Parenting style and obesity risk in children

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A B S T R A C T

Background. Parents play a critical role in their children’s lifestyle habits. The objective was to assess the effect of parenting style on the risk of childhood obesity, and to determine whether poverty was a moderator of the association.

Methods. Participants were from the 1994–2008 cross-sectional samples of the National Longitudinal Survey of Children and Youth (NLSCY), a nationally representative survey of Canadian youth. Factor and cluster analyses identified four parenting styles consistent with Baumrind’s parenting style prototypes. Multivariable logistic regression assessed the risk of obesity based on parenting style after adjusting for covariates. Analyses were stratified by age (preschool: 2–5 years of age, n = 19,026; school-age: 6–11 years of age, n = 18,551) and the moderating effect of poverty (household income < low income cut-offs adjusted for household size and geographic region) was assessed. Analyses used sampling and bootstrap weights.

Results. In multivariable analyses, compared to authoritative parenting, preschool- and school-age children with authoritarian parents were 35% (95% CI: 1.2–1.7) and 26% (CI: 1.1–1.4) increased likelihood of obesity, respectively, but only among the children not living in poverty. In school-age children, poverty was not a moderator.

Conclusions. Parenting style is associated with childhood obesity, but may be moderated by poverty. Successful strategies to combat childhood obesity should reflect the independent and interactive associations of sociodemographic and social–familial influences on health especially in early childhood.

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Background

Obesity prevalence in Canadian youth has doubled since 1980 (Tremblay and Willms, 2000). In addition to biologic factors, sociodemographic and environmental factors are associated with obesity; lower socioeconomic status (SES) (Wang and Beydoun, 2007), living in neighborhoods with poor walkability, and poor access to fresh fruits and vegetables increase the risk for obesity (Powell et al., 2006; Nilsen et al., 2010).

In children, environmental factors specific to family life may play an additional role (Berge, 2009). Previous research in the social–familial domain has primarily focused on behavior-specific parenting (“parenting practices”) and has found that a child’s obesity risk is influenced by parental control over specific behaviors (such as if the parent controls the types and amount of snacks a child is allowed) (Berge, 2009).

General parenting style has been shown to affect adolescent risk behaviors, but its effect on childhood obesity is poorly understood (Newman et al., 2008; Berge, 2009). While some studies report an association between parenting style and BMI z-scores (Berge et al., 2010; Chen and Kennedy, 2005; Olvera and Power, 2010), few studies report an association with obesity (Agras et al., 2004; Wake et al., 2007). The inconsistent findings might suggest that small studies were underpowered to detect associations (Agras et al., 2004), were focused on young children who had not yet undergone their adiposity rebound (Wake et al., 2007), or that other variables may be moderating the association.

In particular, despite the mounting evidence that poverty is an independent predictor of obesity, sociodemographic characteristics have been inadequately investigated in the existing literature (Berge, 2009;
Sleddens et al., 2011). It has been suggested that the relationship between parenting styles and children’s obesity risk may be affected by the larger social environments and contexts in which children live. For instance, neighborhood safety, or parenting norms based on different SES may warrant different parenting styles to be effective (Patrick et al., 2013). But research is limited and further investigation of potential moderation is needed (Sleddens et al., 2011).

Because obesity tracks from childhood to adulthood (Juhola et al., 2011) and is associated with several health risks (Freedman et al., 2001; Moriarty-Kelsey and Daniels, 2010), reducing childhood obesity is a top public health priority (World Health Organization, 2012). Thus the aim of this study is to investigate the association between parenting style and obesity in a large representative sample of Canadian youth, and to assess if poverty moderates this association. Specifically, we hypothesized that 1) compared to authoritative parenting, authoritarian, permissive and negligent parenting would be associated with a higher risk of childhood obesity and 2) the strength of this association would differ between children living and not living in poverty.

**Methods**

A cross-sectional sample of participants from the National Longitudinal Survey of Children and Youth (NLSCY) database comprised the study population. The study’s sampling design and study protocol have been published previously (Statistics Canada and Human Resources Development Canada, 1995). Briefly, samples representative of the non-institutionalized civilian youth (ages 0–11) throughout Canada was collected bi-annually since 1994. The cross-sectional samples of interest for this study (n = 66,813) were those obtained from 1994–2008 (8 cycles).

