for.

Finally, quantitative evidence of the kind reported here provides support for the attempts of Canadian scholars to meaningfully incorporate intersectional thinking into health promotion theory more generally (e.g., Dhamoon and Hankivsky, 2011; Hankivsky and Cormier, 2009; Reid *et al.*, 2012). This new wave of intersectionality-inspired health promotion theory insists that health promotion necessarily pursue social justice, resist essentializing any one group (women, poor people, etc.), recognize that social categories of difference pertaining to gender, sexuality and so forth are fluid and flexible, and ensure that uncovering power relations are always central to the analysis (Reid *et al.*, 2012). It urges health promotion scholars and practitioners to shift the focus of health promotion interventions from individuals to social-structural processes founded upon relations of power and inequality. It also encourages reflexive practice on the part of health promotion practitioners who are challenged to recognize their own forms of power and privilege and identify how the combinations of their own social identities shape their health promotion practice (Reid *et al.*, 2012). There is little room in an intersectionality-inspired health promotion for a mindless quantitative empiricism driven by an apolitical individualist ontology.

Several noteworthy limitations of our study also serve as directions for future research. First, while dichotomizing racial identity as White versus visible minority helps to illuminate the privilege that accompanies Whiteness in Canadian society, it also homogenizes the racially-based experiences of other Canadians. Attentiveness to the varied experiences of non-White racialized identities in Canada, such as Aboriginal, Asian, Black and South Asian, is required in future research of this kind. In addition, the sexual orientation question does not address the full complexity of sexuality which encompasses factors such as desire and action as well as self-professed identity. Further to the issue of measurement, social class in the form of occupational category, relation to the means of production and/or supervisory control in the workplace was not assessed in this study. Additionally attending to sexual practices and occupational category at the very least could also prove useful in future research on the class bases of physical activity and the ways in which class intersects with race, gender and sexuality to promote physical activity. These issues of conceptualization and measurement deserve careful consideration in future research on intersectionality theory and physical activity that seeks to improve upon the rather blunt measures of racial identity, class and sexuality utilized in this study. Properly addressing these limitations would likely expand the number of complex social locations under consideration, however, necessitating utilization of immensely large datasets.

Another major limitation of note regards the nature of the dependent variable, the Physical Activity Index. By calculating caloric expenditure across a wide range of leisure-based physical activities, our analysis is abstracted from the actual social practices—such as gardening, jogging or playing tennis—that are meaningfully situated at the intersection points of axes of inequality. Illuminating differences in overall physical activity between complex social identities can go some ways towards ‘explaining’ why certain health-related outcomes are differentially

distributed between them, but as yet little has been accomplished in regards to explaining how and why the social practices themselves are distributed. Follow-up investigations of the findings described here should identify precisely which social health-related practices are implicated in the differences in overall amounts of physical activity that accrue more to some complex social identities than others.

Finally, while we identified specific complex social locations that appear to be aligned with unexpectedly low levels of physical activity (wealthy visible minority women, well-educated gay or bisexual men) and unexpectedly high levels of physical activity (wealthy visible minority men, well-educated lesbian or bisexual women), we have done little to explain why this is so. Perhaps the nature of the manifestation of patriarchy within families in some racialized communities (George & Ramkissoon, 1998; Talbani & Hasanali, 2000; Rajiva, 2013) or the appropriation of and resistance to dominant discourses pertaining to sport by LGB people (Bridel & Rail, 2007) interact with class in complex ways to shape certain leisure-based physical activities. Introducing potential mediating factors to regression models, a standard means of explaining quantitative associations like ours, would not be appropriate if the mediating factors are not experienced similarly by people inhabiting the complex social locations being examined. Follow-up qualitative research on the experiences of inhabitants of these particular identities may be required in order to understand precisely how physical activity manifests itself at these particular points of intersection between race, gender, class and sexuality.

References

- Amankwah, E., Ngwakongwi, E. and Quan, H. (2009) Why many visible minority women in Canada do not participate in cervical cancer screening. *Ethnicity & Health*, **14**, 337-349.
- Bauer, G. (2014) Incorporating intersectionality theory into population health research methodology: Challenges and the potential to advance health equity. *Social Science and Medicine*, **110**, 10-17.
- Berger, M. T., and Guidroz, K. (2009) Introduction. In Berger, M. T. and Guidroz, K. (eds) *The Intersectional Approach: Transforming the Academy through Race, Class, and Gender*. Chapel Hill: University of North Carolina Press, pp. 1-22.
- Black, J. and Veenstra, G. (2011) A cross-cultural quantitative approach to intersectionality and health: Using intersections between gender, race, class and neighbourhood to predict self-rated health in Toronto and New York City. In Hankivsky, O. (ed) *Health Inequities in Canada: Intersectional Frameworks and Practices*. UBC Press, Vancouver, pp. 71-91.
- Bowleg, L. (2012) The problem with the phrase *Women and Minorities*: Intersectionality – an important theoretical framework for public health. *American Journal of Public Health* **102**, 1267-1273.
- Bridel, W. and Rail, G. (2007) Sport, sexuality, and the production of (resistant) bodies: De-/re-constructing the meanings of gay male marathon corporeality. *Sociology of Sport Journal*, **24**, 127-144.
- Bryan, S.N., Tremblay, M.S., Pérez, C.E., Ardern, C.I. and Katzmarzyk, P.T. (2006) Physical activity and ethnicity: Evidence from the Canadian Community Health Survey. *Canadian Journal of Public Health*, **97**, 271-276.

