CHANGE IN CHILD HEALTH AND SOCIOECONOMIC STATUS:
EXAMINING THE MODERATING EFFECTS OF
DIFFERENTIAL PARENTING

By

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A thesis submitted in conformity with the requirements for the degree of
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Inequality within the family (i.e. differential parenting) is associated with a variety of measures of child adjustment. To date there is no research examining the effects of this phenomenon on children's physical health, or on the fashion in which this phenomenon may combine and interact with socioeconomic markers. The present study assessed 375 mothers and their children over a period of 18 months. Differential maternal negativity between siblings predicted change in child health, controlling for child gender, age, maternal education, income/assets, and absolute level of negativity in the household. The association between maternal education and change in child health was strongest when children were also exposed to high differential negativity, suggesting that these predictors combined in a cumulative fashion. Findings indicate that multiple forms of social disadvantage (i.e. between families and between siblings) can operate independently or in combination with one another to predict change in child health.
Dedication

To my parents – Your lives illustrate the primacy of magnanimity, social justice, and benevolence. These themes are evident throughout this work.
Acknowledgments

First and foremost, I would like to thank my supervisor, Dr. Jennifer Jenkins, for all of the opportunities and guidance I have received over the past two years. Your dedication to families, children and scientific rigor is an inspiration to all of us. I must also acknowledge my friends and lab-mates in the Jenkins Laboratory. Your direction, support and camaraderie have also been invaluable. Additionally, I would like to thank the families and staff involved in the Kids, Families and Places Study, whose time, efforts and involvement made this research possible.

I would like to thank the faculty, staff and students involved in the School and Clinical Child Psychology program at the Human Development and Applied Psychology Department. Your hard work and kindness make us a functional community. I would also like to thank my professors from undergrad for turning me on to psychology, developmental science and academia. Also, the educators from my youth for setting me on the right track, and who continue to guide our youngest generations. Finally, I need to thank my parents, for teaching me the role of higher education and research in the helping enterprise, and my entire family, for always being a source of love, support and fun.
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1 Background

Beginning at conception and continuing throughout infancy and childhood, the pathway towards human health is strongly influenced by the socioeconomic context (Repetti, Taylor & Saxbe, 2007). Wilkinson and Pickett (2009) argue that absolute levels of socioeconomic context are not the only important element in the prediction of health. Rather, they articulate the role of inequality within a society, suggesting that high levels of socioeconomic variability are associated with lower levels of wellbeing. This finding can be considered through the lens of distributive justice, where emphasis is placed upon the conditions in which the goods and harms within society are fairly distributed in order to foster individual well-being (Deutsch, 1985). A substantial body of developmental literature has focused on the early effects of socioeconomic status on child physical and mental health (Bradley & Corwyn, 2002), as well as the ways in which sociodemographic risks combine with risky parenting to influence child health (Repetti, Taylor, & Seeman, 2002). However, there is a relative paucity of literature examining the impact of parenting inequality on the development of child health, where parenting inequality or differential parenting refers to the sibling differences in rearing environments (Jenkins, Rasbash, & O’Conner, 2003). It is important to remember that issues of distributive justice “occur not only at the societal level but also in intimate social relations” (p. 1. Deutsch, 1985). Like inequality within a society, inequality within a family has been shown to have a negative impact on child outcomes (Burt, McGue, Iacono & Krueger, 2006; Caspi, Moffit, Morgan, Rutter, Taylor, Arseneault, et al. 2004).
Studies that have examined the consequences of differential parenting have focused on mental health outcomes in children (e.g. Burt et al., 2006; Caspi et al., 2004; Jenkins, Cheung, Frampton, Rasbash, Boyle, & Georgiades, 2009; Pike & Ketschmer, 2009; Richmond & Stocker, 2009). To date, there have been no studies examining the effects of differential parenting on “physical health” outcomes. Thus, the first goal of the present study is to examine how inequality within families contributes to child health beyond the influence of social disadvantage. Moreover, as many studies have shown that risks combine in the prediction of child well-being (Jenkins, 2008), the second study goal was to test the hypothesis that differential parenting will moderate the effects of socioeconomic status on child health. Specifically, we expected that exposure to societal and familial disadvantage would predict more negative physical health outcomes. Such an approach may illustrate that the “struggles and power imbalances” that influence health within a larger society (p. 1, Hofrichter, 2003) can interact with developmental influences within the immediate family context.

