

# Moving Beyond Income: Neighborhood Structure, Household Behavior, and Children's Health in the United States

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## Abstract

Using insights from economics, pediatrics, psychology, and sociology, this paper examines the effects of income, income inequality, participation in religious services, maternal health, breastfeeding, household smoking, neighborhood characteristics, and racial/ethnic composition of population on child health. Using aggregate data on children's health and well-being for 50 U.S. states derived from the National Survey of Children's Health (NSCH, 2005), we document the following results: (1) neighborhood characteristics are a more powerful predictor of children's health than income; (2) there is a large effect of mother's health on children's health; (3) the independent effect of income inequality on children's health vary across domains of child health outcomes, as some aspects of child health (mental health) are more responsive to the immediate environment of family and neighborhood than others; (4) breastfeeding has beneficial effect on children's health, while household smoking has negative effect on children's health and well-being; and (5) children who participate in religious services at least once a week have less socio-emotional difficulties compared to children who do not.

**JEL Classification:** I1

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## 1 Introduction

In this paper we examine empirically determinants of children's health and well-being in the United States, using aggregated data for the 50 U.S. states, derived from the National Survey

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of Children's Health (NSCH, 2005). We are especially interested in addressing the following five questions: (1) Are the neighborhood structural characteristics a more powerful predictor of children's health and well-being than income? Or Is the health status of children living in neighborhood with high level of safety greater than that of children living in neighborhood with low levels of safety? (2) Does maternal health affect children's health? (3) Does income inequality have an independent effect on children's health? (4) How does household health behavior (such as breastfeeding of child, household smoking) affect children's health? and Do religious children have better health outcomes?

The health of a population depends upon many factors such as income, education, sanitary and medical facilities, culture, social control, climate, and special phases of the environment. The relationship between socioeconomic status (SES) and health is one of the most robust and well documented findings in social science. That wealthy people live longer and have lower morbidity, on average, than do poor people has been well documented across countries, within countries at a point in time, and over time with economic growth (Case et al, 2002; Currie and Stabile, 2003).

Research on the contribution of neighborhood characteristics to individual health has progressed rapidly over the last decade. Mounting empirical evidence of neighborhood socioeconomic structure effects on a range of health outcomes including mortality (Haan, Kaplan, and Camacho, 1987), heart disease (LeClere, Rogers, and Peters, 1998), number of chronic conditions (Robert, 1998), and self-reported health (Malmstrom, Sundquist, and Johansson, 1999) has fueled calls for continued research on the health effects of multiple dimensions of socioeconomic status and the mechanisms that may account for the community structure-health link (Robert, 1999). Despite these efforts, neighborhood effects research on health has typically focused on only one dimension of neighborhood structure—the prevalence of economic deprivation—and has yet to explore competing hypotheses regarding the community level mediators of structural effects of health (Browning, and Cagney, 2003). In

this paper, we draw on collective efficacy theory (Sampson, Raudenbush, and Earls, 1997) and Wilson’s theory of neighborhood decline (Wilson 1987; 1996), and extend the typical focus on the health consequences of neighborhood poverty and income to include a range of other structural characteristics of neighborhoods including supportive neighborhood, safety of child in the neighborhood, and issues with child care and investigate their roles in the determination of children’s health and well-being.

Research linking income inequality to population health within and among industrialized nations has captured the interest of social epidemiologists from diverse disciplines. The central claim of this research is that the level of income inequality in a nation, state, or community is linked in a causal way to the health of the population. More specifically, as income inequality increases, health declines. This claim is consistent with medical sociologists’s long-standing contention that characteristics of the societies in which we live influence health and well-being independent of individual resources, skills, and behaviors.<sup>1</sup> Despite increasing interests in examining the inequality’s effect on population health, empirical evidence regarding aggregate link between inequality and health remains tenuous. Prior research in this area has been criticized on several grounds, most notably for its reliance on bivariate analyses that exclude relevant controls such as the racial composition of the population.<sup>2</sup> Analyses that add those controls find that the association of income inequality with population health becomes insignificant<sup>3</sup>, raising fundamental questions about the evidence on which claims of inequality’s effects on health rely. What should we conclude about the effect of income inequality on health in light of these conflicting results? We re-evaluate this question in the analysis of the associations between income inequality, racial composition, and the aggregate well-being of children in the 50 states of the U.S.