- Choiniere, R., Lafontaine, P. and Edwards, A.C. (2000) Distribution of cardiovascular disease risk factors by socioeconomic status among Canadian adults. *Canadian Medical Association Journal*, **162**, S13-S24.
- Collins P.H. (2000) *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment*. 2nd ed. New York: Routledge.
- Collins, P.H. (1993) Toward a new vision: Race, class, and gender as categories analysis and connection. *Race, Sex, and Class*, **1**, 25-45.
- Courneya, K.S., Katzmarzyk, P.T. and Bacon, E. (2008) Physical activity and obesity in Canadian cancer survivors: Population-based estimates from the 2005 Canadian Community Health Survey. *American Cancer Society*, **111**, 2476- 2482.
- De Maio, F.G. and Kemp, E. (2010) The deterioration of health status among immigrants to Canada. *Global Public Health*, **5**, 462-478.
- Dhamoon, K.R. and Hankivsky, O. (2011) Why the theory and practice of intersectionality matter to health research and policy. In Hankivsky, O. (ed) *Health Inequities in Canada: Intersectional Frameworks and Practices*. Vancouver: UBC Press, pp. 16-49.
- George, U. & Ramkissoon, S. (1998) Race, gender, and class: Interlocking oppressions in the lives of South Asian women in Canada. *Affilia* **13**, 102-119.
- Hankivsky, O. and Christoffersen, A. (2008) Intersectionality and the determinants of health: A Canadian perspective. *Critical Public Health*, **18**, 271-283.
- Hankivsky, O. and Cormier, R. (2009) *Intersectionality: Moving Women's Health Research and Policy Forward*. Vancouver: Women's Health Research Network.

- Hankivsky, O., de Leeuw, S., Lee, J.A., Vissandjee, B. and Khanlou, N. (2011) Introduction: Purpose, overview, and contribution. In Hankivsky, O. (ed) *Health Inequities in Canada: Intersectional Frameworks and Practices*. Vancouver: UBC Press, pp. 1-15.
- Hinze, S.W., Lin, J.L. and Andersson, T.E. (2012) Can we capture the intersections? Older Black women, education, and health. *Women's Health Issues*, **22-1**, e91-e98.
- Jaccard, J. (2001) *Interaction Effects in Logistic Regression: Quantitative Applications in the Social Sciences*. Thousand Oaks, CA: Sage.
- Jackson, P.B. and Williams, D.R. (2006) The intersection of race, gender, and SES: Health paradoxes. In Schultz, A. J. and Mullings, L. (eds) *Gender, Race, Class and Health: Intersectional Approaches*. San Francisco: Jossey-Bass, pp. 131-162.
- King, D.K. (1988) Multiple jeopardy, multiple consciousness. *Signs*, **14**, 42-72.
- Kobayashi, K.M. and Prus, S.G. (2011) Adopting an intersectionality perspective in the study of the healthy immigrant effect in mid- to later life. In Hankivsky, O. (ed), *Health Inequities in Canada: Intersectional Frameworks and Practices*. UBC Press, Vancouver, pp. 180-97.
- Koezuka, N., Koo, M., Allison, K.R., Adlaf, E.M., Dwyer, J.J.M., Faulkner, G. and Goodman, J. (2006) The relationship between sedentary activities and physical inactivity among adolescents: Results from the Canadian Community Health Survey. *Journal of Adolescent Health*, **39**, 515-522.
- Pan, S.Y., Cameron, C., DesMeules, M., Morrison, H., Craig, C.L., and Jiang, X. (2009) Individual, social, environmental, and physical environmental correlates with physical activity among Canadians: A cross-sectional study. *BMC Public Health*, **9**, 21.