In order to investigate the effects of income inequality on health a large number of individuals within a designated area, as well as data across many areas are required. The inequality construct has typically been examined across countries or across states/provinces. In the present study only absolute levels of socioeconomic disadvantage have been assessed. The concept of inequality is operationalized within the domain of parenting, rather than the domain of socioeconomics, in the present paper.
1.1 Socioeconomic Status and Child Health

Researchers have argued that SES can influence child health through a variety of mechanisms which may be organized in three categories: a) inequitable allocation of resources like nutrition, healthcare, housing, stimulating experience, parent expectations and investment, quality of education; b) stress reactions caused by parenting, environmental hazards, adverse life events, violence, and neighbourhood problems and c) health behaviours like tobacco, alcohol and illicit substance abuse and excercise (Bradley & Corwyn, 2002; Repetti, Taylor, & Saxbe, 2007; McEwen & Seeman, 1999; McEwen & Stellar, 1993). However, it has been suggested that the effects of socioeconomic disparity on human health outcomes do not simply operate through absolute levels of material wealth. Rather, inequality itself appears to have an adverse impact on a variety of human health outcomes (Wilkinson & Pickett, 2009). Wilkinson and Pickett (2009) examined the distribution of health and social problems across 21 countries as a function of income inequality. They conclude that social problems – including life expectancy, academic outcomes, child mortality, teenage births, obesity, trust, and mental illness – are worse among nations with the greatest income inequality, such as the UK, Portugal and the USA. Wilkinson and Pickett (2009) suggest that inequality impacts human outcomes through a reduction in social capital and an increase in psychosocial stress. It is important to remember that social exchange frequently occurs within the context of dominance hierarchies. Primate research has demonstrated that individuals at the bottom of the dominance hierarchies often show poorer physiological functioning compared to those at the top (Sapolsky, 2005). Thus, comparative social processes are operative within day-to-day life,
influencing physiology and providing a mechanism whereby inequality becomes embedded in the biology of the individual.

1.2 Parenting and Child Health

Similar to socioeconomic effects on child health, there is unequivocal evidence citing the importance of the early family environment in child development (Repetti, Taylor, & Seeman, 2002). Parents guide and influence the development of their children in a number of ways, providing protection and resources, implementing behavioural control while promoting autonomy, and encouraging active participation and reciprocity in group settings (Grusec & Hastings, 2007). Though the targets of parental behaviour are often psychosocial in nature, it is impossible to disentangle “social” and physiological" influences on child health; human development depends on the coactions of these processes, not their independent contributions (p.5; Rutter, 2007). Thus, it has been suggested that the effects of parenting on child development are best conceptualized by examining the associations between parental behaviour and the human stress or emotional response (Jenkins, 2008). Often emerging as a function of negative parenting, there are health consequences associated with the chronic activation of the biological stress pathways (Boyce, 2007; Repetti, Taylor, & Seeman, 2002).

A number of studies have documented the effects of poor parenting and family adversity on various indicators of child health. For example, one study of 835 children examined the longitudinal influences of parental sensitivity and parental conflict in kindergarten on cardiovascular health during middle school (Bell & Belsky, 2008b).
Researchers found that early parental warmth predicted a variety of cardiovascular indicators of child health including heart rate and dyastolic and systolic blood pressure. These effects were found even after controlling for socioeconomic status. Parenting quality has been linked to early asthma onset, as well. In a prospective cohort study of children with a genetic risk of asthma, problems with caregiving, postpartum depression, and low maternal support during infancy were associated with an increased risk for the onset of symptoms before the age of three, and again before the age of eight (Klinnert, Nelson, Price, Adinoff, Leung & Mrazek, 2001).

Parenting behaviour has also been linked to levels of child stress hormones. Children of mothers who express higher levels of warmth and involvement tend to have steeper diurnal cortisol rhythms, a pattern that is thought to be indicative of better health (Pendry & Adam, 2007). Thus, one possible mechanism by which parenting may be related to child health is through the chronic and persistent activation of the biological stress response system.

