Poverty, Social Capital, Parenting and Child Outcomes in Canada

by
Charles Jones, Linn Clark, Joan Grusec, Randle Hart, Gabriele Plickert & Lorne Tepperman
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Abstract

The experience of long-term poverty affects many child outcomes, in part through a family stress process in which poverty is considered to be one of the major factors causing family dysfunction, depression among caregivers and inadequate parenting. Recent scholarship extends the classical Family Stress Model by researching the ways in which neighbourhood contexts might mediate or modify these relationships. Neighbourhoods vary from the affluent to the economically deprived and since the long-term poor rarely live in well-off neighbourhoods, measures of neighbourhood disadvantage add little to family poverty in the prediction of child health and behaviour problems. But neighbourhoods also differ in the degree to which they are socially organized, cohesive and supportive to the enterprise of raising children. Sociologists refer to this as the "social capital"of neighbourhoods and propose that such social capital may ameliorate the effects of poverty and help parents raise children to achieve their full potential. This study reports the construction of measures related to social capital (Collective Efficacy and Social Support) at the neighbourhood, rather than the individual level, and the use of these along with a battery of census characteristics and other explanatory variables in the prediction of outcomes for longitudinal children aged 4 to 15 in the NLSCY.

The authors used statistical modeling to study the impact of higher or lower amounts of social capital in a national sample and in a smaller sample of some 200 neighbourhoods (as defined by census enumeration areas). The results support some aspects of an expanded family stress theory in that the effects of long-term poverty upon child outcomes are mediated, but also moderated by neighbourhood social capital, and by family "burnout" (dysfunction and parental depression).

The study confirms previous research showing that certain parenting styles are strongly associated with children's health and behaviour problems, and that neighbourhoods account for small but significant proportions of the variation in child outcomes. An innovative result is that the degree to which long-term poverty impacts child outcomes varies according to the characteristics of neighbourhoods. The authors caution that their study cannot provide national estimates of the impact of neighbourhood social capital on child outcomes.

Acknowledgements

We are very grateful to Mr. Dave Haans and Ms. Tina Hotton of Statistics Canada's Toronto Research Data Centre, as well as to Ms. Laine Ruus and her staff at the Data Library Service at the University of Toronto's Robarts Library. Several anonymous reviewers provided very valuable feedback on an early draft of this report. We must also thank Human Resources Development Canada and Statistics Canada for the tremendous amount of work that went into planning and data collection for such a high quality data resource as the NLSCY. Not least we thank the respondents, whether mothers, fathers or children, who answered so many questions about themselves and their families.

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1. Introduction

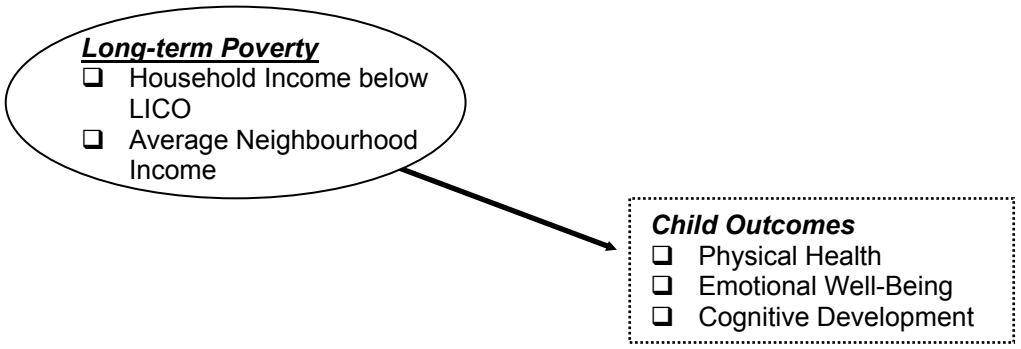
1.1 Outline of this Report

This report is complex and requires a road map. We begin by reviewing the literature on families, poverty and child outcomes, paying particular attention to three distinct themes that are relevant to child outcomes: the effect of long-term poverty, the Family Stress Model, and the role of neighbourhood social capital. Having shown the importance of these themes for understanding child outcomes, we propose a series of predictive models for use with data from the first three cycles of the NLSCY. Analyses of outcomes at the third wave of the NLSCY confirm aspects of the Family Stress Model but are insufficient to test theories about the moderating effects of neighbourhood characteristics, particularly neighbourhood social capital. Further analyses, this time of a subset of children for whom we have sufficient data about their neighbourhood context, permits a holistic view of the process by which child outcomes are determined.

1.2 Poverty, Long-Term Poverty and Family Stress

There is a rich and often contentious body of scholarship that links social exclusion, family and neighbourhood poverty, family stability, and family structure to child outcomes. Literature from the United States is inextricably bound up with race and ethnicity issues that refer essentially to comparisons among African-American, Hispanic and White families, with a focus on rates of illegitimacy or union dissolution, the incidence of lone-parent families, welfare dependency, neighbourhood safety and juvenile delinquency (Duncan and Brooks-Gunn 1997; McLloyd 1998). Similar general findings have been reported from Great Britain (McCulloch and Joshi 2001). While there has been much debate about the negative outcomes associated with children born out of wedlock, and the consequences of divorce for children (Amato and Keith, 1991), there are strong arguments that it is mainly economic adversity that has negative impacts on children's cognitive, behavioural, emotional, and physical development (Duncan and Brooks-Gunn 1997; McLloyd 1998; McCulloch and Joshi, 2001). We show this basic model, as it would apply to children between the ages of 4 and 15, in Figure 1. The basic model is clearly in need of clarification: largely in terms of what social processes mediate between poverty and child outcomes. There is some U.S. evidence that these effects are due to the impact of family poverty on the behaviour of caregivers towards their children and, in the case of two-parent households, the behaviour of caregivers to each other (Conger, Rueter, & Conger 2000).

Figure 1
Basic Model
This predicts child outcomes from poverty indicators alone. This establishes the extent to which there is a basic correlation between long-term poverty and child outcomes.



Many factors contribute to family poverty including underemployment, unemployment, and inadequate income support via government social assistance. Some people cannot earn a living wage given their human capital endowments and the local employment opportunities. Others may have been dismissed or laid off because of an economic downturn, and yet others may become caught in a "poverty trap" where perverse incentives make it difficult to obtain the resources to get off welfare. Some may "inherit" poverty because of being born into a particular social group defined by race, class and location, and families who constitute the "working poor" may have one or both parents working at or near the minimum wage. Whatever the sources of family poverty, the "Family Stress Model" (Conger et al. 2000) proposes that the experience of poverty is one of the more important factors that can put severe strains on spousal relationships, bring about feelings of depression and increase family dysfunction. These intermediate outcomes increase the risk of union dissolution, but whether divorce occurs or not, they have consequences for child outcomes. If the parents stay together but the family remains in poverty, the "Family Stress Model" predicts that the parents will continue to be depressed and the family dysfunctional. If the family dissolves, more stress follows and the children are likely to be brought up by their mother in a lone-parent family may have even lower income in relation to its needs (Finnie 1993; Dooley et al.1995). Lone-parents may re-partner, but while this increases the odds of escaping poverty, there is evidence that parent-child relationships are more difficult to manage in stepfamilies than in intact families (Daly and Wilson 1988).

While much research has focused on the consequences of divorce for child outcomes in lone-parent or stepfamilies, Cherlin et al. (1991) argued that symptoms of family stress have long-term consequences for children in as-yet intact families. They used longitudinal data to show that measures of family dysfunction and marital conflict taken before divorce when children were 7, are statistical predictors of negative child outcomes at age 11 in four areas: reading achievement; mathematics achievement; parent-rated

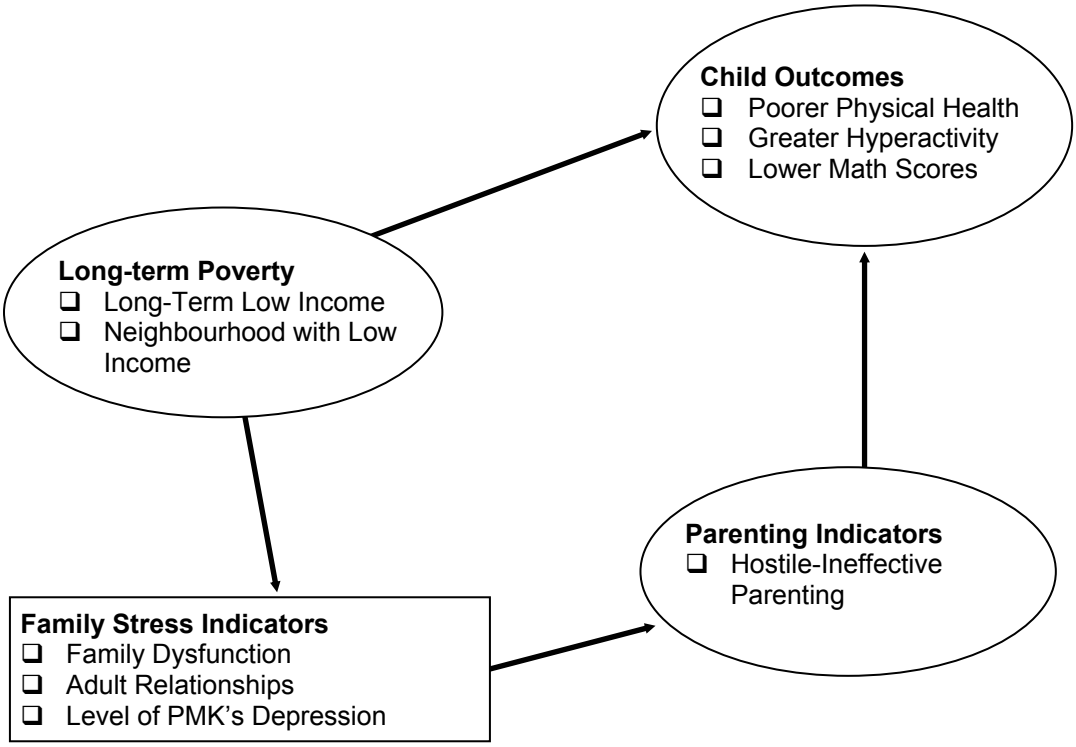
behaviour problems; and teacher-rated behaviour problems. Parental divorce was associated with behaviour problems among boys aged 11 to 16, but these "effects" were *reduced by approximately half* after the introduction of controls for a number of pre-divorce measurements, including the extent of spousal conflict. They conclude from this that much of the "effect" of divorce on children can be predicted by conditions that existed well before the separation occurred, and that: "At least as much attention needs to be paid to the processes that occur in troubled, intact families as to the trauma that children suffer after their parents separate" (1991 : 1388).

1.3 The Family Stress Model

The Family Stress Model (Conger et al. 2000) says that family poverty consists of low income, economic pressure and difficulties created by lack of money (i.e., being unable to pay monthly bills). As welfare states became less generous over the 1990s, poor families were increasingly expected to seek employment income and/or to upgrade their educational qualifications, leading to a complex juggling of work and domestic responsibilities for those with children. According to the model, this contributes to emotional distress (e.g., depression) and family dysfunction. Family distress causes problems in the relationship between adults that are, in turn, linked to less effective parenting—a complex notion that involves insufficient surveillance, lack of control over the child's behaviour, lack of warmth and support, inconsistency, and displays of aggression or hostility by parents or older siblings (Conger et al., 1994; Conger et al, 1997; McLeod and Shanahan, 1993). The variables thus appear sequentially in the model, as shown in Figure 2.

Child outcomes of high levels of family stress and ineffective forms of parenting include poor emotional adjustment, which may be externalized as various forms of aggression, or internalized as depression or low self-esteem. Healthy child adjustment, on the other hand, should emerge as achievement and on-task behaviour in school, persistence in difficult tasks, and enjoyment of daily life. The Family Stress Model is supported by good evidence from respected psychologists and sociologists (Conger et al. 1992; Conger et al., 1993; Whitbeck et al. 1997). Research findings from as long ago as the depression years of the 1930s, suggests that children were protected from the possible adverse consequences of poverty so long as the relationship between adult caregivers was supportive and stable (Komarovsky 1940; Angell 1965).

Figure 2
The Family Stress Model Without Neighbourhood Context
Poverty Causes Family Stress, Which Causes Ineffective Parenting which in Turn Affects Child Outcomes



The Family Stress Model has primarily been applied to socio-emotional and mental health outcome measures; however, there are good reasons to expect that the stress induced in children by poor parenting can also lead to physical health problems (Wickrama et al. 1997). The literature on socio-emotional and mental health outcome measures is not clear about precisely *when* the impact of economic hardship through parents begins to be felt, since the studies cited here were conducted with adolescents and preadolescents. Despite the interesting results reported by Guo and Harris, (2000) in the United States, there has not been sufficient research on how severe the effects of long-term poverty might be.

1.4 The Role of Neighbourhoods and Communities

The Family Stress Model is not completely comprehensive and psychologists recognize that extra-familial variables influence child outcomes. Sociologists such as Wilson (1991) have proposed that residence in poor neighbourhoods generates undesirable child outcomes in large part through the impact of such residence on parenting behaviour. Additionally, certain characteristics of neighbourhoods are hypothesized to lead to what Wilson calls "social isolation" and others have variously referred to as "social exclusion", "marginalization" from mainstream institutions, lack of "collective efficacy" or low

social cohesiveness" (Sampson et al., 1999). Claims have been made for the role of neighbourhood and community cohesiveness as a form of "social capital", which improves child and family outcomes and can mitigate the deleterious effects of living below the poverty line in neighbourhoods with low average income[1] (Coleman 1988; Portes 1998; Sampson et al. 1999). The roles of neighbourhood poverty and neighbourhood social capital are explored separately below.

1.4.1 Neighbourhood Poverty

Much of the literature in the field of neighbourhood poverty relates to the U.S. experience, where neighbourhoods are often ethnically or racially homogeneous and many of the poor ones are almost completely African-American or Hispanic (see, for example, Bianchi 1999; Corcoran et al. 2000; Ross and Mirowski 2001). It is likely that Canada has a lower incidence of poor neighbourhoods that are as segregated by race, ethnicity, or social class, as are poor neighbourhoods in Britain, France or the United States. If so, this may be reflected in a correspondingly smaller proportion of the variation in outcome measures that is between neighbourhoods, as suggested by the results of Boyle and Lipman's (1998) multi-level analysis of Canada's NLSCY[2]. Nevertheless, there are strong grounds for including characteristics of neighbourhoods and family households in models for the prediction of socio-emotional, health and cognitive outcomes for children and youth in Canada. Foster (2001) analyzed Cycle 1 of the NLSCY to show that there were neighbourhood effects on children's indirect aggression, though family effects were more prominent. Census variables that have been linked to child outcomes in analysis of the NLSCY include the incidence of female-headed lone-parent families and other indicators of neighbourhood affluence, such as the local unemployment rate, the percentage of families below a low-income

[1] This field of study is not without controversy. For one thing, the measurement of "social capital" is often inadequate. Sampson, Morenoff and Earls (1999) comment that it has become commonplace for researchers to use essentially individual-level measures such as "lone-parenthood" and "number of family moves" as indicators. More generally, Ginther et al. (2000) argue that postulating neighbourhood influences may complicate explanations unnecessarily since statistically significant regression coefficients for such effects can easily arise because of failure adequately to model the individual or family level determinants of child outcomes. Their review of the literature suggests the effects of neighbourhood attributes are small, even trivial in size and that it is difficult to replicate them from one study to another.

[2] Boyle and Lipman provide an excellent review of the literature up to 1998 and conclude: "About 6 percent of the variation in child problem behaviour is associated with between-neighbourhood differences. Among the indicators of socioeconomic disadvantage, the strongest predictors of child problem behaviour were one-parent family status, family SES, and the percentage of one-parent households in the neighbourhood. These, and other predictor variables measured on families and neighbourhoods (excluding child sex and age), explained from 2.6 to 3.7 percent of the total variance in reported problem behaviour (Boyle and Lipman 1998:38). McCulloch and Joshi (2001) emphasize that while awareness of the role of neighbourhood effects leads to an understanding of the social determinants of children's outcomes that is more than the sum of individual and family-level measures, the size of the estimated effects of neighbourhood conditions is so much smaller than the estimated effects of family-level conditions that families should still be viewed as the key agents in promoting positive development in children.

cut-off, the percentage of high-income families, and an index of neighbourhood disadvantage[3] summarizing the previous measures (Kohen et al. 1998; Boyle and Lipman 1998; Foster 2001).

Researchers have argued that parenting behaviour, as understood in the Family Stress Model, could mediate the effects of neighbourhood economic deprivation upon child outcomes (see, for example, Klebanov et al.'s 1997 study using the U.S. Infant Health and Development Program data). Modifier effects are also possible. Kupersmidt et al. (1995) report a significant interaction between family structure and a measure of neighbourhood disadvantage in the prediction of aggressive behaviour, but few such "potentiating" effects have been published. Boyle and Lipman (1998) were unable to find any significant interactions between family SES and neighbourhood disadvantage, but this may be because family SES and neighbourhood economic deprivation usually go together, thus making tests of such interactions difficult. Below, we conceptualize and measure "neighbourhood social capital" as distinct from neighbourhood economic deprivation, and thus may improve the odds of detecting cross-level interactions between family and relevant neighbourhood level variables.