Data collection consisted of computer-assisted questionnaires completed by the person most knowledgeable (PMK) of the child and included sociodemographic and SES characteristics, family characteristics, neighborhood characteristics, and child’s characteristics. Statistics Canada obtained informed consent and assent from parents and youth respectively, and protects against the identity disclosure of any individual or organization (Canadian Institutes Of Health Research et al., 2010). Thus, as a secondary data analysis with no identifiable information, ethics approval from the Institutional Review Board was not required.

**Measures**

**Parenting style**

Parenting style describes the general characteristics of the interactions between parent and child. Initially described by Baumrind (1966) and expanded upon by Maccoby and Martin (1983) four archetypes of parenting style occur along two dimensions of responsiveness (nurturing or warm/hot) and demand/demandingness (establishing boundaries and enforcing them): authoritative (responsive and demanding), authoritarian (not responsive but demanding), permissive (responsive but not demanding) and neglective (not responsive and not demanding). Twenty-five questions encompassing different interactions between the PMK and child were collected on 5-point Likert scales. Parenting styles were identified according to the methodology outlined by Chao and Willms (2002) and have previously been shown to correspond well with Baumrind’s parenting styles. Briefly, a factor analysis on the PMK–child interactions was conducted. The number of factors was based on the least number of factors with a cumulative eigenvalue of approximately 1. Five variables had low loadings (<0.40) on all factors and were excluded from further analysis. Due to non-unique factor loadings, a varimax rotation was used and the remaining 20 variables had high loadings on a single factor. The four factors that were identified were consistent with those previously reported (Chao and Willms, 2002) and have previously been shown to correspond well with Baumrind’s parenting styles. A factor analysis on the PMK–child interactions was conducted. The number of factors was based on the least number of factors with a cumulative eigenvalue of approximately 1. Five variables had low loadings (<0.40) on all factors and were excluded from further analysis. Due to non-unique factor loadings, a varimax rotation was used and the remaining 20 variables had high loadings on a single factor. The four factors that were identified were consistent with those previously reported (Chao and Willms, 2002) and were labeled as ‘reasons with child’ (5 variables), ‘difficult managing the child’ (5 variables), ‘responsive’ (5 variables), and ‘uses a firm approach’ (5 variables) (Table 1).

Any variable with negative factor loadings was reverse coded; higher values indicated higher cumulative scores of the variables comprising that factor. A scaled score was calculated for each factor, and a cluster analysis was conducted to group similar observations together using k-means clustering. The parenting style that best corresponded to a cluster was identified based on the characteristics provided by Baumrind (1966) and were consistent with the literature (Chao and Willms, 2002).

**Weight status and health**

The child’s height and weight were reported by the PMK and were converted to body mass index (BMI) values and compared to the World Health Organization (WHO) growth curves (De Onis et al., 2007). The literature indicates that parents tend to underestimate height (thus artificially inflating their child’s BMI). Thus the main outcome of interest was whether the child was obese, rather than whether the child was overweight or obese. While this analytic decision was not expected to fully eliminate misclassification, because larger errors in height and weight are required to erroneously classify a normal-weight child as obese, it was likely to diminish misclassification. A child was identified as obese if their BMI percentile was > 97.7th percentile for their age and sex as defined by the WHO growth curves. BMI is not always used for children less than 2 years of age, thus only the participants between the ages of 2–11 (n = 43,437) comprised the eligible sample (Daniels, 2009). An additional 5860 participants were excluded due to missing data.

**Poverty**

The past year’s household income (before taxes and deductions) was reported by the PMK and compared to the low income cut-offs established by Statistics Canada which are adjusted for household size and geographic region (Giles, 2004). Poverty was defined as annual household income below the cut-off. A subanalysis maintaining household income as a low income cut-off ratio did not affect the results; thus poverty as defined above was used in all analyses.

