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Neighbourhood socioeconomic inequality and gender differences in body mass index: The role of unhealthy behaviours

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ABSTRACT

Reported differences in the severity of the social gradient in body mass index (BMI) by gender may be attributable to differences in behaviour. Self-reported height, weight, socioeconomic and behavioural data were obtained for a sample of 10,281 Australians aged ≥15 years in 2009. Multilevel regressions were fitted with BMI as the outcome variable. Two-way interactions between gender and neighbourhood disadvantage were fitted, adjusted for confounders. Models were then adjusted for four behavioural factors ("chips, snacks and confectionary", "smoking, little fruit or veg", "time poor and less physically active" and "alcohol consumption"). Additional models were fitted on a subset with accurate perceptions of weight status (determined by World Health Organization criteria) to control for potential social desirability bias. Although higher BMI was observed for men in most disadvantaged compared with most affluent neighbourhoods (coefficient 0.87, 95% CI 0.35 to 1.40), this pattern was stronger among women (1.80, 95% CI 1.17 to 2.42). Adjusting for differences in behaviours attenuated, but did not fully explain the differences in social gradients observed for men (0.73, 95% CI 0.21 to 1.26) and women (1.73, 1.10 to 2.36). Differences in behaviour did not explain contrasting socioeconomic gradients in adult BMI by gender. Further research on differences in BMI, health and behaviour over time aligned with how heavy a person may perceive themselves to be is warranted.

1. Introduction

High body mass index (BMI) is a key driver of many non-communicable diseases globally (Ng et al., 2014). In most cases, though not all, high BMI is more prevalent within socioeconomically disadvantaged communities (Lovasi et al., 2009). Previous research has suggested that the socioeconomic patterning of BMI among women may be stronger than that for men (Feng and Wilson, 2015a, 2015b). That is, men tend to have higher BMI regardless of neighbourhood disadvantage in comparison to women living in the same areas. Women in affluent areas tend to have substantially lower BMI compared to men in the same neighbourhoods. But because the socioeconomic gradient for women is steeper, the gap in BMI between men and women in disadvantaged neighbourhoods is much smaller. If this reflects a causal relationship, it suggests that women appear to benefit more from living in an affluent neighbourhood in comparison to men.

Although the existence of a socioeconomic gradient is not in dispute, the underlying reasons for the gender differences in the severity of this gradient are not well known. Without doubt, the most common explanations for inequities in overweight and obesity in society are behavioural and stress-related (Friedman, 2000). It is known that a relatively sedentary and inactive lifestyle with ongoing passive overconsumption of energy has a significant impact on the odds of becoming overweight or obese (Hall et al., 2011). This process is effected by tobacco smoking, which influences energy intake, metabolic rate, physical activity and lipoprotein lipase activity (Filozof et al., 2004). Alcohol consumption also adds non-trivial numbers of calories (Suter and Tremblay, 2005; Wang et al., 2010; Wannamethee and Shaper, 2003). Many of these behaviours may be driven – at least in part - by work-related stressors that results in feelings of being rushed and having less than ideal levels of control (Kivimäki et al., 2006). Low levels of social support and social capital may also play a role in shaping behavioural responses to stress (Holtgrave and Crosby, 2006). Evidence suggests that experiences of stress not only shape what people do, but also how the body responds, amplifying the risk of weight gain (Dallman et al., 2003; Seematter et al., 2005).

If men and women experience or respond to the same sources of psychosocial stress and societal influences in different ways, such as taking part in many of the abovementioned behaviours, then this could result in gender differences in weight gain. If these stress

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responses and behavioural patterns are clustered within socioeconomically disadvantaged areas, then this could result in the socioeconomic gradient in BMI. Combined, gendered experiences of stress and participation in certain behaviours correlating with neighbourhood socioeconomic circumstances could explain the differences in severity of the social gradient in BMI between men and women.

The purpose of this study was to investigate gender differences in the patterning of BMI across strata of neighbourhood socioeconomic disadvantage in relation to behavioural factors. A well-known challenge for studies in this regard has been the reliance upon self-reported data, which may under- or over-estimate participation in particular behaviours. For example, it is known that there is social desirability bias in self-reporting of dietary intake (Hebert et al., 1995; Hebert et al., 1997), alcohol consumption (Davis et al., 2010) and physical activity (Adams et al., 2005). In the absence of objectively measured data, one potential avenue to account for this measurement error is to focus on a sample of people for whom social desirability bias may be lower. We hypothesised that weight-related misperceptions (Chang and Christakis, 2003; Gregory et al., 2008; Johnson et al., 2008; Langellier et al., 2014) are potentially driven by the same motivation for social desirability as the mis-reporting of behaviours. Accordingly, in this study we utilised data on BMI classified by World Health Organization criteria to identify people who are overweight or obese compared with 'normal' weight and compare this with whether people perceive themselves as overweight or not. Analyses were conducted on a full sample and on a subset who reported accurate perceptions of their weight status to reduce social desirability bias.