Studies examining the determinants of children’s health have also documented important

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<sup>1</sup>See Durkheim, [1897] 1951; Faris and Dunham, 1939; and Susser, Watson, and Hopper, 1985.

<sup>2</sup>See Judge, 1995; Judge and Mulligan, and Benzeval, 1998; Mellor and Milyo, 2001.

<sup>3</sup>Deaton and Lubotsky, 2003; Mellor and Milyo, 2001; and McLeod et al. 2004.

roles for household health behavior (such as breastfeeding, smoking in the house). There are three previous economic studies that are particularly relevant for this paper. The Cebu Study Team estimated child health production functions for diarrhea, fibrile respiratory infection, and weight with data from Cebu in the Philippines for children upto 2 years old. Individual, household, and community variables were found to affect child health. The study concluded that breastfeeding reduced the incidence of diarrhea but appeared to have little effect on respiratory infections. Barrera (1991) estimated a health production for child height for age with survey data from Bicol in the Philippines. His results showed that the growth benefits from exclusive breastfeeding differed by mother's education levels. Children with less-educated mothers had the most gains. Senauer and Kassaouf (2000) also found strong evidence in favor of positive and significant impact of breastfeeding on children's health. Similarly, studies have documented negative impact of smoking on health.<sup>4</sup> Following past studies, in this paper we also investigate the role of child's family behavior on children's self-repored health and well-being in the U.S. In particular, we explore the role of factors such as reading to young children (children who are read to every day), household smoking (children who live in the household where someone smokes), and breastfeeding (children aged 0-5 who were ever breastfed) on children's health and well-being.

Children's health may also be affected by the health status of their parents, possibly through an inherited susceptibility to different diseases, a less healthy uterine environment, or lower quality care by sick parents. In addition, the health of parents and children might be affected by common but unmeasured environmental factors, resulting in a correlation between their health levels (Case et al. 2002). It is possible that parental health is a 'third factor' that accounts for the income effect in children's health: an income effect in children's health might be observed if parents in poor health have lower earnings, and poor health is

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<sup>4</sup>See the study by Rivard, Gautrin, Malo, and Suissa (1999). They analyzed the relation between maternal smoking and clinically diagnosed incident cases of childhood asthma and found significant relationship.

transmitted from parents to children—producing a spurious correlation between income and children’s health. This line of reasoning suggest that we should include controls for parental health in the determination of children’s health. However, doing so has several potential pitfalls. If the effect of health of parents is affected by their income levels, and income is measured with error, then the ‘effects’ of parental health may simply reflect the effects of income. In addition, if the health of both parents and children are affected by income, the parental health may serve as a proxy for the income levels experienced by children at earlier ages. For these reasons, we cannot clearly separate the effects of parent’s health and family income on children’s health. Mindful of these problems, we estimate models with additional control for maternal health status, to see whether this eliminates the income effect in children’s health.<sup>5</sup>

Family and cultural norms and activities are gaining acceptance as factors in the development of competent and resilient youth (Nettles et al., 1994; Rutter, 1985). Despite the recognition that family routines and values are crucial to children’s development, economic studies have rarely addressed the contribution of children’s or parental religious activities to children’s health.<sup>6</sup> In this paper, we investigate the possibility that level of participation in religious activities by children and parents may also be a useful indicator of child functioning and mental health outcomes.

The remainder of this paper is organized as follows. Section 2 describes the conceptual model underlying this study. Section 3 provides description of data, and the measures and potential factors of children’ health and well-being. Section 4 discusses the empirical specifications and findings. We conclude in Section 5.