**Covariates**

Sociodemographic characteristics known to be associated with parenting style or health were included in multivariable analyses. These included continuous covariates (child’s age, birth weight, birth order of the child, maternal age, family functioning score, neighborhood cohesion, neighborhood safety) and binary covariates (child’s sex, whether the PMK was an immigrant, whether the PMK had at least a high-school education, whether the family was a two-parent or a single-parent household). The family functioning score measured the family’s ability to deal with stressors as a unit and was based on the validated McMaster Family Assessment Device (Byles et al., 1988). A sensitivity analysis was additionally adjusted for neighborhood cohesion and safety. Because the study sample was reduced due to missing neighborhood data but results were unaffected, neighborhood characteristics were omitted from the final models.

**Data analysis**

All analyses were conducted with SAS 9.3. Due to the complex sampling strategy used in the NLSCY, sampling and bootstrap weights were used. The association between parenting style and obesity risk was assessed in multivariable logistic regression adjusting for all the covariates previously described. Authoritative parenting style served as the referent. Whether poverty was a moderator in this association was also assessed. Due to evidence of differences in parenting style between preschool (2–5 years of age) and school-age children (6–11 years of age) in this study sample, analyses were stratified by age category.

**Results**

The analytic sample (n = 37,577) did not significantly differ from those excluded due to missing data (n = 5860) in sex or age of the child, but was less likely to be from an immigrant family or poor, and the PMK was more likely to have at least a high-school education (data not shown). The implications of this are described in the discussion. Most of the missing data occurred with the covariates; the proportion missing parenting style was <5%. A sensitivity analysis wherein multivariable models maximized sample size by minimizing the number of covariates did not differ from the results presented here.

Many of the characteristics were significantly different between the younger and older samples (Table 1). Approximately one-third of the younger children were obese (29.8%), and 18.8% of the school-age children were obese. Nearly half of the parents of younger children were authoritative (41.9%), and the rest were nearly evenly divided into authoritarian, permissive, and neglective (15.7%, 20.1%, and 22.3%, respectively). Parents of school-age children were primarily authoritative (31.9%), or negligent (31.1%), followed by permissive (21.7%) or authoritarian (15.3%).
and 26% (CI: 1.1–1.7, p = 0.0001) (Table 2). Children with permissive or negligent parents were 44% (CI: 1.3–1.8, p = 0.007). However, poverty was not a moderator for the association between permissive parenting and obesity, but no joint interaction between poverty and parenting style was associated with an increased risk of low or high income. In contrast to our study, several cross-sectional studies reported no association between authoritative parenting and elevated BMI (Olvera and Power, 2010; Sleddens et al., 2011), and the negative effects of negligent or permissive parenting on an increased likelihood of obesity compared to an authoritative parenting style. Parenting style was not associated with obesity in younger children from poor households. Compared with authoritative parenting, school-age children of authoritarian parents were more likely to be obese, irrespective of household income.

The results are consistent with the literature reporting the positive effects of authoritative parenting on decreasing BMI (Berge et al., 2010; Sleddens et al., 2011; Rodenburg et al., 2013), and the negative effects of negligent or permissive parenting on an increased risk of elevated BMI (Olvera and Power, 2010; Lissau and Sorensen, 1994). However, the association between parenting style and obesity has been less clear (Sleddens et al., 2011). While this study had nearly 40,000 respondents, previous studies averaged a few hundred respondents. In contrast to our study, several cross-sectional studies reported no association between authoritative parenting and elevated BMI. However, these other studies were conducted among children of different ethnic backgrounds, and cultural heritage and ethnicity may play a role in parental interactions with the child and should be further assessed (Park and Walton-Moss, 2012).