1.4.2 Neighbourhood Social Capital

"Social capital" has been associated with civic participation (Putnam 1995, 2000), a high rate of membership in church and other voluntary organizations and sometimes with pride in a common ethnic or language heritage (Jewell 1988). Many have emphasized that social capital is "the networks, norms, values and understandings that facilitate cooperation within or among groups" (OECD, 2001). Sociologists have attempted to measure important aspects of this concept in a number of ways including: the linkage of neighbourhoods with census characteristics; the use of interviewer and adult respondent ratings of the helpfulness of neighbours (Sampson and Morenoff 1997); the availability of good local parks, playgrounds and play spaces; the incidence of membership in voluntary organizations; and extent to which children are involved in group activities. While many papers have been published about neighbourhood effects, Sampson, Morenoff and Earls (1999) argue that the social mechanisms mediating neighbourhood poverty remain relatively unexplored, both theoretically and empirically.[4]

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[3] Census tracts have been widely used as proxies for neighbourhoods, though some researchers have begun to use census measures of smaller geographical units, such as the zip code. (Ross et al., 2001). As measured with census indicators, "objective neighbourhood disadvantage" is something of a moveable feast. For example, in one paper, Ross and Mirowski (2001) define it as the census tract prevalence of poverty plus the prevalence of mother-only households minus the prevalence of home ownership and the prevalence of college-educated residents. In another paper, (Ross et al. 2001), they use only the first two of these prevalence indicators. Since we wish to treat neighbourhood disadvantage as a concept that is separable from neighbourhood social capital, we prefer a narrower economic definition of disadvantage, thus leaving other census measures for use as potential indicators of dimensions other than the economic.

[4] They propose three dimensions of neighbourhood social organization that affect the lives of children: *intergenerational closure* (institutional linkage between adults and children in a neighbourhood); *reciprocal exchange* (between-adult exchanges about child-related matters); *and informal social control* which is the mutual expectation that neighbourhood residents can and will intervene on behalf of children (echoing a phrase from Portes (1998), "the expectations for action within a collectivity).

We emphasize again, that neighbourhood social capital is theoretically distinguishable from neighbourhood economic deprivation, though there will likely be some degree of overlap between indicators of these concepts. The widespread use of terms such as "neighbourhood poverty" or "neighbourhood disadvantage" (e.g., Ross et al. 2001) is not helpful here since the economic disadvantage of neighbourhoods (often measured as the proportion of families below a poverty line) becomes confused with their social disadvantage (often measured by the percentage of female headed lone-parent families, though we would prefer other indicators such as measures of Collective Efficacy or Social Support). If we are to consider neighbourhood social capital as something that can mitigate the effects of long-term poverty, we must conceive of and measure it as distinct from economic disadvantage.

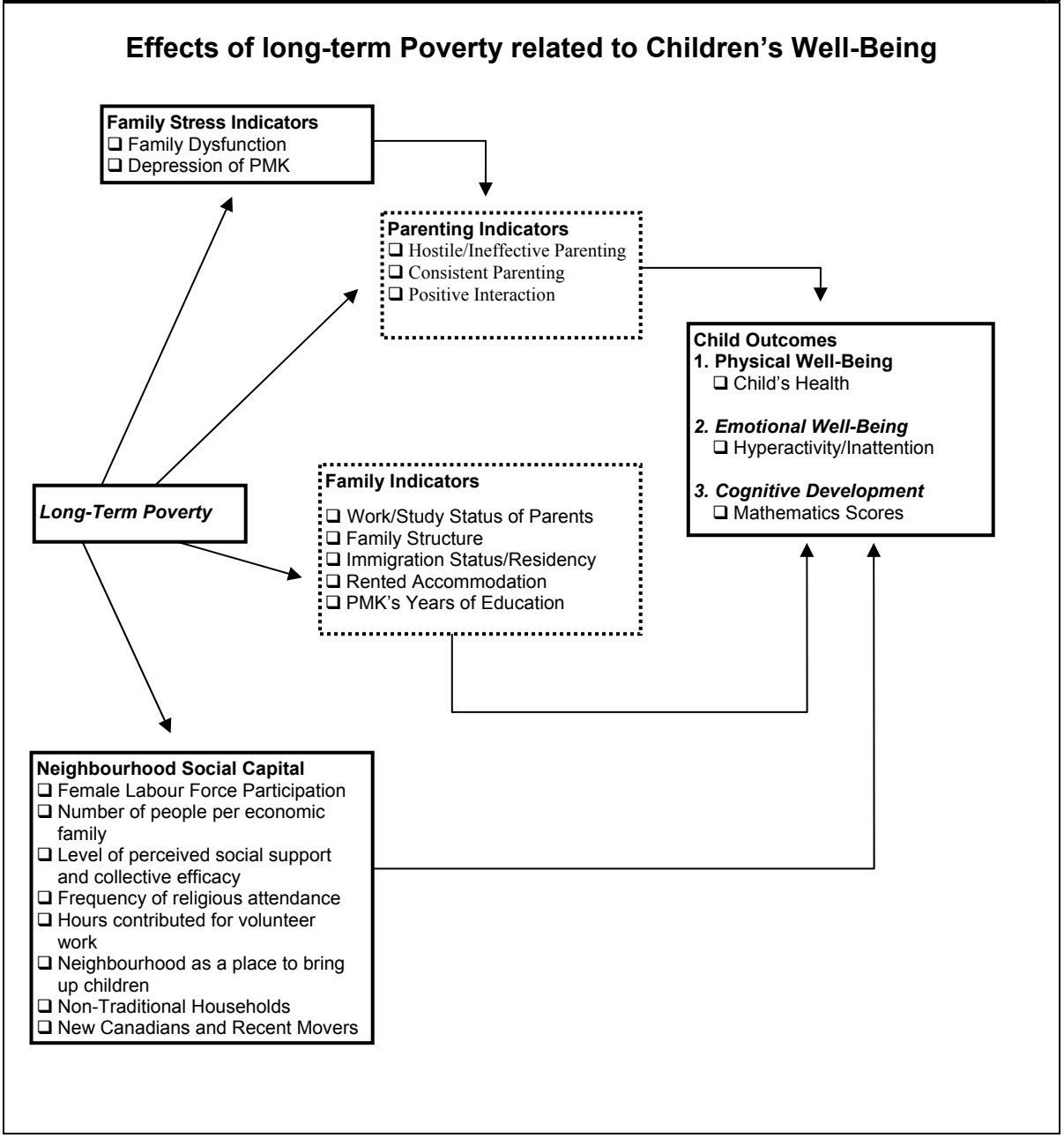
1.5 A Modified Family Stress Model: Parenting and Child Outcomes

The original Family Stress Model does not include aspects of neighbourhoods. A modified version, as shown in Figure 3 postulates that family, but also neighbourhood poverty, brings about emotional distress for the parents and worsens any existing problems in the spousal relationship. Such relationship problems should be observable through measures of family dysfunction and/or depression of one or both of the adult partners. These caregiver problems, in turn, give rise to ineffective parenting practices that have measurable effects upon the child's social/emotional well being, physical health, and cognitive outcomes.

Along the lines of Hilary Clinton's book, *It Takes a Village*, neighbourhoods with higher levels of social capital should be better places to bring up children. This is because (a) the high local expectations for informal social control and mutual support of children allow child surveillance and other parenting tasks to be shared with neighbours, and (b) parents are linked to each other through their participation in community activities, including organized worship and support of local schools. The absence of community cohesion and networks of social support isolates families, leading to lower degrees of trust between neighbours and markedly reducing the possibilities of practical assistance with family matters such as caring for children or sick relatives. Lower levels of neighbourhood social capital should also be associated with less effective political mobilization and thus fewer local facilities and services of the kind that make parenting easier (i.e., community centres, day-cares, parks, policing, social services). Families that are under stress caused by job loss, union dissolution or poverty should suffer less stress, less dysfunction and lower levels of depression if they are in neighbourhoods with higher levels of social capital. In the absence of neighbourhood social capital, highly stressed parents may internalize guilt and blame, leading to overload, burnout, depression, anger and displacement of the ensuing frustration to their children.

Figure 3

The Modified Family Stress Model predicts child outcomes from long term poverty, family stress and parenting indicators, plus the proposed mediating variables of neighbourhood social capital, as well as family level control variables



1.6 Research Objective and Key Concepts

Our objective then is to focus upon how neighbourhood contexts modify the ways in which child outcomes are influenced by the experience of family poverty—particularly longitudinal poverty. This will often overlap with the experience of living in non-standard family forms such as lone-parent families and stepfamilies and the experience of being parented by adults who work in the paid labour force or are taking courses in colleges or universities. However, our primary focus is the impact of long-term poverty.

Mediating social processes by which these factors have their effects include family dysfunction, parental depression, and inappropriate parenting practices. We consider that neighbourhood social capital (as distinct from a neighbourhood's economic disadvantage) may modify the effects of long-term poverty, possibly by reducing the impact of family dysfunction and parental depression. If such a "modifying effect" exists, we predict that the strength of the relationship between long-term poverty and child outcomes will be different from one neighbourhood to another, a proposition that can be tested in a "random slopes" formulation of a multilevel model (Snijders and Bosker 1999).

We understand "long-term poverty" to mean the extent to which the child has lived in families whose income was below Statistics Canada's Low Income Cut-Off" (LICO[5]). We will examine the effects of long-term poverty as well as neighbourhood average income on indicators of family dysfunction and on the measured depression of the child's main caregiver. We will also try to predict parenting styles as well as the child's general physical health, degree of hyperactivity-inattention and performance on a mathematics test. We will pay particular attention to contextual effects, determining whether household poverty has the same influence if child development occurs in communities which have social capital as it does in less socially cohesive ones.

We can hardly reduce a complex activity such as raising children to a simple formula itemizing practices that constitute "good parenting" or "bad parenting". The way parents treat a given child will depend on the child's age, gender and temperament, as well as on the presence of older or younger siblings. That said, there are certain styles of parenting which can be shown empirically to be linked with better or worse child outcomes and these vary between families, between cultures and perhaps between neighbourhoods. We focus on positive parent-child relationships that tend to be strongly age-related, as well as on hostile-aggressive parenting styles that previous research with the NLSCY has shown to be linked with undesirable child outcomes. First, we want to determine whether and to what degree, poverty affects parenting styles. As such, parenting would be an intervening or mediating variable explaining the impact of poverty on child development. Second, we want to find out how, and to what degree, any styles of parenting might compensate for the harmful effects of poverty on child development. In this sense parenting is another conditional or contextual variable that might reduce the effect of poverty on child development.

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[5] Long-term poverty is the extent to which a child has lived in a family whose income was below Statistics Canada's Low Income Cut-Off (LICO). LICOs are calculated for use with after-tax as well as pre-tax income. This study has used pre-tax income in deriving the LICO variable which may have resulted in marginally higher percentages of long-term poverty for children than if post-tax income had been used to derive the LICO variable.

The LICO is defined by Statistics Canada as a family income level for a particular family size and geographical area. Thus a family of given size could be above or below the LICO, depending on whether they lived in a location where the cost of living was lower or higher.

We take a narrow approach to defining "neighbourhood economic disadvantage", preferring to use census indicators of low income, particularly household income. Accordingly, we do not assume that the presence of visible minority groups or recent immigrants is a reliable indicator of poverty. Lack of political mobilization and influence may lead a neighbourhood to have fewer amenities (parks, skating rinks, etc), or to accept undesirable zoning and stigmatized institutions such as half-way houses. This can be linked to a broader conceptualization of neighbourhood disadvantage but we interpret such lack of political influence as a symptom of insufficient neighbourhood social capital, which we construe in terms of social institutions, social networks and social values.[6]

Putting it into more technical terms, measures of longitudinal poverty and indicators of community social capital are the main exogenous variables of our model. We expect to find some overlap between these distinct concepts, but we also expect to be able to use statistical controls to identify their separate effects upon endogenous variables. We do not feel called upon to specify any particular causal order between these exogenous variables, but we certainly see them as forming the beginning of a causal chain where the experience of chronic and, to a lesser extent, temporary poverty brings about symptoms of depression in parents, family dysfunction and conflict between spouses. These, in turn, cause poor parenting practices, resulting in worse socio-emotional and behavioural outcomes, poorer physical health and evidence of cognitive difficulties indicated by elevated risks of learning problems. The effects of family stress on child outcomes are mediated and perhaps modified or buffered by neighbourhood social capital.

Our general strategy is to make up a series of models to explain child outcomes. At each stage, these predictive models add a new set of theoretically relevant explanatory variables. However, all of them include the basic predictors of child gender, age and age squared, as well as child birth-weight, maternal age (age of the biological mother at the birth of the child), the total number of siblings, the number of older siblings and the wave of the survey.

Model 1 predicts child outcomes from poverty indicators alone. (see Figure 1 above.) This establishes the extent to which there is a basic correlation between long-term poverty and child outcomes.

Model 2 predicts child outcomes from poverty indicators and family stress.

Model 3 predicts child outcomes from poverty indicators, family stress and parenting indicators.

Model 4 predicts child outcomes from all of the above, plus potential indicators of neighbourhood social capital.

[6] Some scholars equate a high neighbourhood incidence of educational credentials (possession of at least a Bachelor's degree for example) as an indicator of "human capital". We see "neighbourhood social capital" as more than this, and as including those mechanisms of social cohesion that enable neighbours to support one another.

Model 5 predicts child outcomes from all of the above, plus further possible mediating variables that are the remaining family level and child level predictors.

If the Family Stress Model is valid, the correlation between long-term poverty and child outcomes found in Model 1 should become gradually weaker as more and more theoretically relevant intervening or mediating variables are statistically controlled in Models 2 through 5. If our modified Family Stress Model is valid we should be able to observe that when all other factors have been held constant, the effect of long-term low income upon child outcomes should become a "vanishing partial regression coefficient". If the modifying role of neighbourhood social capital is as we have hypothesized, then a "random slopes" form of the multilevel model should show a statistically significant variation over neighbourhoods in the degree to which child outcomes depend on family poverty.

2. *Longitudinal Methodology*

The first wave of Canada's National Longitudinal Survey of Children and Youth (NLSCY) took place in 1994-1995 and follow-up surveys took place in 1996-1997, and 1998-1999. This report is concerned only with the main NLSCY samples and excludes the "northern" sample from the Yukon and NWT.

The NLSCY is a nationally representative prospective longitudinal sample of newborn through eleven-year old children in Canada. A complex sampling design was developed by Statistics Canada to identify dwellings with eligible children for inclusion in this study (Human Resources Development Canada and Statistics Canada 1997: 239). Households with children in the appropriate age range were selected from an area frame. Once an eligible household was selected, procedures were followed to randomly select one target child in the 0-11 year age range who lived a majority of time in the household. Other children in the same economic family as the target child, up to a maximum of four children in the eligible age range per household, were also selected. In subsequent cycles, the research design was modified to include a maximum of two children per household.

The final NLSCY sample for Cycle 1 includes 13, 439 households and 22, 831 children, with a response rate of 86.3%. The "shared file" for Cycle 1 (as made available to researchers) includes 21,455 of the 22, 831 children (94%) included in the "master file." In similar fashion, the "shared files" for the second and third cycles include 19,215 and 30,821 children respectively. Each of the waves include: (a) children followed-up from Cycle 1; (b) new "longitudinal children" aged between 0 and 2 years old; (c) replacement "longitudinal children" who compensate for those lost to attrition of the longitudinal sample[7]; and (d) "cross-sectional children" whose presence allows each wave of the sample to be representative of the population of children in Canada at that time.[8] Census variables were appended to the NLSCY files to measure the children's neighbourhoods: however, there had been a certain amount of slippage in the assignment of children to 1991 enumeration areas or census tracts. Because of this, Statistics Canada has made available a new assignment (based on postal codes) to 1996 enumeration areas or census tracts (Hunter 2001). While not all children are assigned to a unique enumeration area at each cycle of the follow-up survey, the situation is much improved.

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[7] It is not clear that any such "replacement longitudinal children" were sampled.

[8] The *Overview of Survey Instruments for 1996-97 Data Collection* (overe.pdf) contains the following information, "Because of budgetary constraints, a number of cost-cutting measures were necessary in Cycle 2, including the reduction of the sample. It was decided to remove from the sample all children from households in the integrated component in Cycle 1 (i.e., who participated in the NPHS), a total of 3,884 children. In addition, a maximum of two children per economic family was selected rather than four as during the first cycle, thus reducing the size of the sample by a further 1,908 children. Finally, 136 children were removed from the sample because of the complexity they brought to the weighting. The sample was therefore cut by a total of 5,928 children to 16,903" (1997 : 6). This seems to refer to longitudinal children in Cycle 2. At each cycle subsequent to Cycle 1, the NLSCY is upgraded in age groups no longer covered in the longitudinal sample. For Cycle 2, the additional sample was 4,000 children, approximately 2,000 from 0 to 11 months of age and the same number aged 12 to 23 months. These were drawn from two sources: "…existing NLSCY longitudinal households in which children had been born since Cycle 1 data collection, and a sample of new households…" (ibid).

In Cycle 1, there was a significant clustering of children within households: (a) children who were the only children in to be sampled in their household; (b) children who were one of the two children sampled in their household; (c) children who were one of the three children sampled in their household; and (d) children who were one of the four children sampled in their household.

At Cycle 3, the sample size was increased, largely by adding very young children. In this wave, 14,922 children were the only child sampled in their household, 11,572 children were one of two sampled in their household, 4,638 children were one of three sampled in their household, 776 were one of four sampled in their household, and 55 were one of the five children sampled in their household. (Total children in the public use file was 31,963). The larger number of younger children sampled at Cycle 3 is not directly relevant to this study, since our focus in upon outcomes for children over four years of age at Cycle 3. We do however make use of ratings of their neighbourhoods made by the mothers even of very young children at both Cycles 1 and 3. The larger sample size of Persons Most Knowledgeable (usually the mothers of the children) make our measures of neighbourhood contexts more reliable.