- Purdie-Vaughn, V. and Eibach, R. (2008) Intersectional invisibility: the distinctive advantages and disadvantages of multiple subordinate-group identities. *Sex Roles*, **59**, 377-391.
- Rajiva, M. (2013) 'Better lives': The transgenerational positioning of social mobility in the South Asian Canadian diaspora. *Women's Studies International Forum*, **36**, 16-26.
- Reid, C., Pederson, A., and Dupéré, S. (2012) Addressing diversity and inequities in health promotion: The implications of intersectionality theory. In Rootman, I., Dupéré, S., Pederson, A. and O'Neill, M. (eds.) *Health Promotion in Canada: Critical Perspectives on Practice*, 3rd Edition. Toronto: Canadian Scholars' Press Inc., pp. 54-66.
- Rouhani, S. (2014) *Intersectionality-informed Quantitative Research: A Primer*. The Institute for Intersectionality Research & Policy, Simon Fraser University.
- Rosenfield, S. (2012) Triple jeopardy? Mental health at the intersection of gender, race, and class. *Social Science and Medicine*, **74**, 1791-1801.
- Schulz, A.J., and Mullings, L. (2006) Intersectionality and health: An introduction. In Schultz, A. J. and Mullings, L. (eds) *Gender, Race, Class and Health: Intersectional Approaches*. San Francisco: Jossey-Bass, pp. 3-17.
- Seng, J.S., Lopez, W.D., Sperlich, M., Hamama, L. and Meldrum, C.D. (2012) Marginalized identities, discrimination burden, and mental health: Empirical exploration of an interpersonal-level approach to modeling intersectionality. *Social Science and Medicine*, **75**, 2437-2445.
- Smith, P., Frank, J. and Mustard, C. (2009) Trends in educational inequalities in smoking and physical activity in Canada: 1974-2005. *Journal of Epidemiology and Community Health*, **63**, 317-323.

- Stephens, T., Jacobs Jr., D.R. and White, C.C. (1985) A descriptive epidemiology of leisure-time physical activity. *Public Health Reports*, **100**, 147-158.
- Talbani, A. and Hasanali, P. (2000) Adolescent females between tradition and modernity: Gender role socialization in South Asian immigrant culture. *Journal of Adolescence*, **23**, 615-627.
- Veenstra, G. (2011) Race, gender, class, and sexual orientation: Intersection axes of inequality and self-rated health in Canada. *International Journal for Equity in Health*, **10**, 1-11.
- Veenstra, G. (2013) Race, gender, class, sexuality (RGCS) and hypertension. *Social Science and Medicine*, **89**, 16-24.
- Warburton, D.E.R., Katzmarzyk, P.T., Rhodes, R.E., and Shephard, R.J. (2007) Evidence-informed physical activity guidelines for Canadian adults. *Applied Physiology, Nutrition, and Metabolism*, **32**, S16-S68.
- Warner, D.F. and Brown, T. H. (2011) Understanding how race/ethnicity and gender define age trajectories of disability: An intersectionality approach. *Social Science and Medicine*, **72**, 1236-1247.
- Weber L. (2007) Forward. In Landry, B. (ed), *Race, Gender and Class: Theory and Methods of Analysis*. Upper Saddle River, NJ: Pearson Education, pp. xi-xiv.
- Weber, L. (2006) Reconstructing the landscape of health disparities research: Promoting dialogue and collaboration between feminist intersectional and bio-medical paradigms. In Schultz, A. J. and Mullings, L. (eds), *Gender, Race, Class and Health: Intersectional Approaches*. San Francisco: Jossey-Bass, pp. 21-59.
- Weber, L. and Parra-Medina, D. (2003) Intersectionality and women's health: Charting a path to eliminating health disparities. In Segal, M. T., Demos, V. and Kronenfeld, J. J. (eds)

Advances in Gender Research: Gendered Perspectives on Health and Medicine. San Diego: Elsevier, pp. 181-230.

Williams, T. (2008) Intersectionality analysis in the sentencing of Aboriginal women in Canada: What difference does it make? In Cooper, D., Grabham, E., Herman, D. and Krishnadas, J. (eds), Intersectionality and Beyond: Law, Power and the Politics of Location. London: Routledge, pp. 79-104.

Table 1. Characteristics of the un-weighted working sample (n = 149,574)