1.3 Differential Parenting as a Source of Inequality

Parenting can be viewed as a form of social capital, in that it provides a resource in the form of a relationship that is associated with cognitive and social development, and contributes to the success of individuals in society (Coleman, 1990). Similar to the ways in which income or financial capital is inequitably distributed within nations or other geo-political units of society (Wilkinson & Pickett, 2009), social capital or parenting resources can be inequitably distributed within families (Boyle, Jenkins, Hadiyannakis, Cairney, Duku, & Racine, 2004). Differential parenting can be viewed through the lens
of distributive justice, which concerns the distribution of conditions that influence the health, success, and well-being of individuals (Deutsch, 1985). Issues surrounding distributive justice arise when something desirable is unavailable (i.e. resources), or when something harmful cannot be avoided by all people (Deutsch, 1985). Using this frame, it is possible to see that parenting is both a resource (in terms of parental warmth, love, affection and positive interaction) and a potential “harm” or “cost” (in terms of hostility, ineffective disciplinary practices, and punitiveness) that can be differentially allocated within a family.

Most studies on the associations between parenting and child health measure a single parent-child dyad. Such research cannot reveal the complex ways in which parenting operates within a family unit. Jenkins (2008) notes that measured environments can be divided into the family-level and child-specific. Factors that all siblings experience in a similar fashion operate at the family level, and may include family conflict, the ambient/average level of parental harshness, maternal depression, divorce or the loss of a family member. Conversely, there are experiences that differ for each sibling, such as the particular parent-child relationship or the child’s peer context. Dimensions of parenting can be conceptualized using family-level and child-specific distinctions. When this approach is applied, the family-level average of a particular parenting construct is called ambient parenting which refers to the amount of that dimension (e.g. maternal negativity or positivity) that is present in the household atmosphere (Jenkins, Cheung, Frampton, Rasbash, Boyle, & Georgiades, 2009). The child-specific deviations from this family average is referred to as differential parenting, and can be conceptualized as the amount of negativity or positivity a child experiences relative to the average for that family. The fact that siblings are more dissimilar than
similar after controlling for genetic effects is partially attributable to non-shared environmental influences like differential parenting (Turkheimer and Waldron, 2000). Research has found associations between differential parenting and child psychological adjustment (Burt et al, 2006). Seeing as there are similar biological pathways for parental effects on child mental and physical health (Repetti, Taylor, & Seeman, 2002), it is likely that there will be associations between indicators of child health and differential parenting.

1.4 The Moderating Effect of Parenting

Environmental risks have been found to operate contingently in the prediction of children’s mental health. Rutter (1983, 1993), demonstrated that individual risk factors transmit minimal harm when they are present in isolation. Negative health outcomes emerge, however, when risks occur together. In this case, the number of risks rather than their specific type is what is important to understanding health problems in children. This has been referred to as a cumulative risk model. For instance, Evans (2003) has shown that the aggregation of risks, including poverty, single parenthood, and low parental education, is associated with heightened cardiovascular and neuroendocrine risk as well as increased body fat. The concept of differential susceptibility (Luthar, Cicchetti & Becker, 2000; Masten & Powell, 2003) is the same concept: children are differentially susceptible to the adverse effects of a risk based on the presence of other risks in their lives.

A range of studies have shown that poor quality parent-child relationships leave children vulnerable to the negative effects of other environmental risks. For example,
Simons and colleagues (Simons, Simons, Burt, Drummond, Stewart, Brody, et al., 2006), showed that African American boys exposed to high levels of racial discrimination only exhibited antisocial, violent and delinquent behaviour if parents were unsupportive. Similarly, Kriebel & Wentzel (2011) in a sample of adopted children, showed that children showing the highest level of behavior problems were those who experienced both high levels of pre-adoption risk and low levels of child-centred parenting in the adoptive home. Biological risk factors (including blood lead levels) have also been found to be moderated by the quality of parenting in the prediction of cognitive outcomes in children (Hubbs-Tait, Mulugeta, Bogale, Kennedy, Baker & Stoecker, 2009). Taken together, this body of research suggests that the effects of non-parenting risk factors will be most pronounced under situations of negative parenting.

In summary, the first goal of this study is to test the hypothesis that differential parenting will predict change in child health, over and above socioeconomic status and absolute level of parenting. The second goal is to test the hypothesis that the children most susceptible to the negative influence of socioeconomic status on change in health will be those who are disfavored by parents, in comparison to siblings.