The three-wave structure of the NLSCY data provides a powerful resource for testing the theoretical ideas outlined above. Longitudinal methodology has costs and benefits. Aside from considerable expense in data collection, the main cost is sample attrition: the loss of respondents who will no longer cooperate with the researchers. Significant degrees of sample attrition it reduce confidence in generalizing the results of the study to the overall population.[9] The main benefits of longitudinal methodology are contemporaneous measurement of many variables[10] and related to this, the ability to distinguish respondents who have experienced situations such as chronic illness, "longitudinal" or "chronic" poverty or single parenthood from those who have bounced back after transitory periods of disadvantage (Hill and Jenkins 1999).

Since parenting information is collected for children age 2 to 11 we have a history of up to three cycles of parenting information for all children who were aged 6 to 15 at the Cycle 3 data collection. Likewise, we have a 3-cycle history of household income and poverty for all such children, as well as census data on previous neighbourhoods.

Major explanatory variables in our models for predicting child outcomes include: history of poverty; history of family dysfunction and "person most knowledgeable" (PMK) depression (averages of these variables from Cycles 1 and 2); and averages of past parenting styles (averages of these variables from Cycles 1 and 2). We can only model outcomes for longitudinal children aged 4 and above at Cycle 3.

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[9] Of the 21,455 children aged 0 to 11 in the shared file at Cycle 1, some 15,006 were followed-up at both Cycle 2 and Cycle 3.

[10] Proponents of contemporaneous measurement argue that the responses to retrospective questions are subject to biases and omissions ("telescoping", "false memory", etc). and that only data collection through longitudinal surveys (or accurate administrative records) can eliminate these biases.

2.1 Children's Long-term Exposure to Low Income

Each child in each cycle of the NLSCY is characterized by the income of his or her current economic family expressed as a proportion of Statistics Canada's Low Income Cut Off (LICO). The LICO is not an official poverty line but most children would be better off if their families were above the LICO. It is certain that a large proportion of children who are "in poverty" (however defined) are in economic families whose income is below the LICO. In Cycles 1 and 2, roughly 27% of children aged 0 to 3 years were in families that were below the LICO. Among children aged 8 to 11 years, the figure was lower at about 20% for both boys and girls at Cycles 1, 2 and 3. These are cross-sectional snapshots and tell us little about the "turnover" between being above or below the LICO, nor about what percentage of children remain below the LICO for extended periods of time.

Our measure of long-term low income is a simple count over the three waves of the survey of the number of times the child was below the family LICO. Children who were never observed in families below the LICO have a score of 0, those who were below the LICO at one wave of the follow-up have a score of 1, and so forth, until those who were below the LICO in all waves have a score of 3. Table 1 is based on longitudinal children aged from 4 to 15.

Table 1
The Experience of Long-term Poverty Among Longitudinal Children in the NLSCY

Experienced repeated low income	12%
Experienced predominantly low income	9%
Exposed to low income	23%
Never experienced low income	57%

Data are weighted by the longitudinal weight.

As this table shows, some 12% of the longitudinal children were long-term low-income and thus economically disadvantaged, while as many as 43% had experienced at least transient low-income at some time over the time of the follow-up. This is only applicable to children for whom we have family income data for each of the waves of the survey. If sample attrition on follow-up is greater among economically disadvantaged respondents, these figures will understate the incidence of long-term low income

This long-term poverty classification can be tabulated against family type at any given wave of the NLSCY. Table 2 shows how intact families, stepfamilies and lone-parent families at Cycle 3 have different incidences of long-term poverty up to that point. These results confirm the findings of Finnie (1993) and Dooley et al. (1995) regarding the higher incidence of long-term low income among lone-parents. While some have portrayed remarriage or at least living common-law with a new partner as a strategy that lone-parents might use to escape poverty, this table shows that the incidence of long-term poverty is higher among stepfamilies than among intact families, though lower than for lone-parents.

Table 2 Long-term poverty by family type among longitudinal children aged 4 to 15 at Cycle 3			
	Intact	**Step**	**Lone**
Long term poverty cycles 1-3			
Experienced repeated low income	6%	11%	36%
Experienced predominantly low income	6%	15%	12%
Exposed to low income	22%	27%	24%
Never experienced low income	66%	47%	27%
Totals	100%	100%	100%

Data are weighted by the longitudinal weight.

We use the family-level measure of the child's exposure to low income in combination with an index of neighbourhood average income (the 1995 average household income in two or more person households for the Census Enumeration Area (EA) in which the child was living at the relevant wave of the NLSCY). Taken together, these two measures reflect the economic environment for family stress, parenting styles and child outcomes.

3. Variables Employed in the Analysis

3.1 Dependent Variables

Our analyses focus upon three measures of family stress, four parenting variables and three child outcomes consisting of: a two-item scale summarizing parental ratings of the child's physical health, an eight-item scale summarizing parental ratings of the child's hyperactivity-inattention and mathematics test scores as an indicator of cognitive development. We consider all of these variables as dependent with respect to long-term poverty. We consider measures of family stress to mediate between poverty and parenting or child outcomes: that is, our model considers family stress as both caused (by poverty etc) *and* causing (bringing about less effective parenting styles and worse child outcomes). In the same way, measures of parenting style are both caused (by poverty and by family stress) *and* causing (bringing about less desirable child outcomes) and so measures of parenting style are also mediating variables.

3.1.1 Family Stress

Family stress is indicated by the following three measures: (a) Family Dysfunction[11]; (b) Relationship between the PMK and partner (if any); (c) Depression Score of the PMK (usually the mother).

a) Family Dysfunction: We take this as an indicator of family stress. It is a multiple item Likert scale with possible scores ranging from 0 to 36 and a Cronbach's alpha of 0.88. A high score indicates family dysfunction.

b) Relationship between the PMK and her partner (if any): This is the PMK response to a single item, "All things considered, how satisfied or dissatisfied are you with your marriage or relationship with your partner?" It is not applicable to lone-parents.

c) Depression Score of the PMK: This rating scale is a shortened version of a widely used depression rating scale (CES-D). While not a substitute for psychiatric diagnosis, it aims to gather information about the mental health of respondents, with particular emphasis on symptoms of depression, which we take as another index of family stress. It is a 12-item Likert scale with possible scores ranging from 0 to 36 and a Cronbach's alpha of 0.82.

[11] This is based on items which score a family as dysfunctional when its members showed difficulties in such areas as resolving problems, communicating, controlling anti-social behaviour, and showing and receiving affection.

3.1.2 Measures of Parenting Style

We have analyzed four measures of parenting style obtained in the NLSCY. Each measure was obtained from the PMK separately for each of the sampled children in the household. Thus, when a household contributed two or more to the survey, the PMK would answer the same set of questions over again, with reference to how each child was parented. Accordingly, parenting is conceived as something that can vary by child age, gender, temperament etc., as well as according to the age, gender and educational level of the PMK and between-family or between-neighbourhood characteristics such as poverty or social capital. Parenting Style is measured through the following three indicators: (a) Hostile-ineffective Parenting Interactions; (b) Positive Parenting Interactions; (c) Consistent Parenting; (d) Punitive-aversive Parenting Interactions.

a) Hostile-Ineffective Parenting Interactions[12]: This is based on PMK responses to questions concerning how often parents tell children that they are bad or not as good as others, get angry when they punish children, etc. It is a 7-item Likert scale available for children aged 2 to 11 and has possible scores ranging from 0 to 25 and a Cronbach's alpha of 0.71.

b) Positive Parenting Interactions[13]: This is based on questions answered by the PMK for children aged 2 to 11. It is a 5-item Likert scale with possible scores ranging from 0 to 20 and a Cronbach's alpha of 0.81.

c) Consistent Parenting[14]: This is based on questions answered by the PMK for children aged 2 to 11. It is a 5-item Likert scale with possible scores ranging from 0 to 20 and a Cronbach's alpha of 0.66.

d) Punitive-aversive Parenting Interactions. This is based on questions answered by the PMK for children aged 2 to 11. It is a four-item Likert scale with scores ranging from 0 to 19 and a Cronbach's alpha of 0.57.

3.1.3 Child Outcomes

We focus on three child outcomes: (a) a two-item scale summarizing parental ratings of the child's physical health; (b) an eight-item scale (Cronbach's alpha = 0.84) summarizing parental ratings of the child's hyperactivity-inattention; (c) and mathematics test scores as an indicator of cognitive development.

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[12] The PMK items for Hostile-ineffective parenting are: APRCQ04 How often do you get annoyed with your child for saying or doing something he/she is not supposed to? APRCQ08 Of all the times you talk to your child about his/her behaviour, what proportion is praise? APRCQ09 Of all the times you talk to your child about his/her behaviour, what proportion is disapproval? APRCQ13 How often do you get angry when you punish your child? APRCQ14 How often do you think the kind of punishment you give your child depends on your mood? APRCQ15 How often do you feel you have problems managing your child in general? APRCQ18 How often do you have to discipline your child repeatedly for the same thing?

[13] This is based on items concerning how often parents laugh with children, play sports, hobbies, and/or games together, etc).

[14] This is based on items concerning the proportion of time the parent makes sure the child follows a command or order, enforces a punishment after warning the child, etc.

a) Child's Physical Health: There is an extensive literature on the effects of social background and neighbourhood disadvantage on physical health status (Ross and Mirowski, 2001). Much of the published research uses single-item or two-item scales to measure perceived health. We had intended to use the Health Utility Index, which is a more sophisticated instrument, but it was not available for older children in Cycle 3 so we have used PMK rating of the child's overall health instead. Our measure is based on adding together the responses to two global judgements of the child's health. The first is: "In general, would you say his/her health is: (1) excellent? (2) very good? (3) fair? (4) poor? (5) very poor? The second is: "Over the past few months, how often has he/she been in good health? (1) almost all the time (2) often (3) about half of the time (4) sometimes (5) almost never. The two items correlate at 0.44 and form a summed scale with a minimum score of 2 indicating excellent health and a maximum score of 10 indicating poor health.

b) Child's hyperactivity/inattention: The NLSCY includes several measures of children's emotional outcomes, generally related to mental health and behaviour problems. We choose to focus upon the measure of hyperactivity/inattention because hyperactive children, and those with short attention spans, are likely to be at a disadvantage in the educational system.[15] At high levels, hyperactivity shades into what has been called Attention Deficit Hyperactivity Disorder and may require medical treatment. The NLSCY measure of hyperactivity/inattention for children aged 4 to 11 is based on PMK responses to questions about whether the child was frequently unable to sit still, was easily distracted or restless, had trouble sticking to an activity or concentrating, fidgeted, acted impulsively, or could not wait their turn during games or group activities. It is an 8-item Likert scale with possible scores ranging from 0 to 16 and a Cronbach's alpha of 0.84.

c) The best indicator of cognitive development for older children in the NLSCY is the mathematics test score. Reading tests are only available for younger children. The test administered was a shortened version of the Mathematics Computation Test of the standardized Canadian Achievement Tests, Second Edition (CAT/2).[16]

[15] Regression analysis with data from the public use files of the NLSCY shows that Hyperactivity-Inattention reduces scores on the Mathematics test, even after linear and quadratic functions of age have been controlled.

[16] A raw score was calculated by adding the number of correct responses to the test. Standard scores were developed based on a sample of Canadian children across all ten provinces, referred to as the norm sample. Children in this norm sample in grades 2 and 3 (i.e., who took the level 2 test) were assigned standard scores in the 200 to 400 range (approximately) based on the number of correct responses to the test (i.e., the raw score), children in grades 4 and 5 (i.e., who took the level 4 test) were assigned standard scores in the 264 to 550 range, and children in grades 6 and 7 (i.e., who took the level 6 test) were assigned scores in the 314 to 624 range. Thus, children were essentially assigned a continuous score through equi-percentile equating which is expected to increase over time as the child progresses through school. There were difficulties in the administration of this test in the first two cycles of the NLSCY.

3.2 Explanatory Variables

Child outcomes are caused by characteristics of the children themselves, of their family environments (i.e., parenting styles and household income), and by the wider social context. A holistic picture of the social context of parenting must include the social capital of neighbourhoods (indicated by social cohesiveness, social support, the absence of social problems, the level of local economic prosperity, housing quality, and the level of services provided by municipal, provincial and federal levels of government). For the purposes of data analysis, we will group our explanatory variables into (a) Poverty Indicators; (b) Family Stress Indicators; (c) Parenting Indicators; (d) Neighbourhood Indicators; (e) Family Indicators; and (f) Basic predictors such as the child's gender, age, birth weight and maternal age. However for introductory purposes, we shall organize them by level of analysis, (child level measures, family level measures and neighbourhood-level measures).

3.2.1 Child-level Explanatory Variables

We include the following six child-level explanatory variables in our analyses: (a) experience of poverty; (b) child birth-weight: (c) maternal age; (d) child's age; (e) child's gender; (f) stepchild status.

a) The child's history of experiencing poverty. As discussed above, we formed a measure with four levels, a score of 0 indicating that the child was never in a family below the LICO at any of the three waves of the NLSCY, score of 1 indicating that she was observed below the LICO on one occasion, to a maximum score of 3 indicating that she was below the LICO at all three waves up to and including Cycle 3.

b) Child's birth weight is an indicator of early health status. This is measured via a question asked at Cycle 3 of the NLSCY.

c) "Maternal age" is the age of the child's biological mother when the child was born. Smaller values of maternal age indicate that the child was born to a younger and less experienced mother. There is an extensive literature on the child deficits associated with low levels of maternal age (e.g. Guo and Harris 2000).

d) Child's age is theoretically important as an indicator of the social development process. The statistical analyses use linear and quadratic functions to capture the possibility of simple curvilinear relationships with outcome measures.

e) Child's gender is taken as female (with male as the reference category).

f) Whether the child is a stepchild or a biological child. This is different from whether the child lives in a stepfamily, since stepfamilies can include biological children of the adult partners. In Cycle 1 of the NLSCY, 4.6% of children were stepchildren themselves and 8.6% lived in stepfamilies.

3.2.2 Parenting and PMK-relevant Explanatory Variables:

a) Family dysfunction (see above). According to our modified stress model, this should mediate between the family's experience of poverty and child outcomes. Because of this, it can appear in some data analysis as a dependent variable (caused by long-term poverty and indicators of other potential stressors) and in other data analysis as an independent variable (considered as a possible cause of parenting styles and child outcomes).

b) Depression score of the PMK (see above). Again, this should mediate between poverty experiences and child outcomes and for this reason it can appear either as a dependent or as an independent variable in different statistical tables.

c) Hostile-ineffective parenting (see above). Previous reports based on the NLSCY have shown that this parenting style is associated with undesirable child outcomes. Our model again considers it as a mediating variable, this time dependent upon poverty indicators and also on family stress measures.

d) Positive parent-child interaction (see above), as an indicator of desirable parenting practices.

e) Consistent parenting (see above), again as an indicator of desirable parenting practices.

f) Punitive-aversive parenting (see above), again considered as being potentially a mediating variable that is dependent upon poverty and family stress measures and which may in turn influence child outcomes.

g) PMK years of education. This indicates possession of educational credentials and partly reflects social class origin and middle class values regarding parenting.

h) Frequency of religious attendance of the PMK. This explanatory variable taps aspects of parenting but is also an indicator of social capital reflecting community bonds and a potential support network.

3.2.3 Family-level Explanatory Variables

These measures define the child's current household status with respect to lone-parent and stepfamily status as well as whether the PMK and his/her partner, if any, work or take courses outside the home. Family size and birth order are also measured. All these indicators are "time varying" in that their values could change from one cycle to the next.

a) PMK gender.

b) Current family income in relation to the LICO. This is a continuous measure.

c) Immigration recency, considered as an indicator variable with immigrants within the previous five years considered recent and all others as the reference category.

d) Rented or owned residential accommodation. This indicator of economic class has implications for the kind of neighbourhood in which the child lives.

e) Stepfamily status. This is included because stepfamilies and lone-parent families face different parenting challenges as compared to intact families. The reference category is taken all other family types. Lone-parent and intact family status is captured in the work-study measure described immediately below.

f) Work-study status of the PMK and partner, if any. This measure indicates whether either or both of the child's main caregiver and her partner were working or engaged in some form of formal education. The measure also encodes lone-parent status. The five categories are: (1) Both PMK and partner work or study (2) Neither the PMK nor the partner work or study (3) PMK is a lone-parent who works or studies (4) PMK is a lone-parent who neither works nor studies (5) The PMK and the partner form a role-specialized couple where one works or studies and the other does not. Role-specialized couples are used as the reference category in data analysis.

g) Sibship Size (current number of siblings). Family size is related to parenting practices as well as to social class.

h) Birth Order. We use the number of children older than the child in question as a measure of birth order. When sibship size is also included as a predictor the two variables in combination capture many aspects of birth order.

3.2.4 Neighbourhoods and Child Outcomes

Statistics Canada designed the NLSCY in order to estimate population parameters for the population of children in the ten provinces of Canada rather than as a study of neighbourhood effects. Nevertheless, some information about neighbourhoods was collected from parents and interviewers. In addition, it is possible to link almost all children to Census geographical units. Early analyses of Cycle 1 had showed some problems in linking children to census enumeration areas but these have now been resolved. We measure the social characteristics of neighbourhoods in two ways: (a) through aggregating interviewer and PMK judgments of their neighbourhoods to the level of the 1996 enumeration areas corresponding to their postal codes[17]; (b) through attaching Census data from the 1996 Enumeration Area Profile to the child records.