Variable	Categories	Distribution
Gender	male	69,222 (46.3%)
	female	80,352 (53.7)
Age in years	----	mean=47.53, sd=14.75
	25 - 34	33,530 (22.4%)
	35 - 44	36,500 (24.4)
	45 - 54	34,204 (22.9)
	55 - 64	24,523 (16.4)
	65 and older	20,817 (13.9)
Marital status	married	77,405 (51.8%)
	living common-law	15,735 (10.5)
	widowed	10,927 (7.3)
	separated	6,357 (4.3)
	divorced	12,338 (8.2)
	single (never married)	26,812 (17.9)
Immigrant status	immigrated to Canada 20 years ago or more	12,797 (8.6%)
	immigrated to Canada between 10 and 19 years ago	3,862 (2.6)
	immigrated to Canada < 10 years ago	4,304 (2.9)
	born in Canada	12,8611 (86.0)
Racial/cultural origin	White	136,993 (91.6%)
	Chinese	2,221 (1.5)
	South Asian	1,143 (0.8)
	Black	1,297 (0.9)
	Filipino	752 (0.5)
	Latin American	797 (0.5)
	Southeast Asian	424 (0.3)
	Arab	329 (0.2)
	West Asian	410 (0.3)
	Japanese	214 (0.1)
	Korean	209 (0.1)
	Aboriginal	2,833 (1.9)
	Other	1,025 (0.7)
	Multiple origins	927 (0.6)
Educational attainment	less than bachelor degree	119,733 (80.0%)
	bachelor degree or higher	29,841 (20.0)
Household income	< \$80,000	110,831 (74.1%)
	\$80,000 or more	38,743 (25.9)
Sexual orientation	heterosexual	147,048 (98.3%)
	gay, lesbian or bisexual	2,526 (1.7)

Table 2. Binary logistic regression model on physical activity (n=149,574)

	<i>OR</i>	<i>95% CI</i>	<i>p</i>
Racial identity			
White (ref)	1.000		
visible minority	0.856	0.785 .. 0.933	< 0.001
Gender			
male (ref)	1.000		
female	0.817	0.786 .. 0.849	< 0.001
Educational attainment			
no bachelor degree (ref)	1.000		
bachelor degree or more	1.388	1.326 .. 1.453	< 0.001
Household income			
< \$80,000 (ref)	1.000		
> \$80,000	1.358	1.300 .. 1.418	< 0.001
Sexual orientation			
heterosexual (ref)	1.000		
gay, lesbian or bisexual	1.218	1.067 .. 1.391	0.003

Note: Model controls for age, marital status and immigration status.

Figure 1: Predicted Probability Plot for Race by Gender by Household Income

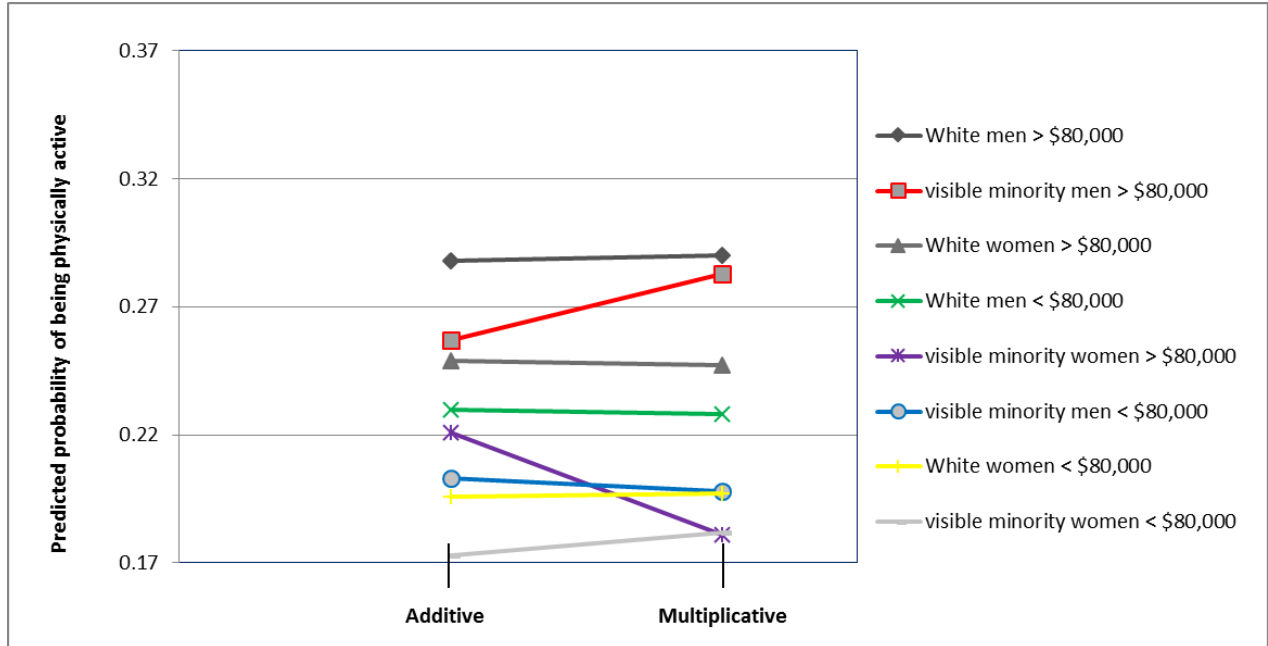


Figure 2: Predicted Probability Plot for Gender by Education by Sexuality