2. Method

2.1. Data

Data analysed in this study was extracted from the "Household, Income and Labour Dynamics in Australia" (HILDA). Details of HILDA are already published (Watson and Wooden, 2002). In brief, HILDA is a nationally representative sample of approximately 15,000 individuals in 7000 households collected annually. A cross-sectional sample of 4889 men and 5392 women aged 15 years or older was selected from the 2009 wave only, due to restrictions in the availability of behavioural data.

2.2. Body mass index

Self-reported height and weight were used to calculate BMI for each participant. BMI was considered in its continuous form.

2.3. Weight related perceptions

In 2009 a question was included in the HILDA survey on self-rated weight as follows: "*Do you consider yourself to be… acceptable weight/underweight/overweight?*" Answers were cross-tabulated against participants' BMI classified according to WHO criteria ('overweight or obese' = BMI ≥ 25). Participant reporting was determined to be at a lower risk of social desirability bias if they perceived their WHO classified 'normal' weight as 'acceptable' or correctly acknowledged that they were overweight, obese or underweight (N = 7094). Participants were excluded if they were either missing self-rated weight data or if they mis-perceived their WHO-classified weight status (N = 3187).

2.4. Behavioural variables

Eleven relevant indicators of behaviour were available and dichotomised. The questions that were asked and the range of possible answers were as follows:

1) ***Physical activity***: The question was: "*In general, how often do you participate in moderate or intensive physical activity for at least 30 minutes?*" Answers included "not at all", "less than once a week", "1 to 2 times a week", "3 times a week", "more than 3 times a week", or "everyday". The binary variable was derived identifying participation of <3 times a week versus 3 or more.
2) ***Feel rushed***: The question was: "*How often do you feel rushed or pressed for time?*" Answers included "almost always", "often", "sometimes", "rarely", or "never". The binary variable was derived to differentiate between those who felt rushed often or more compared with less often.
3) ***Frequency of meeting with friends***: The question was: "*In general, about how often do you get together socially with friends or relatives not living with you?*" Answers included "every day", "several times a week", "about once a week", "2 or 3 times a month", "about once a month", "once or twice every 3 months", or "less often than once every 3 months". The binary variable was derived identifying those who met with friends once or twice every 3 months or less compared with more often.
4) ***Frequency of eating biscuits and cakes***: The question was: "*How often do you usually eat each of the following food types? Biscuits, cakes, pies, cake-type desserts, pastries, etc.*" Answers included "never", "less than once a month", "1 to 3 times a month", "once per week", "2 to 4 times per week", "5 to 6 times per week", "once per day" or "two or more times per day". The binary variable was derived identifying those who ate these food types at least 5 times a week or more compared with less.
5) ***Frequency of eating snack foods***: The question was: "*How often do you usually eat each of the following food types? Snack foods, such as potato crisps, pretzels, popcorn, crackers, oriental snack mix, and salted nuts.*" Answers included "never", "less than once a month", "1 to 3 times a month", "once per week", "2 to 4 times per week", "5 to 6 times per week", "once per day" or "two or more times per day". The binary variable was derived identifying those who ate these food types at least 5 times a week or more compared with less.
6) ***Frequency of eating confectionary and ice-cream***: The question was: "*How often do you usually eat each of the following food types? Confectionery, such as lollies, sweets, chocolate bars, and fudge, and ice cream*". Answers included "never", "less than once a month", "1 to 3 times a month", "once per week", "2 to 4 times per week", "5 to 6 times per week", "once per day" or "two or more times per day". The binary variable was derived identifying those who ate these food types at least 5 times a week or more compared with less.
7) ***Frequency of eating fried potatoes, chips and French fries***: The question was: "*How often do you usually eat each of the following food types? Fried potatoes, French fries, hot chips or wedges.*" Answers included "never", "less than once a month", "1 to 3 times a month", "once per week", "2 to 4 times per week", "5 to 6 times per week", "once per day" or "two or more times per day". The binary variable was derived identifying those who ate these food types at least 5 times a week or more compared with less.
8) ***Consumption of vegetables***: The question was: "*including tinned, frozen and fresh vegetables, on how many days in a usual week do you eat vegetables?*" Answers included "1 day per week", "2 days per week", "3 days per week", "4 days per week", "5 days per week", "6 days per week", "7 days per week" or "do not eat vegetables in a usual week". The binary variable was derived in order to differentiate between those who eat vegetables on fewer than 4 days a week compared with more.
9) ***Consumption of fruit***: The question was: "*including tinned, frozen and fresh fruit, on how many days in a usual week do you eat fruit?*" Answers included "1 day per week", "2 days per week", "3 days per week", "4 days per week", "5 days per week", "6 days per week", "7 days per week" or "do not eat fruit in a usual week".