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<sup>5</sup>Ideally we should be including both mother’s and father’s health status as independent variables in the determination of children’s health, but do not have information on father’s health status. Therefore, we are limited by the availability of data.

<sup>6</sup>Recently psychiatric research have attempted to address this issue. See Varon and Riley (1999).

## 2 Conceptual Model

Biomedical and demographic studies of the determinants of child anthropometry have focussed on the estimation of child health production functions.<sup>7</sup> Anthropometric outcomes are modelled as a function of child, parent, and environmental characteristics as well as inputs into the production function process. These inputs include the child's diet, activity level, amount of time spent caring for the child, the utilization of clean water, the level of satisfaction in the home, and the utilization of health care services.

Estimation of the parameters of the production function requires knowledge of inputs into the process and, since inputs and outputs are jointly determined, instruments such as prices are needed to purge estimates of simultaneity bias (Thomas et al. 1991). This is quite demanding of data and few socioeconomic surveys are sufficiently rich or detailed to permit this estimation. Consequently, the socioeconomic literature on child health has attempted to integrate the biomedical approach with a model of the family (Becker, 1981) and estimate reduced form child health functions.<sup>8</sup>

Assume a household maximizes a quasi-concave utility function<sup>9</sup> which depends on consumption of commodities and leisure as well as quality and quantity of children. Household utility is maximized subject to the constraint that total expenditure is no greater than household earnings and unearned income, a time constraint for each individual and restrictions imposed by the health production function.

In this model, demand for child health (such as child in excellent or very good health, child affected by asthma, child whose parents have at least one concern about their learning, development or behavior, and child with moderate or severe difficulties in the area of emotions,

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<sup>7</sup>See, for example, Martorell and Habicht (1986).

<sup>8</sup>The underlying theory is well known; for a discussion with application to child health, see Behrman and Deolalikar (1988).

<sup>9</sup>See Shultz (1991) and Thomas (1991) for studies which relax the assumption of a single household utility function.

concentration, behavior, or getting along with others) depends on a set of child characteristics  $X_i$ , household (or family) characteristics  $X_h$ , and neighborhood characteristics  $X_n$ , all of which are exogenous:

$$h_i = h(X_i, X_h, X_n, \epsilon_i) \quad (1)$$

The child's characteristics include child's activities outside school, and child health care (such as children currently insured, children lacking consistent insurance coverage in the past year, preventive health care, mental health care, the religious activities of children). Household (or family) characteristics include, breastfeeding (children aged 0-5 who were ever breastfed), reading to young children, household smoking (children who live in household where someone smokes), mother's health, and the level of income. Neighborhood characteristics includes supportive neighborhood (children living in neighborhoods that are supportive), safety of child in the neighborhood (children living in neighborhood that are usually or always safe), and income inequality. Finally,  $\epsilon_i$  is a child specific random error reflecting heterogeneity in individual healthiness, tastes, and unobservable factors.

As a starting point to examine determinants of children's health and well-being, we will estimate a reduced form of regression of child health outcomes on a set of child characteristics  $X_i$ , household (or family) characteristics  $X_h$ , and neighborhood characteristics  $X_n$  in cross-state framework. Thus, the unit of analysis is the U.S. state.

### 3 Data

The data has been obtained from the NSCH, 2005. The NSCH provides information on the health and well-being of children in the 50 States and the District of Columbia. NSCH was fielded using the State and Local Area Integrated Telephone Survey (SLAITS) mechanism. Approximately 1.9 million telephone numbers were randomly generated for inclusion in the NSCH. After eliminating the numbers that were determined to be nonresidential or non-

working, the remaining numbers were called to identify households with children less than 18 years of age. From each identified household, one child was randomly selected to be focus of the interview. The respondent was the parent or guardian in the household who was most knowledgeable about the health and health care of the children under 18 years of age. For 79 percent of the children, the respondent was the mother. Respondents for the remaining children were fathers (17 percent), grandparents (3 percent), or other relatives or guardians (1 percent).