2 Method

2.1 Participants

All of the women giving birth to infants in the cities of Toronto and Hamilton, Ontario between April 2006 and September 2007 were considered for participation. Families were recruited through a program called Healthy Babies Healthy Children, run
by Toronto and Hamilton Public Health, which contacts the parents of all newborn babies within several days of the newborn’s birth. Families for the present study were recruited into the Intensive Sample of the Kids, Families and Places Study (IKFP). Eligibility for the Intensive sample included the newborn child having a sibling less than 4 years old (called Sibling 2), the mother speaking English, the birth-weight of the newborn being over 1500 grams and parents agreeing to being filmed in the home. Eleven-hundred and eighty families were potentially eligible for the Intensive Sample and 501 were enlisted into the study (reasons for non-enlistment included inability to contact families, families not meeting criteria and refusals). A further 5 families were visited but asked for their data to be withdrawn before data collection was completed. We compared our sample with the general population of Toronto and Hamilton using 2006 Census Data, limiting the census data to women between 15-54 years. Additionally, given that mothers with newborn children are more likely to be partnered compared to mothers with older children, statistics for marital status were obtained from the National Longitudinal Survey of Children and Youth, a nationally representative sample of children 0-11 years old (2002), as this sample included mothers with children under one year. Families were similar on family size, income, and marital status. Education levels of IKFP families were higher than census families and rates of immigrants were slightly lower (see Meunier et al., 2011). In the current investigation data for our health outcome of interest at Time 1 and Time 2, was only collected for sibling 2. Thus sibling 2 is the focus of this investigation, although all siblings in the family to a maximum of 4 were assessed for parenting, permitting an accurate calculation of differential parenting. There were 397 Sibling 2’s who participated in the IKFP at Time 1 and Time 2. A small number (n = 23) were missing measurement on the
dependent variable at both time points. Since change scores were of interest, and to avoid imputing data at both time points, these children were dropped from the analysis. Thus, data were available through questionnaires and interviews of 375 mothers at two waves of data collection (baseline and follow-up) which were separated by 18 months on average. Of participating children, 193 (51.5%) were male. At time 1, children were an average of 2.62 years old ($SD = .75$). Ages ranged from 0.58 years to 4.33 years.

### 2.2 Measures

Demographic characteristics, socioeconomic indicators and parenting behaviour were measured at Time 1. Change in health was calculated from the health measure which was administered at both time points.

#### 2.2.1 Demographic Characteristics

Child gender and age in years were collected from mothers: girls = 1. Boys were the reference category.

#### 2.2.2 Socioeconomic Variables

The KFP study has a high proportion of immigrants. As there is a more modest association between income and assets with maternal education in immigrant samples (Gass, 2010), Income and Assets was kept separate from Maternal Education. *Income and Assets* was created as a composite variable. Parents responded to the following questions: “how many rooms do you have in your house”; “Do you own or co-own this home/apartment/unit, even if still making payments: yes =1, no =2”; “Do you own or co-own a car, even if still making payments: yes =1, no =2”. These questions, in addition to
a question pertaining to annual income, were standardized and coded so that all variables were going in the same direction, where higher scores were indicative of higher SES. Items had an internal consistency of $\alpha = .79$. Maternal Education was assessed as the number of years of formal education completed, excluding kindergarten.

2.2.3 Positive and Negative Parenting

Parenting was assessed using self-report measures derived from the National Longitudinal Survey of Children and Youth (NLSCY), a nationally representative survey of Canadian children (Statistics Canada, 2008). Mothers were asked to rate a variety of statements describing affection, positive interaction, punishment and hostility in the parent-child relationship using a 5-point Likert Scale (1 = never, 5 = many times each day), with items adapted from Strayhorn and Weidman’s (1988) Parent Practices Scale. Items were subjected to a factor analysis by the NLSCY, resulting in 3 dimensions that accounted for 40% of the variance in responses: Warmth/Involvement, Hostility/Ineffectiveness, and Consistency. The current investigation focused on the Warmth/Involvement dimension (i.e. parental Positivity) and the Hostile/Ineffective dimension (i.e. parental Negativity).

Examples from the positivity scale include ‘how often do you and your child laugh together?’, ‘How often do you and he/she talk or have fun with each other for 5 minutes or more?’, ‘How often do you do something together that he/she enjoys?’ Internal consistency for this scale was good ($\alpha = .79$). Examples from the negativity scale include ‘how often do you get angry with your child?’, ‘How often do you get annoyed with him/her for saying or doing something he/she is not supposed to?’ Internal
consistency for this scale was also good ($\alpha = .80$). Parental positivity and negativity have been found to be associated with indices of child adjustment and family-level adversity in the theoretically expected ways (Browne, Odueyungbo, Thabane, Byrne, & Smart, 2010; Ho et al., 2008; Kohen et al., 2002; Peters et al., 2010; Strohschein et al., 2010); in previous studies these scales have also provided valid measurement of differential parenting (Jenkins et al., 2003; Boyle et al., 2004). The parenting scores were derived by taking the mean of all items for positivity or negativity, creating a range of possible scores from 1 to 5.