[17] We also aggregated the same variables directly to the level of the five character postal code. This postal code information is readily available for most children in cycles 2 and 3, but not in Cycle 1.

3.2.5 Neighbourhood Information from Survey Respondents and Interviewers

The first wave (Cycle 1) includes a series of interviewer ratings of each respondent's neighbourhood, as well as a large number of questions addressed to the PMK. There are no questions specifically about neighbourhoods in Cycle 2, but the third wave repeats some of the neighbourhood questions that had been asked of the PMK in Cycle 1. Key measures obtained at Cycles 1 and 3 are a single item in which the PMK is asked: *How do you feel about the neighbourhood as a place to bring up children?* (Excellent, Good, Average, Poor, Very Poor) and a five-item scale of Neighbourhood Cohesiveness (Cronbach's alpha = 0.86): *If there is a problem around here the neighbours get together to deal with it; There are adults in the neighbourhood that children can look up to; People around here are willing to help their neighbours; You can count on adults in this neighbourhood to watch out that children are safe and don't get in trouble; When I'm away from home, I know that my neighbours will keep their eyes open for possible trouble.* This neighbourhood cohesiveness measure is also referred to as Perceived Collective Efficacy (Foster et al., 2001).

Neighbourhood measures that were obtained only in Cycle 1 include the interviewer ratings, a two-item scale of Neighbourhood Safety, and a four-item scale of Neighbourhood Problems[18] (Cronbach's alpha =0.70). Items in the Neighbourhood Safety scale were: *It is safe to walk alone in this neighbourhood after dark*; and *It is safe for children to play outside during the day*. Items in the Neighbourhood Problems scale were: *How much of a problem is the following in this neighbourhood: Garbage, litter or broken glass, in the street or road, on the sidewalks or in yards?; How much of a problem is the following in this neighbourhood: Selling or using drugs?; How much of a problem is the following in this neighbourhood: Alcoholics or excessive drinking in public?; How much of a problem is the following in this neighbourhood: Groups of young people who cause trouble?*

Questions asked of the interviewer (Cycle 1 only) included: How would you rate the volume of traffic on the street or road?; Is there garbage, litter or broken glass in the street or on the sidewalks or in yards?; Are people loitering, congregating or hanging out?; Are any persons arguing, shouting, fighting or otherwise behaving in hostile or threatening ways?; Are drunken or otherwise intoxicated persons visible?; Based on street level frontage, how would you judge the land use on this block?; and, how would you rate the general condition of most of the buildings on the block or within 100 yards of the respondent's house? We have formed a Neighbourhood Quality scale as a simple count of the number of unfavourable neighbourhood and housing observations recorded by the interviewer in response to these questions. The maximum possible score is 7 and the minimum score is 0.

[18] Some Cycle 1 items that were <u>not</u> included in any of the three scales include: "There are good parks, playgrounds and play spaces in this neighbourhood"; "How much of a problem is the following in this neighbourhood: Burglary of homes or apartments"; "How much of a problem is the following in this neighbourhood: Unrest due to ethnic or religious differences?"

Measures that are not directly about neighbourhoods, but which sociologists interpret as indicative of social capital include the question, ‘‘Are you involved in any local voluntary organizations, such as school groups, church groups, community or ethnic associations?’’ This was not asked in Cycle 2. Additionally, religious attendance is measured at all three cycles by the question, Other than on special occasions (weddings, funerals or baptisms), how often did you attend religious services or meetings in the past 12 months? The religious attendance question is asked about the PMK herself and of the PMK for each selected child.

Further measures that are not directly about neighbours or neighbourhoods, but are linked to sociologists notions of “community”[19] include a series of questions that formed a six-item scale of Social Support (Cronbach’s alpha=0.82): *If something went wrong, someone would help me; I have family and friends who make me feel safe, secure and happy; There is someone I trust whom I would turn to for advice if I were having problems; There is no one I feel comfortable talking about problems with; I lack a feeling of closeness with another person; There are people I can count on in an emergency.*

3.2.6 Aggregating PMK and Interviewer Responses to Neighbourhood Levels

Neighbourhoods are defined here as 1996 Census Enumeration Areas (EAs) [20]. We chose these because they are the smallest (most local) geographical units available to us—much smaller and more socially homogeneous than Census Tracts of Census Subdivisions. EAs can be characterized by their profile on Census variables, such as the percentage of visible minorities or lone-parent families etc., a topic to which we return below. Neighbourhoods can be rural, urban or suburban as well as rich, poor or in between. The sociological literature suggests that neighbourhoods can have greater or lesser amounts of social capital, a concept whose empirical indicators include measures of social cohesiveness, social support and the absence or successful management of social problems[21].

It is important to consider how interviewer and PMK ratings of neighbourhoods are treated in data analysis, the basic decision being whether or not all children in a given neighbourhood are considered to experience the same amount of social capital, social cohesiveness and other similar indicators. Kohen, Hertzman and Brooks-Gunn (1998) worked with Cycle 1 of the NLSCY and used the interviewer’s observation of neighbourhood safety, the PMK rating of social cohesiveness, and census variables in order to predict outcomes for pre-school children. Each census measure necessarily has the same value for all children in the same neighbourhood, but since they did not aggregate interviewer and PMK ratings to the neighbourhood level, Kohen et al. were essentially looking directly at the “effect” of what each PMK says about the

[19] Sociologists often use the term “gemeinschaft” when they mean to invoke smaller scale and presumably mutually supportive communities.

[20] One could also use the five-character postal code as an operational measure of neighbourhoods.

[21] Hirschi and others have written about “delinquescent” neighbourhood, meaning those which are likely to generate teenage delinquency.

neighbourhood upon what the she says about child outcomes. This is a reasonable first approximation, but much less satisfactory than using measures of neighbourhood properties which are the same for all children in the neighbourhood. Such measures would be either census characteristics or aggregated judgments from survey respondents.

We conceive social cohesiveness and similar neighbourhood measures as properties that are the same for all local residents ("contextual" or "outer" variables in the language of hierarchical modeling). Hence, we follow the approach taken in Foster's dissertation (Foster 2001), and construct the average scores for social cohesiveness and other neighbourhood properties for as many local geographical units as possible. Foster used the larger census tracts, but we consider these to be potentially too heterogeneous to be considered as neighbourhoods. We have adopted a similar strategy, but have chosen to concentrate on the 1996 EAs, selecting those that included at least a minimal number of households and discarding the rest. This makes it impossible to obtain national estimates but is essential for the purpose of research which focuses upon survey based indicators of social capital.

One advantage of the NLSCY is that some of the same questions about neighbours and neighbourhoods were asked in Cycle 1 and again (with a larger sample) in Cycle 3[22]. This means that we can make a more reliable estimate of the social cohesiveness or social support scores for a given EA by combining the average neighbourhood score from Cycle 1 with the average from Cycle 3.[23] We worked with the best matching 1996 EA as our operational definition of neighbourhoods and analyzed the effects of those EAs for which we could obtain stable estimates of their neighbourhood characteristics through combining information from all available waves of the NLSCY. We selected those 1996 EAs for which we had PMK judgments about neighbourhoods from at least six respondents. This strategy sacrifices any possibility of making statements about a nationally representative sample of children in neighbourhoods. On the positive side, we are working with conceptually reasonable operational measures of social cohesiveness and social support in geographical units that are local enough to be called neighbourhoods.

In the language of hierarchical modeling, neighbourhood level variables, such as the mean Social Cohesiveness (Collective Efficacy) score, are "contextual" or "outer" variables. Taking social cohesiveness as the neighbourhood measure of interest, a child outcome can be written as a function of the average level of social cohesiveness in the neighbourhood and all children in the same neighbourhood (EA or postal code) are considered to experience the same level of social cohesiveness[24].

[22] The religious attendance measure is available in every cycle of the NLSCY, so in this case, our estimate of a given EA's average level of religious attendance can be based on all waves.

[23] We check the assumption that neighbourhood cohesiveness has not changed much over the four-year period by estimating the correlation between cycles 1 and 3 over EAs.

[24] The PMK perception of neighbourhood cohesiveness can be written as a deviation from the aggregated perceptions of many neighbours, along the lines of the hierarchical modeling literature, (e.g. Singer, 1998).

The main survey-based measures of neighbourhood quality for 1996 enumeration areas are therefore:

a) Collective Efficacy / Social Cohesion (Foster et al., 2001 call this Collective Efficacy) of the Enumeration Area, as averaged PMK responses to the Social Cohesiveness Scale (from Cycles 1 and 3). A high score indicates higher levels of Collective Efficacy as perceived by parents.

b) Child Appropriateness of the Enumeration Area, as average responses to the question *How do you feel about the neighbourhood as a place to bring up children?* (from Cycles 1 and 3). Because of the coding that was used, a higher score of this aggregated measure indicates the view that the neighbourhood is a bad place to bring up children.

c) Involvement in Local Community Organizations, as average responses to the question *Are you involved in any local voluntary organizations, such as school groups, church groups, community or ethnic associations?* (from Cycles 1 and 3). Because of the coding that was used, a higher score of this aggregated measure indicates neighbourhoods where the percentage of "no" answers from parents was higher.

d) Religious Attendance in the Enumeration Area, as averaged responses to the question *Other than on special occasions (weddings, funerals or baptisms) how often did you attend religious services or meetings in the past 12 months?* (from all three Cycles). Because of the coding that was used, a higher score of this aggregated measure indicates the view that the neighbourhood tends to include parents who are infrequent in their religious observance.

e) Social Support of the Enumeration Area, as averaged PMK responses to the Social Support Scale (from Cycles 1 and 3). A high score indicates a neighbourhood where parents say that they receive a lot of support from family and friends.

3.2.7 Objective Neighbourhood Indicators from the 1996 EA Profile

We used Statistics Canada's public use "1996 Enumeration Area Profile". This includes a wide range of measures: age, gender and family status variables from the standard census form (100% coverage) or income[25], education, visible minority status, etc. from the long form (20% sample coverage). We have used selected summary measures of average income, female labour force participation and average household size and we have also constructed some further objective indicators of neighbourhood environments:

a) Our index of *Neighbourhood Income* is the mean household income of two or more person households. A poverty indicator would have been preferable but there is no such variable at the EA level of aggregation.

[25] Unlike the 1996 Census Tract Profile, the 1996 Enumeration Area Profile does not include specific indicators of low income.

b) The index of *Mothers' Labour Force Participation* is the labour force participation rate of females 15 years and over in private households with children six years and over only. Given the gendered division of childcare, the extent to which other households in the neighbourhood include mothers who work outside the home has implications for parenting possibilities. We introduce this measure to test whether levels of mothers' labour force participation that are above a certain threshold level might affect child outcomes through reducing neighbourhood sociability and the sharing of surveillance and other child-care responsibilities which have traditionally been part of the "women's sphere".

c) The index of *Average Family Size* is the mean number of persons per economic family. This indicates the extent to which the neighbourhood contains larger households of the kind likely to contain children. Again, this has implications for the sharing of child surveillance by adults. It is also relevant for child socialization by peer groups.

d) The index of *Non-Traditional Households* adds the prevalence of female headed lone-parent households, of single-person households, of divorced or separated adults and of households in apartment buildings and subtracts the prevalence of home ownership and of households living in single detached dwellings. Following Ross and Mirowski (2001), this index divides each of the six percentages by 10, adds the first four indicators, subtracts home ownership and detached dwellings and divides the total by six. We use the term "non-traditional" here because in the past, such households were commonly regarded as less desirable places for raising children. Neighbourhoods scoring high on this indicator are likely to be densely populated and their forms of social capital may be different from those in suburban housing developments.

e) The index of *New Canadians* adds the prevalence of visible minority groups, of those whose home language is neither English nor French and those who immigrated in the 15 years since the 1996 Census. As before, the index divides each of the enumeration area percentages by 10, adds them all together and divides the total by the number of components—in this case, three. Many visible minority or recent immigrant groups have active community associations and those where ignorance of Canada's official languages is common are likely to rely on family and neighbourhood support. This might therefore be a social capital indicator.

f) The index of *Recent Neighbourhoods* adds the prevalence of persons who moved within the previous five years and the prevalence of occupied private dwellings built in the previous five years. As before, the index divides each of the enumeration area percentages by 10, adds them together and divides the total by the number of components—in this case, two. Neighbourhoods with a high incidence of newcomers should have lower amounts of social capital.

g) The index of *Asian Origin Visible Minorities* expresses the sum of the census counts of self-identified Chinese, South Asian, Korean, Japanese, South-East Asian, West Asian and Filipino visible minority groups as a percentage of the population count of the enumeration area. This is included because the sociological literature on families

describes such cultural groups as having larger, more gender segregated, but in many ways more cohesive extended family structures than modern North American families. It is therefore an indicator of social capital.

Tables 3 and 4 show some of the correlations between these characteristics of enumeration areas (our operational definition of neighbourhoods). The highest correlation in Table 3 occurs between New Canadians and Asian Visible Minorities but this is because they have a common component. Aside from that, the largest correlation is –0.47, indicating that neighbourhoods containing what we have called Non-Traditional Households tend to have smaller economic families. Such neighbourhoods also tend to include larger proportions of New Canadians (r = 0.37) and to have lower average family income (r = -0.36).

Table 4 allows us to see the relationship between our aggregated survey measures of neighbourhoods and selected Census EA profile variables. Unlike the correlations in the previous table which were based on all 44,000 enumeration areas in Canada, those in Table 4 are based on the 498 Eas in each of which we had at least six respondents who answered the neighbourhood questions in either of Cycle 1 or Cycle 3. The largest correlation is between the aggregated version of "years lived at this address" and the Census measure of Recent Movers in the enumeration area. (r = -0.39). After that, comes the correlation between the aggregated version of a neighbourhood's being "not a good place to bring up children" and the prevalence of Non-Traditional Households (r = 0.33). Neighbourhoods with higher percentages of non-traditional households also tend to have more transience and lower Collective Efficacy (perceived cohesiveness).

Table 3
Correlations between selected characteristics of 44,000 1996 Census Enumeration Areas

	Inc avge	FLF par	Size fam	Non trad	New Can	Rec	Asian vis mi
Census Variables							
Average Household Income	1.00						
Female LF Participation	0.25	1.00					
Persons per economic family	0.19	0.01	1.00				
Non traditional households	-0.36	-0.20	-0.47	1.00			
New Canadians	-0.06	-0.19	0.21	0.37	1.00		
Recent Movers	-0.04	0.03	-0.11	0.34	0.25	1.00	
Asian Vis. Min.	0.04	-0.14	0.18	0.24	0.90†	0.24	1.00

†These two indicators have a common component.

Source: 1996 Enumeration Area Profile

Table 4
Correlations between aggregated survey measures of neighbourhoods and selected Census characteristics for the corresponding enumeration areas

	Census Characteristics						
	Inc. Avge	**Flab Fpar**	**Fam size**	**Nontr. Hhld**	**New Can**	**Movers**	**Asian vis min**
Aggregated Survey Measures							
Collective Efficacy	0.15**	0.15**	0.01ns	-0.25**	-0.03ns	0.00	-0.08ns
Years lived at this address	-0.26**	-0.18**	0.00	-0.24**	-0.07ns	-0.39**	0.17**
Social Support	-0.07ns	-0.05ns	-0.07ns	-0.05ns	0.05ns	0.17**	0.01ns
"Not a good place to bring up kids"	-0.28**	-0.13**	-0.03ns	0.33**	0.13**	0.07ns	0.15**
Low incidence of volunteer work	-0.08ns	-0.14ns	0.00	0.20**	0.0	0.13**	0.05ns
Infrequent religious attendance	0.04ns	-0.05ns	-0.15**	0.17**	-0.05ns	0.17**	0.02ns
Family dysfunction	-0.17ns	-0.04ns	0.01ns	0.03ns	-0.01ns	-0.14**	0.03ns

Above correlations are calculated over the 498 enumeration areas (1996 Census) that had aggregated survey measures based on a sufficient number of respondents in Cycles 1 and 3.

ns = not significant

** = p<0.01 (two-tailed tests of statistical significance)

4. Statistical Modeling

4.1 Overview of the Analysis

The present study uses extensions of linear regression models to predict indicators of family stress, parenting style and child outcomes. We chose the SAS system for data management and statistical analysis because it includes routines for the estimation of regression models using generalized estimating equations (Diggle, Liang and Zeger, 1994) as well as conventional ordinary least squares (OLS). SAS also includes routines for estimating models with complex random effects and these can be used for estimating the coefficients of hierarchical models (Littell et al. 1996; Singer 1998).

We test the basic model that the experience of chronic and, to a lesser extent, temporary poverty brings about symptoms of depression in parents as well as conflict between spouses and that these, in turn, cause poor parenting practices, resulting in the following child outcomes: poorer physical health[26], greater risk hyperactivity-inattention disorder, and lower mathematics test scores. We test the modified Family Stress Model by estimating the coefficients of a logical sequence of nested multiple regression models.

4.2 The National Sample and the Neighbourhoods Sample

We report two distinct groups of results. The first is based on data from up to 15,000 "longitudinal children" for whom data are available at Cycle 3. We use this "national sample" to predict indicators of family stress and parenting behaviour, as well as child outcomes in the domains of physical health, emotional adjustment and cognitive development. In this first series of analyses, the census indicators are measures of the enumeration area in which the child was living at the time, but the survey-based measures of neighbourhoods are usually obtained from the child's mother who is often the same person giving information about child outcomes. Since there are never more than two longitudinal children in a family at Cycle 3 and since most Enumeration Areas (EAs) contain no more than one family with a longitudinal child, it was impossible to estimate hierarchical models at with the national sample. Instead, we used OLS and GEE methods to estimate conventional multiple regression models in which we predicted parent and child outcomes from their history of exposure to long-term poverty and other characteristics.