A limitation of the existing literature is the role that SES may play in the association between parenting style and childhood obesity. While the evidence for low SES and the risk of childhood obesity is mounting (Shrewsbury and Wardle, 2008), studies of parenting style as an independent predictor of obesity risk in children have been mixed, oftentimes hampered by small sample sizes, or multivariable models which did not adjust for SES (Olvera and Power, 2010; Sleddens et al., 2011). The moderation of poverty on the risk of obesity has only been assessed by Topham et al. (2010) who reported that poverty was a moderator for the association between permissive parenting and obesity, but no

### Table 1

<table>
<thead>
<tr>
<th>Child's characteristics</th>
<th>2–5 year olds (n = 19,026)</th>
<th>6–11 year olds (n = 18,551)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>50.9%</td>
<td>51.1%</td>
<td>0.35</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>3.8 (0.4)</td>
<td>9.2 (0.5)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Obesity</td>
<td>29.8%</td>
<td>18.8%</td>
<td>0.06</td>
</tr>
<tr>
<td>Birth order</td>
<td>1.8 (0.3)</td>
<td>1.7 (0.4)</td>
<td>0.05</td>
</tr>
<tr>
<td>Parental characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authoritarian</td>
<td>17.5%</td>
<td>15.1%</td>
<td>0.002</td>
</tr>
<tr>
<td>Authoritative</td>
<td>88.0%</td>
<td>88.7%</td>
<td>0.20</td>
</tr>
<tr>
<td>Maternal age</td>
<td>33.3 (2.1)</td>
<td>38.1 (2.3)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Household characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family functioning score</td>
<td>8.1 (2.0)</td>
<td>8.1 (2.3)</td>
<td>0.60</td>
</tr>
<tr>
<td>Poverty</td>
<td>15.9%</td>
<td>14.9%</td>
<td>0.11</td>
</tr>
<tr>
<td>Parenting style</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authoritative</td>
<td>41.9%</td>
<td>31.9%</td>
<td>0.0001</td>
</tr>
<tr>
<td>Authoritarian</td>
<td>15.7%</td>
<td>15.3%</td>
<td></td>
</tr>
<tr>
<td>Permissive</td>
<td>20.1%</td>
<td>21.7%</td>
<td></td>
</tr>
<tr>
<td>Negligent</td>
<td>22.3%</td>
<td>31.1%</td>
<td></td>
</tr>
</tbody>
</table>

* P-value comparing the distribution between 2–5 year olds and 6–11 year olds.

### Table 2

<table>
<thead>
<tr>
<th>Parenting style</th>
<th>Full sample (95% CI)</th>
<th>p</th>
<th>Poor households (95% CI)</th>
<th>p</th>
<th>Non-poor households (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Younger children</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authoritative</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Authoritarian</td>
<td>1.35 (1.2–1.5)</td>
<td>0.0001</td>
<td>1.0 (0.7–1.5)</td>
<td>1.0</td>
<td>1.44 (1.3–1.7)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Permissive</td>
<td>1.07 (0.9–1.2)</td>
<td>0.40</td>
<td>1.1 (0.7–1.6)</td>
<td>0.7</td>
<td>1.05 (0.9–1.2)</td>
<td>0.36</td>
</tr>
<tr>
<td>Negligent</td>
<td>1.13 (1.0–1.4)</td>
<td>0.13</td>
<td>0.6 (0.4–1.0)</td>
<td>0.05</td>
<td>1.26 (1.1–1.4)</td>
<td>0.01</td>
</tr>
<tr>
<td>Poverty (yes v no)</td>
<td>1.20 (1.0–1.4)</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>School-age children</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authoritative</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Authoritarian</td>
<td>1.41 (1.1–1.8)</td>
<td>0.007</td>
<td>1.0 (0.7–1.6)</td>
<td>0.7</td>
<td>1.05 (0.9–1.2)</td>
<td>0.36</td>
</tr>
<tr>
<td>Permissive</td>
<td>1.09 (0.9–1.3)</td>
<td>0.35</td>
<td>0.6 (0.4–1.0)</td>
<td>0.05</td>
<td>1.26 (1.1–1.4)</td>
<td>0.01</td>
</tr>
<tr>
<td>Negligent</td>
<td>0.86 (0.7–1.0)</td>
<td>0.12</td>
<td>0.6 (0.4–1.0)</td>
<td>0.05</td>
<td>1.26 (1.1–1.4)</td>
<td>0.01</td>
</tr>
<tr>
<td>Poverty (yes v no)</td>
<td>1.08 (0.8–1.3)</td>
<td>0.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Adjusted for age, sex, poverty, whether the person most knowledgeable about the child was an immigrant, whether the person most knowledgeable about the child had at least a high-school education, whether the household was a single or two-parent household, family functioning score, birth order of the child, birth weight of the child, and maternal age.