Though only one older sibling was included in the primary analysis, at Time 1 parents filled out the parenting scales for all their children to a maximum of 4. Based on established methodology, this permitted the assessment of ambient and differential parenting (Jenkins, Cheung, Frampton, Rasbash, Boyle, & Georgiades, 2009). Family average scores were computed across all siblings for both negativity and positivity. This family average is the average amount of negativity or positivity across all children in the family. Child specific or differential parenting is calculated by subtracting the family average from the raw score of the individual. This represents the degree of difference between the positivity or negativity experienced by the target child and the average level in the family. Higher scores on ambient parenting indicate higher average levels of either positivity or negativity in the family. Higher scores on differential parenting indicate that children are experiencing more of that parenting dimension, relative to the siblings.
2.2.4 Change in Child Health

Change in child health was the primary outcome of interest in the present investigation. Mothers responded to the following question at baseline and 18 month follow-up: *In general, would you say this child’s health is (1) excellent, (2) very good, (3) good, (4) fair or (5) poor.* The distribution of child health was positively skewed at both baseline and follow-up. Seeing as the purpose of the analysis was to examine the predictors of change in health, a simple difference score was derived by subtracting the initial score from the follow-up score so that higher values are associated with a worsening in reported health. The resultant distribution was leptokurtic and centered on zero. That is, the majority of children did not change, resulting in a large spike in the middle of the distribution and two smaller tails. Due to this large departure from normality, it was decided that analytical techniques that rely on a Gaussian distribution would be inappropriate. Therefore, non-zero values were re-coded so that children either improved (-1), stayed the same (0), or worsened (1). This variable was treated as ordinal.

2.3 Data Analysis

All study variables were measured at baseline. For the purposes of the present analysis, only child health was examined at 18 month follow-up, permitting the computation of change scores. First, continuous study variables were evaluated for univariate normality and summarized using means and standard deviations; frequencies for categorical variables are given. Second, correlations amongst continuous predictor variables were examined using Pearson’s correlation coefficients. Finally, ordinal
regression using cumulative probability logits was used to examine the relationship between the predictors and the outcome since the latter was measured on an ordinal scale. Ordinal Regression is similar to Logistic Regression. In Logistic Regression the natural logarithm of the odds of one event occurring relative to *one alternative event* is modelled as a linear function. In this type of Ordinal Regression (referred to hereafter just as Ordinal Regression, though there are other types of logits that can be used), the natural logarithm of one event, compared to all events that are ordered before it, are modelled. Ordinal Regression is appropriate in situations where the odds are uniform or “parallel” no matter which event in an ordinal series is considered. For example, in an analysis with 3 possible ordered events: 1, 2, and 3, ordinal regression assumes the following:

\[
\begin{align*}
\theta_1 &= \frac{P(\text{Event 1})}{P(\text{Event} > 1)} \\
\theta_2 &= \frac{P(\text{Event 1 or 2})}{P(\text{Event} > 2)}
\end{align*}
\]

Where \(\theta_1\) represents the odds of event 1 occurring relative to event 2 and 3, and \(\theta_2\) represents the odds of event 1 and 2 occurring relative to event 3. Thus, the above equations can be represented as the following:

\[
\begin{align*}
\theta_j &= \frac{P(\text{Event} \leq j)}{P(\text{Event} > j)}
\end{align*}
\]

Where \(\theta_j\) can range from 1 to the number of ordered events minus 1. Subsequently, the Ordinal Regression Equation is written as follows:

\[
\ln (\theta_j) = \alpha_j - \beta X
\]
To the left of the equals sign is the logit. The subscript ‘j’ indicates that there is a different logit for j-1 events, which in this case equals 2. Also, each logit has its own threshold value ($\alpha_j$), which is a latent cut-off value for each logit function (not of substantive interest). However, all logits have the same $\beta$ weight, indicating that the effects of the independent variable on the odds are the same for different logits. Preliminary analyses indicated that this assumption was met, suggesting ordinal regression was appropriate. In the present analysis, this means that odd’s ratios can be interpreted as the odds of a child demonstrating “worse” health compared to “same” or better”, or the odds of demonstrating “worse” or “same” health, compared to “better”.