[26] Physical health is measured by PMK responses to questions about the child's general health status hlcq01 and hlcq02. The Health Utility Index might have been preferable but was not asked of all longitudinal children in Cycle 3.

The second group of results is based on a much smaller sample of children selected because they were from neighbourhoods containing more than five children at Cycle 3, thus allowing us to estimate "random slopes" models in a hierarchical modeling framework. This "neighbourhoods sample" includes some 200 different EAs (130 in analyses when observations from only Cycle 1 and Cycle 3 are included) and is further restricted in that the measures of neighbourhood social capital are restricted survey-based information about neighbourhood that has been averaged over at least six adult respondents. We discuss this sample in more detail below, but first we report the results of analyses using the national sample.

4.3 Results from the National Sample

These results are in three sections: (1) the prediction of family stress from long-term poverty and other measures including indicators of neighbourhood social capital; (2) the prediction of parenting style from long-term poverty, family stress and other measures as before; and (3) the prediction of selected child outcomes from long-term poverty, family stress, parenting style, etc. Since our theoretical model specifies that measures of family stress and parenting style mediate in the causal chain between long-term poverty and child outcomes, they appear as dependent variables in some tables and as independent variables in others.

4.3.1 Determinants of Family Stress (Data from Longitudinal Children in the National Sample at Cycle 3)

As discussed in the introduction, the Family Stress Model proposes a causal path leading from long-term poverty through depression and dissatisfaction in the family to inadequate parenting and unsatisfactory child outcomes. A first step in testing this model is to establish the causes of family stress. We use long-term low income, change in family income and neighbourhood average income along with a battery of other measures in order to predict scale scores on family dysfunction, PMK depression, and the PMK response to a single question about her degree of satisfaction with her spouse (*All things considered, how satisfied or dissatisfied are you with your marriage or relationship with your partner? Which number comes the closest to how you feel, where 1 is completely dissatisfied and 11 is completely satisfied?).*

Results from regression analyses with data from children who were followed up to Cycle 3 are shown in the table. Each indicator of family stress is predicted from Model 1 (poverty indicators only) and Model 2 (poverty indicators along with all other explanatory variables). The results from Model 1 and Model 2 support the family stress hypothesis in that family dysfunction has significant partial regression coefficients for all three income indicators, while depression and satisfaction with one's partner have significant associations with long-term low income and income change respectively. If the effects of poverty upon family stress were mediated by neighbourhood and family

variables we would expect that the coefficients for income measures in Model 2 would be smaller than in Model 1. This is true for the measures of family dysfunction and depression though only in the case of depression do we see a coefficient become non-significant in Model 2. Lone-parents (on average poorer) have higher depression scores and higher dysfunction as compared to role-specialized couples. All three indicators of family stress have significant relationships in the expected directions with the census indicator of neighbourhoods with larger households, as well as with the individual measure of social support. They differ markedly in the degree to which they can be predicted; family dysfunction having a squared multiple correlation of 0.22 while the value for PMK depression is 0.10 and that for partner satisfaction is only 0.04. We conclude that the NLSCY measure of the quality of conjugal relationships does not support the Family Stress Model but that depression and family dysfunction behave roughly as would be expected.

Table 5
National Sample regressions predicting family stress indicators

Explanatory Variables	Dysfunction Model 1	Dysfunction Model 2	Depression Model 1	Depression Model 2	Satisfaction Model 1	Satisfaction Model 2
1. Income Indicators						
Long-Term Low Income	0.116**	0.047**	0.186**	0.032*	0.009ns	0.000ns
Change in income to needs	-0.048**	-0.034**	-0.042**	-0.018ns	0.031**	0.028**
EA Average Income	-0.036**	0.027*	-0.046**	-0.010ns	-0.031**	-0.039**
2. Neighbourhood Indicators						
EA Female labor force participation rate		0.035**		0.012ns		-0.031**
EA Persons per economic family		-0.054**		-0.033**		0.029*
EA Non traditional households		-0.060**		-0.029*		0.029ns
EA New Canadians		0.043*		0.020ns		-0.013ns
EA Recent movers		-0.009ns		0.000ns		0.009ns
EA Asian visible minorities		-0.021ns		0.012ns		0.014ns
Perceived Collective Efficacy		-0.112**		-0.020ns		0.019ns
Perceived Social Support		-0.366**		-0.089**		0.114**
Perceived "Not a good place to bring up children"		0.006ns		0.039**		-0.042**
Volunteer work (No)		0.000ns		-0.003ns		-0.013ns
Infrequent Religious Attendance		-0.006ns		0.055**		-0.044**
3. Family Indicators						
PMK Years of Formal Education		-0.073**		-0.073**		0.007ns
Renting rather than owning home		-0.024*		0.025**		0.009ns
Recent Immigrant		0.000ns		-0.001ns		0.009ns
Stepfamily		0.050**		0.051**		-0.015ns
Parental Work/Study Status						
Both work or study		0.015ns		-0.033**		-0.043**
Neither works/studies		0.003ns		0.028**		0.020ns
Lone Parent works/studies		0.071**		0.134**		-
Lone Parent not working nor studying		0.058**		0.124**		-
Gender of respondent (female)		-0.025**		0.022*		0.017ns
Adjusted R-Squared	0.020	0.216	0.043	0.102	0.002	0.044
Number of Observations	10,188	10,188	10,171	10,171	8,554	8,554

**=p<0.01, *=p<0.05, †=0.10 (two-tailed tests of statistical significance), ns = not significant

Family dysfunction and PMK depression are measured as multiple item scales. Satisfaction with the spousal relationship (for those with a partner only) is measured by the PMK responses to a single question.

The family work/study variable encodes lone parent status: the reference category is a role-specialized couple where one partner works or studies and the other does neither.

These coefficients are estimated from least squares regressions over child records. Since some families contribute two children, the sample is effectively clustered, thus biasing the standard errors though not regression coefficients except insofar as the estimates are pulled towards the parameters in the population of adults with more than one child.

Table 6
National Sample: models predicting two indicators of parenting style
Predicting the Child's Experience of Two Parenting Style Measures at Cycle 3.
Based on responses linked to longitudinal children aged 4 to 11 at Cycle 3

Explanatory Variables	Positive Parenting Model 1	Positive Parenting Model 2	Hostile Parenting Model 1	Hostile Parenting Model 2
Intercept	13.04	17.88	8.242	8.245
1. Income Indicators				
Long-Term Low Income	0.034^{ns}	0.064^{ns}	0.060^{ns}	-0.122^{ns}
EA Average Income	0.011^{ns}	0.003^{ns}	0.102**	0.109**
Change in family income to needs	-0.099**	-0.105**	-0.010^{ns}	-0.010^{ns}
2. Family Stress Indicators				
Family Dysfunction		-0.088**		0.110**
PMK Depression		0.005^{ns}		0.125**
3. Neighbourhood Indicators				
EA Female labor force participation		-0.021^{ns}		0.172**
EA Persons per economic family		0.417*		-0.597**
EA Non traditional households		0.098*		-0.065^{ns}
EA New Canadians		-0.249*		0.343*
EA Recent movers		-0.003^{ns}		0.047^{ns}
EA Asian visible minorities		0.366^{ns}		-2.11^{ns}
Perceived Collective Efficacy		0.087**		-0.012^{ns}
Perceived Social Support		0.007^{ns}		0.0^{ns}
"Not a good place to bring up children"		-0.050^{ns}		0.337**
Volunteer work (No)		-0.251*		-0.010^{ns}
Infrequent Religious Attendance		-0.131**		0.069^{ns}
4. Family Indicators				
PMK Years of Formal Education		0.032^{ns}		0.052*
Renting rather than owning home		0.107^{ns}		-0.208^{ns}
Recent Immigrant		0.198^{ns}		-0.523^{ns}
Stepfamily		0.128^{ns}		0.056^{ns}
Parental Work/Study Status				
Both work or study		-0.306**		0.252^{ns}
Neither works/studies		0.863**		-0.274^{ns}
Lone Parent works/studies		-0.423**		0.378^{ns}
Lone Parent not working nor studying		0.212^{ns}		-0.247^{ns}
Gender of respondent (female)		0.041^{ns}		0.542^{ns}
Child's number of siblings		-0.491**		0.269**
Between-child correlation	0.601	0.674	0.553	0.512
Deviance/df	7.989	6.216	12.925	11.751
Adjusted R-Squared	0.002	0.221	0.002	0.086
Number of Observations	8,423	7,004	8,384	6,845

**=p<0.01, *=p<0.05, †=0.10 (two-tailed tests of statistical significance), ns = not significant

The EA female labour force participation rate is the rate for females with children over six years old only.

The family work/study variable encodes lone parent status: the reference category is a role-specialized couple where one partner works or studies and the other does neither.

Maternal age and child gender as well as child age, age squared, birth weight and birth order, are included in the full model but the coefficients are not shown.

Empirical standard estimates are used (with the "sandwich" estimator.)

4.3.2 Determinants of Parenting Styles (Longitudinal Children in the National Sample at Cycle 3)

Even within the same family, parents treat their children differentially depending on their age, birth order, gender and temperament. Mothers often parent differently from fathers and biological parents differently from stepparents. Our questions about parenting flow from the Family Stress Model and relate to differences between better off families and those exposed to poverty, and/or between well-functioning families and those under stress. From this point of view, the effects of child age and gender upon how they are parented are not of primary interest, so although we control for them in our analyses, we do not present them in our results and we minimize our discussion of them.

Table 6 displays the results of fitting models predicting two measures of parenting style: (1) positive parenting; and (2) hostile-aggressive parenting. As in the previous table, we present restricted and full models (Model 1 and Model 2) for each of these parenting style measures. The results for Model 1 establish that neither of them is linked with long-term poverty, thus failing to support the predictions of the Family Stress Model. On the other hand both these parenting measures have highly significant relationships with Family Dysfunction. Parents in more dysfunctional families give less positive parenting and more hostile-aggressive parenting. Both measures of parenting style are also linked to family size: larger families being associated with less positive parenting and more of the hostile-aggressive style. The relationships are not always consistent: hostile-aggressive parenting is affected by PMK depression as well as by the perception that the neighbourhood is not a good place to bring up children, while positive parenting is not. Some patterns of association unique to positive parenting are that it is higher when the PMK has a high degree of trust in her neighbours (Collective Efficacy) and lower when both parents, or a lone-parent, is engaged in work or study.

There are also some interesting linkages with objective Census measures of neighbourhoods: both parenting styles are affected by the EA's average size of economic families, which seems to increase positive parenting and to decrease hostile-aggressive parenting. Both the EA average income level for economic families and the local level of labour force participation by mothers of children over 6 increase the amount of hostile-ineffective parenting, but these two Census measures of neighbourhood have no relationship with positive parenting style.

4.3.3 Determinants of Selected Child Outcomes (Longitudinal Children in the National Sample at Cycle 3)

As before, we report a logical sequence of regression models. In this case, we focus upon the child outcomes of physical health (as judged by the PMK in her response to two global questions about the child's health status), hyperactivity (as reported upon by the PMK in an eight-item scale) and mathematics test scores, as administered in school.

The analysis of physical health is shown in Table 7; of hyperactivity-inattention in Table 8; and of mathematics test scores in Table 9.

Model 1 shows the effect of long-term low income and it is highly significant for all three child outcomes. Model 4 shows the effect of including family stress and parenting indicators and Model 5 adds family indicators. All models include classic indicators of disadvantage such as child's birth weight, number of siblings and number of older siblings, each of which (except birth weight which becomes non-significant in the full model for mathematics test scores) is a highly significant predictor for all three child outcomes. One surprise here is that children with more siblings tend to do better in mathematics than children from smaller families.

Maternal age is a highly significant predictor in all models for hyperactivity-inattention and the mathematics test score, but is unrelated to physical health status except in Model 5 after many other predictors have been held constant. Children in stepfamilies are more hyperactive and do worse in the mathematics test, but are no different from other children in terms of their general physical health. On the other hand, the children of lone-parents who work or study are more hyperactive than children in role-specialized families and have worse physical health, but are no different in mathematics test scores. Family dysfunction is associated with worse physical health and lower mathematics scores, but has no effect on hyperactivity-inattention. The PMK level of depression affects the child's physical health status in both models in which it appears as a predictor, but has inconsistent effects upon hyperactivity-inattention and mathematics scores. Completing the complex pattern of results, hostile-aggressive parenting has highly significant relationships with child hyperactivity-inattention and the child's physical health status but no significant relationship with mathematics test scores.

Measures capturing aspects of the neighbourhood provide a similarly complex set of results. The objective Census characteristic of Non-Traditional Households, which some might think of as a form of disadvantage is in fact associated with better mathematics test scores in both Models 4 and 5. The same explanatory variable is unrelated to general physical health status or to hyperactivity-inattention. PMK judgements about the neighbourhood being a bad place to raise children are associated with the child's physical health status as well as her mathematics test scores, but not with hyperactivity-inattention.

Table 7
National Sample: models predicting the child's physical health status

	Metric Partial Regression Coefficients		
Explanatory Variables	**Model 1**	**Model 4**	**Model 5**
1. Intercept	3.265	3.211	3.687
2. Income Indicators			
Long-Term Low Income	0.089**	0.043**	0.046**
Change in family income to needs			0.000ns
EA Average Income for 2+ pers holds	-0.030**	-0.014†	-0.008ns
3. Family Stress Indicators			
Family Dysfunction Score		0.017**	0.016**
PMK Level of Depression		0.023**	0.024**
4. Parenting Indicators			
Positive Parenting 2-11		-0.001ns	-0.004ns
Hostile-Ineffective Parenting 2-11		0.011**	0.011**
Consistent Parenting 2-11		-0.001*	-0.006ns
Punitive-Aversive Parenting 2-11		-0.006ns	-0.009ns
5. Neighbourhood Indicators			
EA Female labor force participation		0.002ns	0.008ns
EA Persons per economic family		-0.077ns	-0.114*
EA Non traditional households		0.001ns	0.017ns
EA New Canadians		0.004ns	0.01ns
EA Recent movers		-0.011ns	-0.017*
EA Asian visible minorities		0.062ns	0.037ns
Perceived Collective Efficacy		0.002ns	0.000ns
Perceived Social Support		-0.010ns	-0.009ns
"Not a good place to bring up children"		0.082**	0.063*
Volunteer work (No)		-0.016ns	-0.029ns
Infrequent Religious Attendance		0.001ns	-0.004ns
6. Family Indicators			
PMK Years of Formal Education			-0.030**
Renting rather than owning home			0.038ns
Recent Immigrant			0.022ns
Stepfamily			0.099ns
Parental Work/Study Status			
Both work or study			-0.005ns
Neither works/studies			-0.136ns
Lone Parent works/studies			-0.115*
Lone Parent not working nor studying			-0.069ns
Gender of the PMK (female)	0.027ns	0.021ns	0.013ns
7. Child Characteristics			
Child gender (female)	-0.047*	-0.025ns	-0.028ns
Child age	-0.019ns	-0.019ns	-0.026ns
Child age squared	0.001ns	0.001ns	0.001ns
Maternal age	0.001ns	0.003ns	0.007*
Birth weight	-0.089**	-0.075**	-0.077**
Number of siblings	-0.075**	-0.067**	-0.062**
Number of older siblings	0.066**	0.067**	0.051**
8. Summary Statistics			
Between-child correlation	0.255	0.221	0.220
Deviance/df from GEE	1.138	1.093	1.095
Number of Observations	11,857	10,734	9,539
Number of Households at Cycle 3	8,336	7,403	6,576

**=p<0.01, *=p<0.05, †=0.10 (two-tailed tests of statistical significance), ns = not significant

The measure of poor health is the result of adding numerical scores from two questions asked of the child's main caregiver (the PMK.) Higher scores mean poorer health status.

The EA female labour force participation rate is the rate for females with children over six years old only.

For children aged 12-15 we used the most recent parenting scores.

The family work/study variable also encodes lone parent status: the reference category is a role-specialized couple where one partner works or studies and the other does neither.

Maternal age and child gender as well as child age, age squared, birth order, and PMK age are included as predictors in all models.

Empirical standard estimates are used (with the "sandwich" estimator.)