* Adjusted for age, sex, whether the person most knowledgeable about the child was an immigrant, whether the person most knowledgeable about the child had at least a high-school education, whether the household was a single or two-parent household, family functioning score, birth order of the child, birth weight of the child, and maternal age.

* Poverty was not a moderator for the association between parenting style and obesity among older children, thus no stratified results are presented.
association for authoritarian parenting was found, and negligent parent- ing was not assessed. In addition, the study had a limited sample size, and used parental education and occupation for SES, which have been shown to be distinctive from household income (Geyer et al., 2006).

Study results suggest that compared to authoritative parenting, authoritarian parenting is associated with obesity risk throughout early and middle-childhood. The child’s ability to self-regulate their energy intake has been suggested as one possible mechanism. Authoritarian parenting (characterized by low-responsiveness and high-demandingness) may translate to parents a) not responding to children’s cues of hunger and/or satiety, and b) demanding or controlling the child’s energy intake (Frankel et al., 2012). Thus, children’s ability to regulate their own energy intake is underdeveloped and these children may be more likely to overindulge when given the opportunity (Patrick et al., 2013).

Consistent with the literature, poverty was a strong independent predictor of obesity and moderated the association among younger children (Wells et al., 2010). Among school-age children, however, poverty was no longer an independent predictor of obesity risk after adjusting for parenting style and other SES characteristics such as maternal immigration status and parental education. Thus it is unclear whether the independent effect of poverty on obesity risk may overshadow the effect of parenting style in younger children. Although parenting style may not impact obesity risk during early childhood among poor children in this study, parenting style has been associated with affecting poverty’s impact on cognitive development, risky behaviors in adolescence, and other health and wellness factors (Linner et al., 2002; Wen and Shenassa, 2012).

Due to the cross-sectional nature of this study, we cannot assess if parenting style adapted to different needs of the children based on their different ages. In addition, parent–child interactions were based on parental report, and variations due to cultural differences, sociodemographic characteristics and parental perceptions may exist (Baumrind, 1966, 1967). Thus while the Baumrind parenting styles may be able to generally group parenting practices, direct observations of parent–child interactions are strongly needed. Parenting styles were identified based on cluster analysis across multiple cross-sectional samples between the years 1994–2008. Thus although parenting styles were identified based on their common features, it is possible that the association between parenting styles with children’s obesity risk may have changed during this time period. Longitudinal studies assessing the stability of parenting styles over time and across ages are needed. As previously mentioned, parental report of height and weight likely artificially inflates their child’s BMI. However, while the analytic decision to assess obesity likely minimizes misclassification of normal-weight children in this study sample, misclassification of overweight children as obese is still a concern as it is improbable that one-third of the 2–5 year olds in this sample are truly obese. Although prevalence estimates of obesity based on parental report among 9-year olds in the NLSCY sample was found to be similar to those obtained using measured BMI (Banach et al., 2007), larger studies measuring height and weight in representative samples of children are needed.

Residual confounding by unmeasured variables (e.g., physical activity and dietary intake) may also affect our results and should be further assessed. Maternal depression has been suggested to also be a moderator (Topham et al., 2010), but we were unable to assess this. Lastly, analyses were restricted to households with children between the ages of 2–11 and with data on parenting style and may no longer be representative of Canadian youth. However, the proportion lost due to missing data was relatively low (1%) and to the best of our knowledge the sample is the largest to date and may still be informative of general parenting practices and their associations with obesity in Canadian youth.

In this large cross-sectional sample of Canadian youth, authoritarian parenting was associated with an increased likelihood of childhood obesity when compared to authoritative parenting, but this association was moderated by household income among the sample of preschool-age children. Thus results suggest that both poverty and parenting style are important predictors of childhood health and successful strategies to combat childhood obesity need to reflect their independent and interactive associations on health. However, in order to successfully implement a strategy that combines individual-level targets with larger societal targets, more research on the qualitative differences of social–familial characteristics based on sociodemographic characteristics is needed.

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.ypmed.2015.03.005.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

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