For categorical variables, odds ratios can be interpreted as the effect associated with a marker compared to a reference category (e.g. odds for males versus females). Continuous variables were transformed into Z-scores so that the effects can be interpreted as the odds associated with a 1 standard deviation increase in the predictor variable. All analyses were conducted using SPSS 19.

Model building took place in two steps. First the main effects of parenting (ambient and differential) were entered into the regression equation while controlling for child gender, child age, income and assets, and maternal education. Second, two interactions were entered into the equation: income/assets x differential parenting, and maternal education x differential parenting. This process was conducted separately for positivity and negativity. Model fit was evaluated using deviance (i.e. $-2 \times$ log likelihood) and the likelihood ratio test (i.e. change in deviance).
3 Results

3.1 Missing Data

There was small amount of missing data on predictors and outcomes (< 6.0%). Recommendations laid out by Graham (2009) were utilized for the handling of missing data. Descriptive statistics and a correlation matrix of continuous variables (Tables 1 & 2) are reported using data derived from Expectation Maximization (Little & Rubin, 1987; 2002). Multiple Imputation, as described by Rubin (1987) and Schafer (1999) was utilized for hypothesis testing. Ten datasets were generated using the Multiple Imputation program within SPSS 19 and we report the pooled estimates generated by SPSS.

3.2 Analysis

Descriptive statistics for continuous study variables are presented in Table 1. In terms of change in child health, 79 (21%) reported a decrease, 237 (63%) stayed the same, and 59 (16%) improved. Correlations amongst predictor variables are presented in Table 2. Mothers who had higher levels of income and assets also had higher levels of education, exhibited more ambient positivity, and less ambient negativity. Mothers with higher education levels also exhibited less ambient negativity and less differential positivity. When there were high levels of ambient positivity there were lower levels of ambient negativity and differential positivity. Differential positivity and negativity were inversely related with one another. Finally, older age was associated with higher ambient negativity and higher differential negativity.
Results for Maternal Negativity are presented in Table 3. Model 1 was a significant improvement over the null model, which fitted only an intercept (-2 Log Likelihood = 662.98, $\chi^2 (6) = 18.83, p = .005$). In this model, a one-standard deviation increment in maternal education was associated with 32% lower odds of a decline in health, or absence of improvement in health. Furthermore, a one standard deviation increment in differential negativity was associated with 26% higher odds of a decline in health, or absence of improvement in health. Neither income/assets nor ambient negativity were significant predictors of change in child health. In Model 2 the interactions among differential negativity and maternal education and income and assets were evaluated. The interaction between differential negativity and income and assets was non-significant and dropped from the model. The interaction between

<table>
<thead>
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<th>Variable</th>
<th>$M$</th>
<th>$SD$</th>
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<tr>
<td>Child Age</td>
<td>2.62</td>
<td>0.75</td>
</tr>
<tr>
<td>Income &amp; Assets</td>
<td>0.19</td>
<td>0.77</td>
</tr>
<tr>
<td>Maternal Education</td>
<td>15.51</td>
<td>2.64</td>
</tr>
<tr>
<td>Ambient Positivity</td>
<td>4.47</td>
<td>0.44</td>
</tr>
<tr>
<td>Ambient Negativity</td>
<td>2.80</td>
<td>0.57</td>
</tr>
<tr>
<td>Differential Positivity</td>
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<td>0.13</td>
</tr>
<tr>
<td>Differential Negativity</td>
<td>-0.01</td>
<td>0.17</td>
</tr>
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</table>

Table 1. Descriptive statistics of continuous predictor variables at Time 1 using Expectation Maximization for Missing Data.
maternal education and differential negativity was found to be significant. This interaction was plotted one standard deviation above and below the means for both variables in Figure 1. It is possible to see from Figure 1 that maternal education has little impact on child health under conditions of low differential negativity. However, under conditions of high differential negativity, low maternal education doubles the odds of a worsening or absence of improvement in child health. This model was a significant improvement over Model 1 ($-2 \text{ Log Likelihood} = 658.47$, $\chi^2 (1) = 4.51$, $p = .005$).