Table 8
National Sample: models predicting the child's hyperactivity-inattention scores

Explanatory Variables	Metric Partial Regression Coefficients		
	Model 1	Model 4	Model 5
1. Intercept	9.418	1.60	1.596
2. Income Indicators			
Long-Term Low Income	0.217**	1.71**	0.079^{ns}
Change in family income to needs	0.001^{ns}	-0.001^{ns}	0.001^{ns}
EA Average Income for 2+ pers holds	-0.018^{ns}	-0.015^{ns}	-0.014^{ns}
3. Family Stress Indicators			
Family Dysfunction Score		0.017^{ns}	0.014^{ns}
PMK Level of Depression		0.073**	0.068**
4. Parenting Indicators			
Positive Parenting 2-11		0.016^{ns}	0.018^{ns}
Hostile-Ineffective Parenting 2-11		0.352**	0.348**
Consistent Parenting 2-11		-0.037†	-0.035†
Punitive-Aversive Parenting 2-11		0.018^{ns}	0.026^{ns}
5. Neighbourhood Indicators			
EA Female labor force participation		0.022^{ns}	0.014^{ns}
EA Persons per economic family		0.082^{ns}	0.110^{ns}
EA Non traditional households		0.031^{ns}	0.022^{ns}
EA New Canadians		0.133^{ns}	0.107^{ns}
EA Recent movers		-0.040^{ns}	-0.056^{ns}
EA Asian visible minorities		-1.171^{ns}	-0.991^{ns}
Perceived Collective Efficacy		-0.038^{ns}	-0.037^{ns}
Perceived Social Support		0.021^{ns}	0.019^{ns}
"Not a good place to bring up children"		0.135^{ns}	0.106^{ns}
Volunteer work (No)		0.286†	0.228^{ns}
Infrequent Religious Attendance		0.092†	0.082†
6. Family Indicators			
PMK Years of Formal Education			-0.016^{ns}
Renting rather than owning home			0.299
Recent Immigrant			-0.158^{ns}
Stepfamily			0.641**
Parental Work/Study Status			
Both work or study			0.048^{ns}
Neither works/studies			0.037^{ns}
Lone Parent works/studies			0.640**
Lone Parent not working nor studying			-0.083^{ns}
Gender of the PMK (female)	0.190^{ns}	-0.166^{ns}	-0.216^{ns}
7. Child Characteristics			
Child gender (female)	-1.339**	-1.201**	-0.120**
Child age	-0.041^{ns}	0.520^{ns}	0.411^{ns}
Child age squared	-0.006^{ns}	-0.036†	-0.029^{ns}
Maternal age	-0.076**	-0.040**	-0.030*
Birth weight	-0.367**	-0.367**	-0.349**
Number of siblings	-0.442**	-0.482**	-0.424**
Number of older siblings	0.399**	0.529**	0.465**
8. Summary Statistics			
Between-child correlation	0.201	0.151	0.146
Deviance/df from GEE	11.688	10.638	10.563
Number of Observations	7,994	4,546	4,464
Number of Households at Cycle 3	6,132	3,930	3,861

**=p<0.01, *=p<0.05, †=0.10 (two-tailed tests of statistical significance), ns = not significant

The measure of child hyperactivity is a scale formed of questions responded to by the PMK for children aged 4-11 only.

The EA female labour force participation rate is the rate for females with children over six years old only.

The family work/study variable also encodes lone parent status: the reference category is a role-specialized couple where one partner works or studies and the other does neither.

Maternal age and child gender as well as child age, age squared, birth order, and PMK age are included as predictors in all models.

Empirical standard estimates are used (with the "sandwich" estimator.)

Table 9
National Sample: models predicting the child's mathematics test scores

Explanatory Variables	Metric Partial Regression Coefficients		
	Model 1	Model 4	Model 5
1. Intercept	-81.09	4.364	-31.861
2. Income Indicators			
Long-Term Low Income	-8.292**	-8.766**	-5.794**
Change in family income to needs			0.001^{ns}
EA Average Income for 2+ pers holds	1.087^{ns}	2.155**	1.251^{ns}
3. Family Stress Indicators			
Family Dysfunction Score		-0.729**	-0.595*
PMK Level of Depression		-0.340**	-0.228^{ns}
4. Parenting Indicators			
Positive Parenting 2-11		-1.037*	-0.905*
Hostile-Ineffective Parenting 2-11		-0.453^{ns}	-0.662^{ns}
Consistent Parenting 2-11		0.262^{ns}	0.123^{ns}
Punitive-Aversive Parenting 2-11		-0.858^{ns}	-0.668^{ns}
5. Neighbourhood Indicators			
EA Female labor force participation		-0.785^{ns}	-1.224^{ns}
EA Persons per economic family		-3.748^{ns}	-6.104^{ns}
EA Non traditional households		5.843**	5.125**
EA New Canadians		0.837^{ns}	-2.362^{ns}
EA Recent movers		-2.364*	-1.951^{ns}
EA Asian visible minorities		14.07^{ns}	26.071^{ns}
Perceived Collective Efficacy		-0.650^{ns}	-0.887^{ns}
Perceived Social Support		0.269^{ns}	0.237^{ns}
"Not a good place to bring up children"		-9.444**	-8.013**
Volunteer work (No)		1.005^{ns}	3.422^{ns}
Infrequent Religious Attendance		-1.384^{ns}	-0.724^{ns}
6. Family Indicators			
PMK Years of Formal Education			4.686**
Renting rather than owning home			-7.36ns
Recent Immigrant			10.068^{ns}
Stepfamily			-8.996*
Parental Work/Study Status			
Both work or study			2.926^{ns}
Neither works/studies			-0.943^{ns}
Lone Parent works/studies			-3.074^{ns}
Lone Parent not working nor studying			2.341^{ns}
Gender of the PMK (female)	-1.330^{ns}	1.225^{ns}	4.702^{ns}
7. Child Characteristics			
Child gender (female)	4.000†	2.007ns	2.967^{ns}
Maternal age	1.834**	1.633**	1.140**
Birth weight	4.832**	4.763*	2.830^{ns}
Number of siblings	4.548**	5.060**	4.34*
Number of older siblings	-8.525**	-8.502**	-7.97**
8. Summary Statistics			
Between-child correlation	0.200	0.200	0.166
Deviance/df from GEE	4612.0	4453.8	4408.3
Number of Observations	4,391		3,510

**=p<0.01, *=p<0.05, †=0.10 (two-tailed tests of statistical significance), ns = not significant

The mathematics scale score is constructed in such a way that it has a built-in correlation with age. Child age and age squared are included in all models.

The measure of poor health is the result of adding numerical scores from two questions asked of the child's main caregiver (the PMK)

The EA female labour force participation rate is the rate for females with children over six years old only.

For children aged 12-15 we used the most recent parenting scores.

The family work/study variable also encodes lone parent status: the reference category is a role-specialized couple where one partner works or studies and the other does neither.

Maternal age and child gender as well as child age, age squared, birth order, and PMK age are included as predictors in all models.

Empirical standard estimates are used (with the "sandwich" estimator.)

This analysis of child outcomes using the national sample at Cycle 3 of the NLSCY confirms that long-term low income has negative outcomes for children. In the case of hyperactivity-inattention, the introduction of variables which can be considered to mediate the impact of long-term poverty reduces its effect to non-significance. However, in the case of physical health and mathematics scores, the effects of long-term low income persist, even after adding a large number of family level and neighbourhood level variables to the battery of predictors.

Our analysis shows that some neighbourhood measures are significantly associated with child outcomes and with indicators of parenting style. However, we consider this part of the analysis to be inadequate as regards the survey-based measures of neighbourhoods since they are in most cases based on the same PMK reporting both on the neighbourhood and on her child. Furthermore, many children in the national sample are the only child in their enumeration area, so it is impossible to find out whether poverty has different effects from one neighbourhood to another. For this reason we decided to focus on a smaller number of children clustered so that there are several per enumeration area and we now turn to analysis of this "neighbourhoods sample".

4.4 Results from the Neighbourhoods Sample

4.4.1 The Sub-Sample for Analyzing Neighbourhood Effects

Numbers are reduced in the neighbourhoods sample by the requirement that most families should include more than one child and that each neighbourhood should contain at least a reasonable number of families[27]. This requirement stems from the logic of asking multilevel questions and also for the technical reason that while mixed models can produce unbiased estimates from unbalanced layouts where randomly occurring missing observations are present, data which depart too much from a balanced layout present too great a computational challenge. After some experimentation we set the selection condition that child-occasions must be from EAs which each contained more than ten child-occasions from children about whom we had longitudinal data. This resulted in our analyses being carried out on up to 5,250 child-occasions when from Cycles 1, 2 or 3 and 3,455 child-occasions when we restricted attention to Cycles 1 and 3 only. The numbers are reduced when predicting child outcomes that are only measured for children in a limited age range and sometimes by the presence of missing data on certain explanatory variables.

[27] As discussed above, we have aggregated respondents' judgments about their neighbourhoods to the level of enumeration areas and our analyses of the neighbourhood sample use only those aggregated neighbourhood variables that are based on data from six or more respondents. These respondents do not have to be parents of the children whose outcomes are being predicted in any particular analysis. It is quite possible for example that some the PMKs who provided judgments of a given enumeration area were mothers of very young children while we would be predicting outcomes for seven year olds. The upshot of this focus upon neighbourhoods about which we have aggregated measures is that we drop children from enumeration areas about which we have insufficient information

4.4.2 Clustered Observations and Longitudinal Analysis

Children in the NLSCY sample are to some degree "clustered" within households and enumeration areas. (In addition, the longitudinal aspect of the data produces a kind of "clustering" of observations over time.) So far as children within households and within enumeration areas are concerned, most such clusters are of size one, while a small percentage are of size two, three or more[28]. Children at Cycle 3 are to some degree clustered within families, though more than half were the only child sampled from their household. Families, in turn, are to some degree clustered within census EAs, though again, a considerable proportion of families are the only ones sampled in their neighbourhoods. Census tracts are larger scale geographical units but even so, less than 100 of them contain more than 20 households from the NLSCY sample (Foster et al. 2001.)

There are two general approaches to the analysis of longitudinal data of the kind collected in the NLSCY. The first is to focus upon outcomes at the most recent data collection and to use as much as possible of the history of each child in explanatory models. The second is to restructure the data on each child's history into a set of child-occasions (see for example Allison 1999) and use mixed models to carry out hierarchical modeling.

Mixed models are very general in that they can treat each child's occasions (wave by wave observations) as clustered within the child who is clustered within a family etc. When the data are imperfect, as is almost inevitable with longitudinal studies, mixed models are more forgiving than standard approaches to repeated measures analysis since, in principle, they can obtain unbiased estimates even with unbalanced and randomly missing data (Littell et al. 1996 : 115.) Hierarchical mixed models typically show that most of the variation in child outcomes is between children (often associated with age or gender) and after that between families, with quite small proportions of variation lying between EAs, census tracts or larger units (Boyle and Lipman 1998; Foster 2001.) While all approaches can estimate cross-level interaction effects (for example, the interaction between neighbourhood characteristics and parenting styles in affecting child outcomes) mixed models can estimate the variances of random slopes, thus testing whether or not family-level relationships are similar in different neighbourhoods (Snijders and Bosker 1999 : 67-85.)

[28] While many of the sampled households contribute only one child to the survey, the sampling design for cycle 1 allowed up to four children to be sampled in any economic family. In cycles 2 and 3 the maximum number of children per newly selected economic family was limited to two and while in principle all cycle 1 children were to have been followed up, it appears that the definition of a "longitudinal child" excludes those children who were one of three or four children sampled from the same economic family in cycle 1. The essential point here is that while cycle 1 of the NLSCY has a certain amount of clustering of children sampled from the same economic family, the definition of "longitudinal children" is such as to minimize the consequences that this might have for respondent burden and accurate estimation of standard errors. The maximum number of longitudinal children per household at Cycle 3 is two. Cross sectional estimates from cycle 1 data are of considerable interest when estimating models which focus upon the effects of household structure upon child outcomes but longitudinal children are of much less use in this respect.

4.4.3 The Multi-Level Modeling Framework

Variation in child outcomes that relates to family income, ethnicity, parenting practices and other parent characteristics is "between-family" and in the simplest theoretical model "between-family" differences should affect all children in the same family in the same way. In a more sophisticated "cross-level interaction" formulation a family level event, such as the experience of bereavement, divorce or transient poverty, may affect younger children differently from older ones. Of course, children brought up within the same household often have different outcomes. Such differences may be related to early health deficits, gender, birth order, differential parenting or other factors, but they are all "within-household". In the language of hierarchical modeling, "within-family" variation in child outcomes is nested within "between-family" variation. In turn, families are located within neighbourhoods; so we can also talk about "between-family" variation in child outcomes being nested within "between-neighbourhood" variation. We could also discuss "between-family" variation in parenting practices being nested within "between-neighbourhood" variation. When we have measured the same outcome repeatedly for each child as in a longitudinal survey, we also have "within-child" variation.

Thinking about effects that may occur at different levels of analysis leads us to the classical discussions of "ecological" and "individualistic" fallacies. These so-called fallacies arise because partial regression coefficients estimated at one level of analysis do not necessarily have the same size, or even sign, as the corresponding coefficients estimated at a lower or higher level of analysis. When this happens it is usually because different social processes are operating at the various levels of analysis. For example, a correlation over census tracts between the percent of lone-parent families and the percent of children who drop out of high school might reflect relatively less effective parenting by lone parents, but it might equally represent lone parents tending to live in low income areas, where all children are at higher risk of dropout. A virtue of hierarchical linear modeling is that it explicitly models the "levels of analysis" issue and produces best linear unbiased estimates of model parameters.

Hierarchical linear models use "mixed model" data analysis that estimates not only the "fixed" part of the standard multiple regression model, but also the variances of random intercepts at different levels of the model. It is also possible to estimate the variances of random slopes, also at different levels. In the "random intercepts model" we estimate the variance of random intercepts summarizing differences between EAs, $\tau_{Neighbourhoods}$, as well as the variance of random intercepts representing differences between families, $\tau_{Families}$, and the variance of random intercepts summarizing differences between children, $\tau_{Children}$. A residual variance, σ^2 can be estimated from within-child variation between waves of the longitudinal survey. One useful result that can be obtained from hierarchical modeling is a statistical test of the hypothesis that the variance of random intercepts at some level of the model is zero. For example, if the random intercepts for neighbourhoods are essentially the same value (zero variance) then the neighbourhood level explanatory variables in the predictive model can be said to explain neighbourhood differences in child outcomes. In general, as more independent variables are added to the predictive model, the unexplained variation at neighbourhood, family and child levels of

the model is reduced and each can be reported separately. The "random slopes model" contains the same terms as the random intercepts model but adds a term for the variance of the slope parameter that is hypothesized to vary over clusters. We present such a model below for the slope of the relationship between long-term family poverty and child health and we test the hypothesis that this slope varies over neighbourhoods.

4.4.4 Hierarchical Linear Models for Predicting Child Outcomes

In this section we report on the results of fitting hierarchical linear models for the prediction of two child outcomes and one parenting style. We chose the child's physical health as rated by the person most knowledgeable about the child (the PMK) in Cycles 1, 2 and 3 as our first dependent variable and the child's level of hyperactivity-inattention (again as rated by the PMK) in Cycles 1 and 3 as our second. We were unable to analyse the mathematics test scores in this way, because of deficiencies in their administration at Cycle 1. The final analysis in this section is the prediction of hostile-aggressive parenting within the framework of the same multilevel model.

4.4.4.1 Hierarchical Linear Models for Predicting Child's Physical Health

The child's physical health is measured by the PMK's responses to two global questions. Higher scores indicate poorer health, as perceived by the PMK. Table 10 shows the prediction of PMK-rated child health in five analytical steps. All five models include the basic predictors of child gender, age and age squared, as well as child birth-weight, maternal age, PMK gender, the total number of siblings, the number of older siblings, and the wave of the survey. A summary of a sixth model (the "empty" or "null" model) is given in the bottom left of the table. Model 1 includes the exogenous variables of long term poverty and neighbourhood average income. Models 2, 3 and 4 add the variables that mediate and modify associations: family dysfunction and PMK depression (Model 2), parenting styles (Model 3) and neighbourhood social capital indicators (Model 4.) Model 5 includes further time-varying family-level measures, including the work/study status of the PMK and partner (if any), a measure that also encodes lone parent status. Further measures incorporated in Model 5 include whether the family is a stepfamily, immigration status, home ownership and the number of years of formal education of the PMK.

Table 10
Neighbourhoods Sample Random Slope and Intercepts Models of the Child's Physical Health at Cycles 1, 2 and 3

Explanatory Variables	Model 1	Model 2	Model 3	Model 4	Model 5
1. Intercept	3.675	3.430	3.353	3.778	3.905
2. Poverty Indicators					
Long-Term Low Income (Ltpoverty)	0.113**	0.085**	0.074*	0.072*	0.012^{ns}
EA Average Income for 2+ person hse-holds	-0.003^{ns}	-0.001^{ns}	-0.004^{ns}	0.013^{ns}	0.013^{ns}
Change in family income to needs					-0.001^{ns}
3. Family Stress Indicators					
Family Dysfunction Score		0.015**	0.014**	0.012**	0.012**
PMK Level of Depression		0.015**	0.015^{ns}	0.015**	0.013**
4. Parenting Indicators					
Positive Parenting 2-11			0.009^{ns}	0.008^{ns}	0.008^{ns}
Hostile-Ineffective Parenting 2-11			0.017**	0.018**	0.019**
Consistent Parenting 2-11			-0.016**	-0.017**	-0.014*
Punitive-Aversive Parenting 2-11			-0.004^{ns}	-0.006^{ns}	-0.003^{ns}
5. Neighbourhood Indicators					
EA Female labor force participation rate				0.015^{ns}	0.019^{ns}
EA Persons per economic family				-0.088^{ns}	-0.079^{ns}
EA Non traditional households				-0.002^{ns}	-0.004^{ns}
EA Change in Non traditional households					-0.256**
EA New Canadians				0.022^{ns}	0.031^{ns}
EA Recent movers				-0.008^{ns}	-0.011^{ns}
EA Asian visible minorities				-1.356†	-1.297†
EA Collective Efficacy				0.009	0.0^{ns}
EA Social Support				-0.003†	-0.020^{ns}
EA "Not a good place to bring up kids"				0.126*	0.108*
EA Volunteer work				-0.084^{ns}	-0.057^{ns}
EA Infrequent Religious Attendance				-0.013^{ns}	-0.022^{ns}
6. Family Indicators					
PMK Years of Formal Education					-0.032**
Renting rather than owning home					0.139*
Recent Immigrant					-0.476†
Stepfamily					0.086^{ns}
Parental Work/Study Status					
Both work or study					-0.071*
Neither works/studies					-0.077^{ns}
Lone Parent works/studies					-0.070^{ns}
Lone Parent not working nor studying					0.063^{ns}
Child Birth Weight		-0.164**	-0.153**	-0.148**	-0.152**
Number of siblings in the household		-0.059*	-0.054†	-0.060*	-0.061*
Likelihood Ratio Chi Square	14862.6	14744.8	14617.2	14343.4	14247.2
Variance Components Empty Model					
Residual $\sigma 2$	0.617**	0.615**	0.615**	0.609**	0.611**
$\tau_{Children}$	0.372**	0.364**	0.361**	0.354**	0.357**
$\tau_{Families}$	0.191**	0.167**	0.148**	0.148**	0.141**
$\tau_{LTpoverty* Poor Health}$		0.026**	0.025**	0.027**	0.026**
$\tau_{Neighbourhoods}$	0.024*	0.008^{ns}	0.004^{ns}	0.002^{ns}	0.0^{ns}
Observations Used	5,250	5,235	5,208	5,131	5,097	4,858

**=p<0.01, *=p<0.05 , †=0.10 (two-tailed tests of statistical significance), ns = not significant

Analysis of child-occasions data from 2271 children, 1451 households and 215 enumeration areas, each enumeration area containing at least 20 child-occasions.

The measure of poor health is the result of adding numerical scores from two questions asked of the child's main caregiver (the PMK.) Higher scores mean poorer health status.

The EA female labour force participation rate is the rate for females with children over six years old only.

For children aged 12-15 we used the most recent parenting scores.

The family work/study variable also encodes lone parent status: the reference category is a role-specialized couple where one partner works or studies and the other does neither.

Maternal age and child gender as well as child age, age squared, birth order, and PMK age are included as predictors in all models.

We begin this section by reporting estimates of the fixed effects in the mixed model. PMK ratings of their children's physical health are associated with long-term poverty, though not with neighbourhood average income (Model 1). The sign of the regression coefficient is positive, indicating that longer-term poverty is associated with poorer child health. After adjustment for family stress in Model 2, this coefficient is considerably reduced, but remains statistically significant. Further adjustment, this time for parenting styles (Model 3) has no effect on the coefficient for long term poverty and the addition of neighbourhood measures (Model 4) reduces the coefficient for long term poverty by only a small amount. The introduction of the final set of family measures reduces the coefficient for long term poverty to less than one third of the value it had in Model 1 and renders it statistically insignificant. We conclude that the effect of long-term poverty on children's physical health is entirely mediated by the combination of family stress measures introduced in Model 2 and the remaining family measures added in Model 5. Parenting styles affect children's physical health but contrary to the family stress model, they do not mediate the effects of long-term poverty.

Our estimates of random effects from the mixed model are equally informative. These include $\tau_{\text{Neighbourhoods}}$ as well as τ_{Families} as the variances of random intercepts and $\tau_{\text{LTpoverty*Poor Health}}$ which is the variance of the slope of the relationship between long-term poverty and poor health. As in our analysis of how estimates of fixed effects change when more explanatory variables are added to the model, we can observe how the different variance components from one model to the next.

Between-neighbourhoods variation includes both $\tau_{\text{Neighbourhoods}}$ and $\tau_{\text{LTpoverty*Poor Health}}$. In an earlier analysis (not shown) we had left that variance undivided and had been able to show that between neighbourhoods variation was significantly different from zero in the empty model as well as in Model 1, but that by the time we got to Model 5, it had been reduced to less than half its original size and was not significantly different from zero. This showed that there were indeed between-neighbourhood differences in child health and that they could be accounted for by controlling for measures of poverty, family stress and neighbourhood social capital.

The empty model summarized in the bottom left of Table 10 summarizes the results of predicting physical health from intercepts only. This model has no random slope included and the between-neighbourhoods variance is significantly different from zero. Model 1 introduces the fixed effects of long-term poverty and other predictors. It also introduces a random slope for the relationship between long-term poverty and the child's physical health, a step that immediately reduces $\tau_{\text{Neighbourhoods}}$ to non-significance, while almost all of its variation goes into $\tau_{\text{LTpoverty*Poor Health}}$, which expresses the variability of this relationship over neighbourhoods. The variance of the random slope remains highly significant in Models 2 through 5 and we have not yet found a cross-level interaction in the fixed effects which would reduce its size. Thus, we have shown that the effect of long-term poverty on child health has a different slope depending on the neighbourhood in which children were living at Cycle 3 of the NLSCY. Neighbourhoods do indeed modify the effects of long-term poverty. This could be because of a variety of social processes, ranging from the differing degree of supportiveness of neighbourhoods to differential migration between neighbourhoods by the children. Precisely how it occurs must be the subject for future research.

Between-families variation in children's physical health is significantly different from zero in all models. This means that significant between-family variation remains even after all explanatory variables have been entered. Comparisons of how $\tau_{Families}$ changes as we move from the empty model to Model 5 shows that the introduction of poverty measures (Model 1) reduces it by only a small amount, while adding measures of family stress (Model 2) contributes a further small reduction and adding parenting measures only produces a further slight per cent drop. It makes sense that the addition of neighbourhood measures has no effect on $\tau_{Families}$, while adding the remaining family measures reduces it by a further ten per cent or so.

Returning to description of the fixed effects of explanatory variables upon child health, there are interesting results regarding the effects of family stress, parenting measures and certain neighbourhood indicators. PMK depression and hostile-aggressive parenting have highly significant effects that are not much affected by adding any other explanatory variables. Consistent parenting has significant effects upon child health and this effect is essentially unchanged by adding neighbourhood measures in Model 4, but disappears after the addition of family level measures in Model 5. These family measures clearly mediate the effects of consistent parenting, or the lack of it, upon children's physical health. Family dysfunction displays a similar pattern, though its effect in Model 5 remains statistically significant, but somewhat attenuated. Neighbourhoods with higher scores on census indicators of non-traditional households are associated with poorer child health in Models 4 and 5, though the direction of the partial association changes after the introduction of family-level indicators of non-traditional households in Model 5. Neighbourhoods with higher numbers of Asian visible minorities are associated with better child health in both Model 4 and Model 5. Among aggregated neighbourhood measures there are linkages to child health both from averaged social support and averaged responses to the question about whether the neighbourhood was a good or a poor place to bring up children. The effect of averaged social support is significant in Model 4 but not in Model 5, so we conclude that it is mediated by family-level measures.

4.4.4.2 Hierarchical Linear Models for Predicting Child's Hyperactivity-Inattention

Table 11 shows the same five nested models as reported in the previous table but this time for prediction of the hyperactivity-inattention scale for children aged 4-11 at Cycles 1 and 3. We do not estimate a random slope of the kind shown in the previous table. We excluded observations from Cycle 2 in order to make the aggregated survey measures of neighbourhoods more closely linked with the child record[29]. Because of this and since the measure of hyperactivity-inattention is only available for children up to age 11, the number of child occasions for analysis is at most 2,742 and is reduced to 2,529 in the final model due to missing data in some explanatory variables.

[29] No questions had been asked about neighbourhoods in Cycle 2. While our method of aggregating PMK responses about neighbourhoods to the EA level should allow us to use aggregated neighbourhood measures for Cycle 2 observations, we took a conservative approach here and excluded them.

Table 11
Neighbourhoods Sample[1] Random Intercepts Models Predicting Hyperactivity-inattention at Cycles 1 and 3

Explanatory Variables	Model 1	Model 2	Model 3	Model 4	Model 5
1. Intercept	9.369	8.439	4.995	1.034	2.858
2. Poverty Indicators					
Long-Term Low Income	0.233**	0.114**	0.189*	0.193*	0.042^{ns}
EA Average Income	-0.091^{ns}	-0.080^{ns}	-0.136*	-0.128^{ns}	-0.090^{ns}
3. Family Stress Indicators					
Family Dysfunction Score		0.039**	0.004^{ns}	0.014^{ns}	0.011^{ns}
PMK Level of Depression		0.098**	0.055**	0.052**	0.048**
4. Parenting Indicators					
Positive Parenting 2-11			0.041†	0.040^{ns}	0.033^{ns}
Hostile-Ineffective Parenting 2-11			0.353**	0.352**	0.348**
Consistent Parenting 2-11			-0.037†	-0.035†	-0.029^{ns}
Punitive-Aversive Parenting 2-11			0.084*	0.079*	0.081*
5. Neighbourhood Indicators (EA)					
EA Female labor force participation rate				0.039^{ns}	0.027^{ns}
EA Persons per economic family				0.264^{ns}	0.2557^{ns}
EA Non traditional households				0.130^{ns}	0.130^{ns}
EA Change in neighbourhood (dquart)					-0.201^{ns}
EA New Canadians				0.495^{ns}	0.744^{ns}
EA Recent movers				-0.071^{ns}	-0.059^{ns}
EA Asian visible minorities				-2.645^{ns}	-4.26^{ns}
EA Collective Efficacy				0.012^{ns}	-0.021^{ns}
EA Social Support				0.114*	0.124*
EA "Not a good place to bring up kids"				0.226^{ns}	0.092^{ns}
EA Volunteer work				0.732*	0.661*
EA Infrequent Religious Attendance				-0.024^{ns}	-0.059^{ns}
7. Family Indicators					
PMK Years of Formal Education					-0.136**
Renting rather than owning home					0.183^{ns}
Recent Immigrant					-1.331^{ns}
Stepfamily					0.328^{ns}
Parental Work/Study Status					
Both work or study					-0.039^{ns}
Neither works/studies					0.270^{ns}
Lone Parent works/studies					0.496^{ns}
Lone Parent not working nor studying					0.251^{ns}
Child Birth Weight	-0.517**	-0.470**	-0.438**	-0.420**	-0.363**
Maternal age	-0.044*	-0.036*	-0.027^{ns}	-0.029^{ns}	-0.013^{ns}
Number of siblings	-0.347**	-0.299**	-0.440**	-0.457**	-0.449**
Number of older siblings	0.338**	0.302**	0.419**	0.426**	0.329**
Likelihood Ratio Chi Square	14205.1	14077.4	13602.2	13533.9	12634.7
Variance Components: Empty Model					
Residual $\sigma 2$ 5.649**	5.543**	5.530**	5.556**	5.536**	5.568**
$\tau_{Children}$ 4.287**	3.526**	3.575**	2.093**	2.120**	2.009**
$\tau_{Families}$ 1.795**	1.895**	1.569**	1.289**	1.291**	1.217**
$\tau_{Neighbourhoods}$ 0.616**	0.647**	0.526**	0.397**	0.341**	0.330**
Observations Used	2,736	2,724	2,713	2.701	2,529

**=p<0.01, *=p<0.05, †=0.10 (two-tailed tests of statistical significance), ns = not significant

The family work/study variable encodes lone parent status: the reference category is a role-specialized couple where one partner works or studies and the other does neither.

Birth weight, maternal age and child gender as well as child age, age squared, number of siblings and birth order, are included in all models. Child gender (not shown) has a highly significant effect on hyperactivity-inattention in all models with boys being more hyperactive.

[1]N=3,455 child-occasions at Cycles 1 and 3.

As in our analysis of the national sample (Table 8) there is a highly significant relationship between long-term poverty and hyperactivity-inattention in Model 1. This relationship is attenuated as further explanatory variables are controlled and becomes non-significant in Model 5. As predicted by the Family Stress model the coefficient for long-term poverty is reduced by half when measures of family dysfunction and PMK depression are introduced in Model 2. The addition of parenting style measures in Model 3 does not further reduce the estimated effect of long-term poverty but reduces the coefficient for family dysfunction to non-significance while having no effect on the coefficient for PMK depression. These results are consistent with the idea that family stress mediates the effect of long-term poverty upon the child's hyperactivity-inattention and that some measures of parenting style in turn mediate the effect of family dysfunction. The effects of PMK depression are not mediated by any of our parenting measures and remain highly significant in all models up to and including Model 5. Hostile-ineffective parenting has a highly significant relationship with hyperactivity-inattention in all models in which it appears and the same is true for consistent parenting, though at a lower level of statistical significance. Neighbourhood-level measures of social support and the prevalence of volunteer work are positively associated with children's hyperactivity-inattention in models 4 and 5. Analysis of the national sample had shown that being from a stepfamily or a lone parent family where the parent worked or studied made children more hyperactive, but these results are not confirmed in analysis of the neighbourhoods sample.

We show estimates for the random effects part of the model at the bottom of Table 11. These include $\tau_{\text{Neighbourhoods}}$ as well as τ_{Families} and τ_{Children} as the variances of random intercepts at different levels of the hierarchy. As in our analysis of how estimates of fixed effects change when more explanatory variables are added to the model, we can observe how the different variance components change from one model to the next. Starting with the model containing only intercepts as predictors (the "empty model") we observe that between-neighbourhoods variation in child hyperactivity is significantly different from zero, though about one seventh of that which lies between children and about one third of the between-family variance. These estimates can be contrasted with those reported by Boyle and Lipman (1998), though they dealt with data from Cycle 1 only, used a much larger sample of children and employed a different estimation method. Comparing the random effects in Models 1 through 5, it is clear that adding successive groups of explanatory variables gradually reduces the between-neighbourhoods variation until by Model 5, it is almost half its original value though still significantly different from zero. This means that there are persistent neighbourhood differences in child hyperactivity, even after all child-level, family-level and neighbourhood level explanatory variables have been controlled. Further analysis of these data will explore the effects of including data from Cycle 2 and fitting random slope terms of the kind reported in the multilevel modelling of children's physical health status.

4.4.4.3 Hierarchical Linear Models for Predicting Child's Experience of Hostile-Ineffective Parenting

We report a series of multi-level random intercepts models predicting hostile-aggressive parenting in Table 12. As in Table 11 the data are from the neighbourhood sample and only include waves 1 and 3. Because of this and also because of the fact that this parenting scale is only available for children up to age 11, the number of child occasions for analysis is at most 2,742 and is reduced to 2,545 in the final model due to missing data in some explanatory variables. We focus on the sources of hostile-aggressive parenting because our analyses of the national sample confirm previous studies using the NLSCY, which have shown that this style is associated with negative child outcomes.

Table 12 shows four models labelled Model 1, Model 2, Model 4 and Model 5, the absent Model 3 being the one that would have included parenting variables as predictors had we been building models of child outcomes. The fixed effects estimated for the various models show that long-term poverty initially has no effect on hostile-ineffective parenting, a finding that confirms results from the national sample. As other explanatory variables are introduced in Models 2 through 5 the relationship becomes statistically significant, though in the opposite direction to the one expected under our interpretation of the Family Stress Model: that is, net of other factors the experience of long-term poverty is associated with reduced levels of hostile-aggressive parenting. Both indicators of family stress have highly significant effects on hostile-aggressive parenting in all the models and these effects are in the expected direction: family dysfunction and caregiver depression are associated with higher levels of hostile-aggressive parenting. Our aggregated survey measures of Collective Efficacy, Social Support etc. have no association with hostile-ineffective parenting. However, objective indicators of neighbourhood characteristics show very interesting relationships. Higher levels of labour force participation by mothers of children over six has a highly significant impact upon hostile-aggressive parenting ($b = 0.249$ in the final model). This is the same result as we obtained in the national sample, though the regression coefficient was smaller ($b = 0.173$). The Census indicator of New Canadians shows a significant relationship with hostile-ineffective parenting such that the higher the incidence of New Canadians, the greater the hostile-ineffective parenting score. Our interpretation of this relationship must take into account the further finding that the presence of East Asian Visible Minorities in the enumeration area is associated with a marked reduction in hostile-ineffective parenting. Overall this style of parenting is affected by family stress and by several objective indicators of neighbourhood type.

Table 12
Neighbourhoods Sample Random Intercepts Models of the Child's Experience of Hostile-Ineffective Parenting at Cycles 1 and 3

Explanatory Variables	Model 1	Model 2	Model 4	Model 5
1. Intercept	8.563	7.200	8.145	8.223
2. Poverty Indicators				
Long-Term Low Income (Ltpoverty)	-0.059^{ns}	-0.217*	-0.222*	-0.218†
EA Average Income for 2+ person hse-holds	0.165*	0.176*	0.028^{ns}	0.032^{ns}
Change in family income to needs				0.001^{ns}
3. Family Stress Indicators				
Family Dysfunction Score		0.081**	0.087**	0.089**
PMK Level of Depression		0.107**	0.106**	0.105**
4. Neighbourhood Indicators				
EA Female labor force participation rate			0.238**	0.249**
EA Persons per economic family			-1.034*	-0.985*
EA Non traditional households			-0.230†	-0.251†
EA Change in Non traditional households				0.027^{ns}
EA New Canadians			1.317*	1.528*
EA Recent movers			0.136^{ns}	0.090^{ns}
EA Asian visible minorities			-8.833*	-10.12**
EA Collective Efficacy			-0.115ns	-0.100^{ns}
EA Social Support			0.116†	0.099^{ns}
EA "Not a good place to bring up kids"			0.371^{ns}	0.406^{ns}
EA Volunteer work			-0.511^{ns}	-0.474^{ns}
EA Infrequent Religious Attendance			0.160^{ns}	0.125^{ns}
5. Family Indicators				
PMK Years of Formal Education				-0.016^{ns}
Renting rather than owning home				-0.044^{ns}
Recent Immigrant				-0.268^{ns}
Stepfamily				0.556†
Parental Work/Study Status				
Both work or study				0.181^{ns}
Neither works/studies				0.063^{ns}
Lone Parent works/studies				0.233^{ns}
Lone Parent not working nor studying				-0.281^{ns}
Gender of PMK (female)	1.298**	1.117**	1.050**	0.884*
Number of siblings in the household	0.307**	0.369**	0.360**	0.322**
Number of children older than this child	-0.203†	0.263*	-0.268*	-0.269*
Likelihood Ratio Chi Square 14380.8	14282.4	14122.1	14016.6	13084.0
Variance Components: Empty Model				
Residual σ2 6.413**	6.335**	6.482**	6.439**	6.470**
$\tau_{Children}$ 0.251^{ns}	0.155^{ns}	0.078^{ns}	0.092^{ns}	0.059^{ns}
$\tau_{Families}$ 5.288**	5.147**	4.486**	4.446**	4.154**
$\tau_{Neighbourhoods}$ 1.267**	1.250**	1.009**	0.719**	0.716**
Observations Used 2,742	2,742	2,729	2,717	2,545

**=p<0.01, *=p<0.05 , †=0.10 (two-tailed tests of statistical significance), ns = not significant

The EA female labour force participation rate is the rate for females with children over six years old only.