<table>
<thead>
<tr>
<th>Variable</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
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<td>1 Child Age</td>
<td>-0.01</td>
<td>0.07</td>
<td>0.02</td>
<td>0.05</td>
<td>0.17**</td>
<td>-0.07</td>
<td>0.15**</td>
</tr>
<tr>
<td>2 Male</td>
<td>-0.02</td>
<td>0.05</td>
<td>0.02</td>
<td>-0.03</td>
<td>0.08</td>
<td>-0.05</td>
<td></td>
</tr>
<tr>
<td>3 Income &amp; Assets</td>
<td>0.45**</td>
<td>0.10*</td>
<td>-0.13*</td>
<td>-0.07</td>
<td>0.03</td>
<td></td>
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<td>4 Maternal Education</td>
<td>0.04</td>
<td>-0.12*</td>
<td>-0.13*</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5 Ambient Positivity</td>
<td>-0.20**</td>
<td>-0.20**</td>
<td>0.04</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6 Ambient Negativity</td>
<td>0.03</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>7 Differential Positivity</td>
<td>-0.32**</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8 Differential Negativity</td>
<td></td>
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</tbody>
</table>

* $p < .05$, ** $p < .01$

Table 2. Correlations between continuous study predictor variables at Time 1
There were no significant main effects for ambient or differential positivity, and no significant interactions of differential positivity with income and assets or maternal education. Consequently, results for positivity have not been presented in table format.

<table>
<thead>
<tr>
<th>Term</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>Male</td>
<td>0.67†</td>
<td>(0.44, 1.02)</td>
</tr>
<tr>
<td>Child Age</td>
<td>0.84</td>
<td>(0.68, 1.04)</td>
</tr>
<tr>
<td>Income &amp; Assets</td>
<td>1.22</td>
<td>(0.90, 1.66)</td>
</tr>
<tr>
<td>Maternal Education</td>
<td>0.68*</td>
<td>(0.54, 0.86)</td>
</tr>
<tr>
<td>Ambient Negativity</td>
<td>1.04</td>
<td>(0.84, 1.29)</td>
</tr>
<tr>
<td>Differential Negativity</td>
<td>1.26*</td>
<td>(1.02, 1.57)</td>
</tr>
<tr>
<td>Maternal Education *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential Negativity</td>
<td></td>
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</tr>
</tbody>
</table>

Note. OR = Odds Ratio, CI = Confidence Interval. Continuous variables converted to Z-scores before modelling so that estimates can be interpreted as effect for 1 SD change.

\( p < .05, \; \dagger < .10 \)

Table 3. Ordinal regression output indicating odds of demonstrating a decrease in mother reported child health
Figure 1. The effect of maternal education on odds of worsening in mother reports of child health is moderated by differential maternal negativity.

4 Discussion

The goals of the current study were to test two hypotheses: 1) differential parenting will predict change in child health and 2) the interaction between socioeconomic status and differential parenting will predict change in child health. Both of these hypotheses received support in the case of differential maternal negativity, but not in the case of differential positivity. Higher levels of differential negativity were found to be associated with higher odds of poorer health outcomes while controlling for child characteristics, household income, assets and maternal education. This finding contributes to existing longitudinal research that has demonstrated robust associations between experiences of being parented and child health (Bell & Belsky, 2008ab; Belsky, Bell, Bradley, Stallard, & Stewart-Brown, 2007). Children who are disfavoured within a
family have declining levels of maternal-reported health across 18 months, compared to children who are favoured. Beyond the effects of absolute levels of parenting (which were controlled for and non-significant in the current study), maternal behaviour may influence child behaviour by creating an affectively negative environment that is characterized by a lack of security, competition, fear and anxiety (Jenkins & Greenbaum, 1999). Similar to the negative consequences of social competition and inequality within countries, the differential allocation of psychological harm within families has a negative impact on disfavoured children, not just in terms of their emotional and behavioural development as has been previously demonstrated (e.g. Boyle et al, 2004), but also in terms of their physical well-being in early childhood. Like the effects of absolute levels of parenting demonstrated in other research (Repetti et al, 2007), and the effects of absolute socioeconomic level (Bradley & Corwyn, 2002) and socioeconomic inequality (Wilkinson & Pickett, 2009), effects of differential parenting are likely operative through the human stress response. As target children receive more negativity than siblings, and experience themselves in a position of relative disadvantage within the family, stress reactivity is likely to be high. Research in non-human primates has demonstrated the physiological consequences of relative disadvantage, where the inferior members of dominance hierarchies have poorer health outcomes (Sapolsky, 2006). This trend extends to humans, consistent with the large body of research articulating the health effects of socioeconomic position on health. Results from the current study suggest that effects of disadvantage also operate within the family, whereby disfavored children show declining health status across early childhood. However, the effect of differential maternal negativity on child health also operates in a broader context of socioeconomic variability, functioning to moderate the
effects of environmental risk as indexed by maternal education. Many mechanisms through which low maternal education confers risk to children have been suggested, including preterm and small-for-gestational-age births (Luo, Wilkins & Kramer, 2006), exposure to environmental stressors such as tobacco smoke (Wills, 1995), inadequate nutrition, neighbourhood stress exposure, and limited access to medical care (Bradley & Corwyn, 2007). Additionally, there are parenting factors that covary with low maternal education which have been collectively described as “reactive responding”, characterized by excessively emotional or situationally-bound decision making, absence of long term planning, and a narrow repertoire of strategies (Taylor & Seeman, 1999). It is likely that the impact of these environmental risks and parenting behaviours are more deleterious in situations where a child is also treated more negatively than their siblings, exacerbating the physiological stress a child is experiencing and, therefore, health patterns Conversely, the absence of this disfavoured position within the family may buffer the consequences of the risks that typically coincide with low maternal education.