The family work/study variable also encodes lone parent status: the reference category is a role-specialized couple where one partner works or studies and the other does neither.

Maternal age and child gender as well as child age, age squared, birth order, and PMK age are included as predictors in all models.

The random effects shown in Table 12 display a completely different pattern from that typical when predicting child outcomes. Instead of having most of the non-residual variation between children, as almost always happens when modeling child outcomes (Boyle and Lipman, 1998), Table 12 shows that the largest random intercept variance is for $\tau_{Families}$. Furthermore the between neighbourhoods variance $\tau_{Neighbourhoods}$ is considerably larger as a proportion of the residual variance when predicting hostile-aggressive parenting than when predicting child outcomes such as physical health. The variance component for children declines in size as we move from the empty model to Model 5, though it is non-significant in all models. The intercept variance for families declines only slightly (from around 5.2 to around 4.1) as further explanatory variables are introduced and remains highly significant in Model 5. The variance component for neighbourhoods is of course smaller and exhibits a steeper decline until by Model 5 it is at around 60% of its value in the empty model, though still highly significant. It appears then that while parents certainly adopt different styles when socializing older or younger, male or female children hostile-aggressive parenting, as measured in the NLSCY has little between-child variation and very significant between-family and between-neighbourhood variation.

5. Discussion

5.1 The Effects of Long-Term Poverty on Child Outcomes

Analysis of the national sample confirms that the experience of long-term poverty has negative impacts on children, causing poorer physical health, increased hyperactivity and worse performance in mathematics tests. We have interpreted the Family Stress Model (Conger et al., 2000) as predicting that these negative impacts are mediated by family stress and by ineffective parenting practices. This implies that when stress and parenting indicators are controlled, the partial relationship between long-term poverty and child outcomes ought to be reduced. Our results show that this prediction is sustained only for the "mental health" outcome of hyperactivity-inattention. The child outcome of physical health shows some reduction in the impact of long-term poverty after measures of family stress and parenting practices have been controlled, but the relationship remains highly significant. The highly significant impact of long-term poverty upon mathematics test performance at Cycle 3 is essentially unaffected by any of a large number of control variables. We did not include school measures in our analysis and it may be that certain aspects of schooling can reduce the impact of long-term poverty. Future research should address this hypothesis.

5.2 Neighbourhood Effects

5.2.1 The Effects of Objective Census Indicators and Survey-Based Indicators of Neighbourhood Characteristics

Analysis of the national sample of longitudinal children in the NLSCY at Cycle 3 showed few significant relationships between objective Census characteristics of neighbourhoods and child outcomes. The strongest of these was the positive impact of living in EAs with larger prevalence of non-traditional households upon mathematics test scores – a relationship that does not occur with the other two child outcome measures. There is also a strong relationship between the PMK's evaluation of the neighbourhood as a better or worse place to bring up children and mathematics test scores. Children from neighbourhoods with higher average family income tend to have better health, but this relationship disappears when other explanatory variables are statistically controlled.

Our results also show that certain neighbourhood characteristics have an impact on parenting styles, indeed there are indications that parenting styles may have more between-neighbourhoods variation than do child outcomes. It is of course true that parenting differs from one child to another within the same family. Nevertheless, the data

analysis which treated parenting styles as dependent showed that reliable correlates can be found with several family-level and particularly neighbourhood level explanatory variables. Religious attendance and perceived Collective Efficacy of the neighbourhood increase the level of positive parenting interactions. Hostile-aggressive parenting is associated with enumeration areas having higher average income, higher levels of female labour force participation by mothers, as well as with the enumeration area's having a lower average family size. Neighbourhoods having higher percentages of East Asian visible minorities have significantly lower levels of hostile-aggressive parenting. This overall pattern suggests that parenting styles may to some extent reflect local patterns of employment as well as values and assumptions linked to social class and ethnicity. If so, one might speculate that the effects of parenting styles on some child outcomes may depend on their relationship to local norms. For example, children might respond to a given level of hostile-aggressive parenting differently according to how much it deviates from the neighbourhood average.

5.2.2 Neighbourhoods Modify the Impact of Long-term Poverty

The NLSCY is not designed for carrying out research on neighbourhood effects, and so we constructed a sub-sample more appropriate to this purpose. Using this "neighbourhood sample" we were able to show that the relationship between long-term poverty and child health has a different slope depending on the neighbourhood in which children were living. Neighbourhoods do indeed modify the effects of long-term poverty and this variation in the slope of the poverty-health relationship remains statistically significant beyond the one per cent level even after controlling for a battery of other explanatory variables. However, we remain ignorant about the social processes that are captured by this statistical relationship. Some neighbourhoods might be more supportive than others, due perhaps to having more "social capital" discussed by authors such as Coleman (1988), Portes (1998) and Putnam (2000). But even though we have taken considerable trouble to aggregate survey-based measures of relevant variables to the neighbourhood (EA) level, none of them has an impact upon the size and statistical significance of the random slope. We hope to pursue this problem using chid health and other outcomes in subsequent research.

5.3 The Effects of Family Stress and Parenting Style

Our results confirm the importance of family stress and parenting style. Varying combinations of family dysfunction, the level of depression of the main caregiver, and hostile-ineffective parenting have statistically significant negative impacts upon child outcomes. However, precisely which indicators of family stress or parenting style are implicated seems to vary from one child outcome to another. For example, analysis of the national sample shows that all three indicators impact physical health status, but only PMK depression and hostile-aggressive parenting affect hyperactivity-inattention.

Mathematics scores are reduced by family dysfunction, but are not affected in the full model by PMK depression.

Hostile-aggressive parenting has a highly significant association with children's physical health and hyperactivity-inattention in all models fitted to data from both the national and the neighbourhoods samples. Mathematics scores are not affected by hostile-aggressive parenting.

5.4 Other Effects

5.4.1 The Effects of Working or Studying Among Couples and Lone Parents

We measured parental involvement in work or study in combination with lone parenthood. This permits a distinction between lone parents who are engaged in work or study and those who are not. Current trends in the "re-shaping of the welfare state" encourage or require lone parents to participate in study or paid work, so it is highly policy relevant to test whether or not working lone parents have better or worse child outcomes than those who are full-time caregivers. Since we only entered this variable in the full model, the effects we report are net of long-term poverty and a host of other explanatory variables. The role-specialized couple where one partner works or studies and the other does neither is used as the reference category. This type of family reports worse child physical health outcomes than other groups, though the higher health levels are statistically significant only for children where two parents were both involved in work or study (national sample) and for children of working or studying lone parents (neighbourhoods sample). Lone parents are typically at much greater risk of being below the LICO but since long-term poverty is controlled here, any effects of lone parenthood are over and above the income-related aspects of that condition and may relate to the factors such as increased use of child minders or day care and/or lesser parental surveillance. Results from the national sample show that children of lone parents who work or study have significantly higher levels of hyperactivity than those in role-specialized families while the children of lone parents who neither work nor study are not significantly different from those in the reference category. Net of all other explanatory variables, our combined indicator of lone parent status and parental working status shows no relationship with mathematics test scores. Nor is there a relationship between this indicator and the child's experience of hostile-ineffective parenting, though there are highly significant links with positive parenting interactions: working lone parents give fewer positive parenting interactions, as do couples where both parents work or study.

5.4.2 The Effects of Living in a Stepfamily

Again, we estimated the effects of this variable in the full model only, so the effects we report are net of long-term poverty and a host of other explanatory variables. Children who live in stepfamilies are no different from other children in terms of physical health. However, they have significantly higher hyperactivity scores and lower scores in the mathematics test (a reduction of 9 points on the standardized mathematics scale). Net of other explanatory variables, there is no effect of being in a stepfamily upon the child's experience of positive parenting interactions or of hostile-aggressive parenting. If the percentage of children raised in stepfamilies were to increase over the coming decades as seems quite likely, given current trends in union dissolution and re-partnering, these results predict a small general increase in child hyperactivity and a small general decrease in cognitive functioning as indicated by mathematics test scores.

5.4.3 The Effects of Years of Education Completed by the PMK

Since we estimated the effects of this variable in the full model only, the effects we report are net of long-term poverty and a host of other explanatory variables. More years of formal education completed by the PMK is generally associated with better child outcomes. Somewhat surprisingly it is also associated with higher levels of hostile-aggressive parenting.

5.4.4 The Effects of Recent Immigration Status

As before, we estimated the effects of this variable in the full model only so the effects we report are net of long-term poverty and a host of other explanatory variables including Census indicators of the percentage of New Canadians in the EA. For this reason, and also because the numbers of children from recent immigrant families are small, there are no statistically significant associations between child outcomes and this explanatory variable.

5.4.5 Child Gender, Age, Birth Weight, Maternal Age, Family Size and Birth Order

The child's gender, birth weight, age of the biological mother at the child's birth, current age, current family size and current birth order are included in all predictive models, though not always reported since the primary focus of this research was on other factors. It is very striking that these measures often continue to have highly significant impacts upon child outcomes even after long-term poverty and a large number of other explanatory variables have been statistically controlled. Lower birth weight and lower maternal age are generally associated with worse child outcomes, even net of all other factors (though the effect of birth weight disappears in the final

model for predicting mathematics test scores.) In view of the literature in the area (Sweetman and Rama, 2001) it is rather surprising that after controlling for all other variables, larger family size (more siblings) is associated with *better* physical health, *less* hyperactivity and *higher* mathematics test scores, though less surprising that it goes with fewer positive parenting interactions and more hostile-aggressive parenting. The unexpected finding regarding family size may be because we estimate its effect while controlling for another family-size linked variable, the number of children who are older than the current child. It would very likely be safer to interpret these two measures as a combination rather than separately.

5.5 Policy and Research Implications

Our results confirm the negative consequences of long-term poverty for children and therefore the policy importance of reducing children's exposure to it. They also show the persistent importance of such classic risk factors as lower birth weight and maternal age and therefore the policy importance of health-related policy interventions targeted at higher risk pregnancies and younger mothers. Family dysfunction and depression experienced by mothers are important influences leading to undesirable child outcomes and should therefore be targeted by policies directed at relieving family stress and improving mothers' mental health. Hostile-aggressive styles of parenting are similarly associated with undesirable child outcomes but since the direction of causation is uncertain here, it is difficult to make a policy recommendation.

Finally, we have shown that certain aspects of neighbourhoods – most plausibly, those related to social support and more general aspects of "social capital" - have a statistically significant effect on the slope of the relationship between long-term poverty and children's physical health. While more research is needed before making any policy recommendation this result raises intriguing questions about the methods by which neighbourhood social capital might be increased and what the likely balance of costs and benefits of such interventions might be in comparison to the costs and benefits associated with policy interventions in the areas of maternal health or family functioning.

As noted below, our measures of "neighbourhood social capital" are primitive and one implication for future research is that some effort should be made to find out what it is about neighbourhoods that makes some of them have protective features which limit the effects of long-term poverty upon child outcomes. More generally, a truly holistic account of child development needs to take account of family contexts as well as neighbourhoods. The current shared file in the NLSCY does not include the household roster, so researchers simply do not know about such important details of family context as what proportion of the children are girls, what proportion are stepchildren, what the age-distribution of children in the household might be, etc.

5.6 Limitations of the Study

While the NLSCY data are from a high quality and nationally representative longitudinal study the data are observational rather than experimental. Although we have used a causal vocabulary at various points in this report, we emphasize that correlation does not provide proof of causation. This point is relevant to the associations between measures of parenting style and of children's hyperactivity where it could be argued that each is likely to influence the other so that the flow of causation is bi-directional rather than being one-way from parents to children, as we have assumed in this study. The "correlation and causation" issue is also relevant to how we interpret the associations between parenting practices and neighbourhood characteristics. Living in a neighbourhood where higher proportions of mothers work outside the home may generate a causal process which produces higher levels of hostile-aggressive parenting, but an alternative explanation is that there is a self-selection process by which families which already have higher levels of hostile-aggressive parenting select themselves into such neighbourhoods (Tienda, 1991).

Like many other studies in this area, we have used Census enumeration areas as an operational definition of "neighbourhood". Enumeration areas are smaller than census tracts which makes them likely to be more socially homogeneous, but there is still the danger that they may not correspond to what people think of as "their neighbourhood". Our objective 1996 Census measures of enumeration areas may be error-prone, since many of them are based on the 20% sample coverage of the long form while those based on counts are subject to Statistics Canada's "random rounding" procedure.

Our indicators of "neighbourhood social capital" are as yet primitive and fail to capture the theoretical richness of the concept. While the random slopes approach allows us to conclude that neighbourhoods are certainly acting as contexts that modify the impact of long-term poverty upon physical health we still cannot say precisely what it is about neighbourhoods that has this modifying effect.

Our measures of the child's physical health and hyperactivity-inattention are based on reports made by the person most knowledgeable (the PMK), usually the mother, and since most parents lack medical qualifications their judgments of these child outcomes will not be as accurate as those made by a nurse or by a physician. The mathematics test scores are not subject to this criticism.

Our data are from the main NLSCY data files and exclude the "Northern Sample". Those of our results, based upon this national sample of longitudinal children at Cycle 3 derive from data analysis with unweighted observations. We believe that re-analysis using weights appropriate to the complex sample design of the NLSCY[30] will not change any of our substantive conclusions but we have not yet carried this out. Our final set of analyses (the neighbourhoods sample) is based on a sub-sample of children and uses their data from all three cycles of the survey in the form of "child occasions". While this sub-sample contains children from each of Canada's ten provinces it very likely over-represents those larger enumeration areas containing higher percentages of children.

[30] SAS files containing the relevant "bootstrap weights" were made available to us late in March, 2002, though without any documentation appropriate to the NLSCY.

6. Summary and Conclusion

In a nationally representative longitudinal sample of children aged 4 to 15 years living in Canada, this study has examined the impact of long-term poverty, family stress, parenting and neighbourhood social capital on three child outcomes: physical health, hyperactivity-inattention and mathematics test scores. Enumeration areas from the 1996 Census of Canada were used as a proxy for neighbourhoods. The measure of long-term poverty is based on whether the child was in an economic family whose income was below Statistics Canada's Low Income Cut-Off (LICO) at each wave of the survey. Data analysis was carried out in a nationally representative sample of longitudinal children aged between 4 and 15 (the "national sample") and also in a sub-sample of children from Census enumeration areas each of which contained several children from different families (the "neighbourhood sample").

Experiencing long-term poverty has statistically significant effects on all three of the child outcomes, as well as on measures of family stress and some indicators of parenting style. An interpretation of the Family Stress Model led to a series of regression analyses where groups of conceptually related explanatory variables were entered in sequence. The results show that the effects of long-term poverty upon these child outcomes occur partly because poverty increases dysfunction and depression among family members. Hostile-aggressive parenting is associated with worse child outcomes but does not appear to mediate the effects of long-term poverty though it may mediate aspects of family stress. The results support some aspects of an expanded family stress theory in that the effects of long-term poverty upon child outcomes are mediated, but also moderated by neighbourhood social capital, and by family "burnout" (dysfunction and parental depression).

Analyses treating of hostile-aggressive parenting as a dependent variable show that it is linked to those neighbourhoods which have higher female labour force participation rates by mothers of children older than six (as well as to neighbourhoods with larger numbers of persons per economic family.) It is also linked at the family level to indicators of stress such as family dysfunction and PMK depression. Hierarchical models fitted to the neighbourhood sample show significant between-neighbourhoods variation in hostile-aggressive parenting. They also show that the variance between children and within families is relatively small while the variance between households and within neighbourhoods is relatively large. This suggests that while children of different age and gender are parented differently within the same family, the larger differences are between families and even between neighbourhoods.

Neighbourhood characteristics have few direct effects upon the three child outcomes. Multi-level modeling analysis with the neighbourhood sample showed that aspects of census enumeration areas which are most plausibly explained in terms of their varying amounts of "neighbourhood social capital" significantly modify the effects of long-term poverty upon children's physical health status. The slope for the relationship between long-term poverty and child health varies to a statistically significant extent, depending on the neighbourhood in which the children were living at Cycle 3. This conclusion that the degree to which long-term poverty impacts child outcomes varies according to the characteristics of neighbourhoods is based on a sub-sample of children from the NLSCY and cannot strictly speaking be generalized to the whole NLSCY population.

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