Unexpectedly, there was no main effect of ambient maternal negativity on changes in child health. This is unexpected, given the existing research on parenting and health in early childhood (e.g. Bell & Belsky, 2008ab). However, all studies of parenting and child physical health have focused on absolute levels of parenting and not the differential contexts in which it occurs. Thus, it is possible that the effects of ambient and differential parenting have been confounded in parenting research that does not have a sibling design. Additional research is required to answer this question. It is noteworthy that both absolute and differential positivity were not found to predict child health. Although there are replicated associations between both negativity and
positivity with developmental outcomes, it has been argued that negativity is more closely related to both contextual risk factors and child outcomes (Berg-Nielsen, Vikan, & Dahl, 2002), consistent with our findings.

4.1 Limitations and Future Directions

A few limitations of the current study should be addressed in future studies. First, the reliance on within-informant data for both the predictors and the outcome variable raises the possibility of shared method variance bias. Although an examination of the phenomena over time decreases this risk, future studies of differential parenting and child health should rely on multiple informants, in addition to objective biological markers of child health. Secondly, although there are multiple siblings enrolled in the Kids, Family and Places Study, the burden on parents in answering questions about all their children necessitated decisions about which constructs would be measured in all children (mental health) and which would be more limited (physical health). Thirdly, although the use of single item measures is widespread in survey studies of child health (e.g. Chen, Martin, & Matthews, 2006ab), this may not be optimal based on the domain-specific model of measurement error, which implies that more items result in greater contract validity (Gardner, Cummings, Dunham & Pierce, 1998). However, it has been demonstrated that single item scales can perform as well as multi-item scales in terms of convergent and discriminant validity (Gardner, Cummings, Dunham & Pierce, 1998), adding confidence to our findings.

Results from the current study have implications for the investigation of social inequality more generally. First, these findings illustrate the importance of considering multiple forms of inequality and multiple social locations in which these inequalities are
manifested. The principles of distributive justice are not limited to economic situations; rather, they extend to any situation in which goods or harms are distributed across a unit of organization (i.e. countries, families, schools, workplaces, etc.) in a fashion that differentially impacts psychological, physiological, economic or social well-being of individuals (Deutsch, 1985). Thus, it is important to apply principles of distributive justice when conceptualizing family relations, ensuring that parent-child dyads are considered in terms of the broader family environment, especially when siblings are present.

Second, researchers have articulated the importance of considering multiple sources of capital when examining the determinants of child development (financial, social and human; Bradley & Corwyn, 2002). The findings from this study suggest that the effects of different types of inequality may be multiplicative. Rather than each type of inequality having its own impact, these sources of inequality combine together to augment the effects of each in the prediction of health. It is important to understand these multiplicative patterns, in which aggregates of risk are more deleterious to well-being than single exposures of risk.
5 References


inconsistencies with a Canadian national database. *Child and Adolescent Psychiatry and Mental Health, 4*(5).