Data collection began on January 29, 2003 and ended on July 1, 2004. A computer assisted telephone interview system was used to collect the data. A total of 102,353 interviews were completed for the NSCH. The number of completed interviews varied by State, ranging from 1,848 in New Mexico to 2,241 in Louisiana and Ohio. More than 2,000 interviews were completed in 25 states. Further details of data collection methodology are available from NCHS.

The cooperation rate, which is the proportion of interviews completed after a household was determined to include a child under age 18, was 68.8 percent. The national weighted response rate, which includes the cooperation rate as well as the resolution rate (the proportion of telephone numbers identified as residential or nonresidential and the screening completion rate (the proportion of households successfully screened for children), was 55.3 percent. Overall response rates ranged from 49.4 percent in New Jersey to 64.4 percent in South Dakota.

In order to produce the population-based estimates at States level, the data records for each interview were assigned a sampling weight. These weights are based on the probability of selection of each household telephone number within each State, with adjustments that compensate for households that have multiple telephone numbers, for households without telephones, and for nonresponse. The weights were also adjusted by age, sex, race, ethnicity, household size, and educational attainment of the most educated household mem-



ber to provide a dataset that was more representative of each State's population of non-institutionalized children less than 18 years of age. States-level data were obtained by accounting for the weights and the complex survey design. Responses of "don't know" and "refuse to answer" were counted as missing data.

### 3.1 Measures of Children's Health and Well-being

State-level data on children's health and well-being are derived from the NSCH. The NSCH has responses to physical and mental health related questions. Our measures of children's health status and well-being are the self-reported levels of: overall child health status (percentage of children in excellent or very good health); impact of asthma (percentage of children affected by asthma); parent's concerns (percentage of children aged 0-5 whose parents have least one concern about their children's learning, development, or behavior); and socio-emotional difficulties (percentage of children aged 3-17 with moderate or severe difficulties in the area of emotions, concentrations, behavior, or getting along with others). These four measures of children's health and well-being are subjects of empirical explorations in this study. The validity of self-rated health as a predictor of mortality<sup>10</sup>, morbidity<sup>11</sup>, subsequent disability<sup>12</sup> and health care utilization<sup>13</sup> have been widely documented. Furthermore, self-assessed health is a stronger predictor of mortality than is physician-assessed health.<sup>14</sup>

### 3.2 Determinants of Children's Health and Well-being

**Socioeconomic Status :** There is a vast literature documenting the relationship between socioeconomic status and health (see Michael Marmot and Richard G. Wilkinson, 1999, for a

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<sup>10</sup>Benyamini and Idler, 1999; Idler and Angel, 1990; Idler and Benyamini, 1997; Kaplam, Barell and Luskey, 1988.

<sup>11</sup>Ferraro, Farmer and Wybraniec, 1997.

<sup>12</sup>Idler and Kasl, 1995; Kaplan, Strawbridge, Camacho, and Cohen, 1993.

<sup>13</sup>Andersen et. al., 1987; Malmstrom, Sundquist, and Johansson, 1999.

<sup>14</sup>Mossey and Shapiro, 1982.

review). To capture the socioeconomic factors of children's health, we include per capita state income and income inequality, measured by Gini coefficient. We include income inequality as a determinant of children's health and well-being because research linking income inequality to population health within and among industrialized nations has captured the interest of social epidemiologists from diverse disciplines. The central claim of these past studies is that the level of income inequality in a nation, state, or community is linked in a causal way to the health of the population; specifically, as income inequality increases, health declines. Per capita state incomes are for the year 2003, while income inequality is for the year 1999. Data on these two variables have been obtained from the U.S. Census Bureau.

**Health Care:** To capture effects of health care on children's health, the relevant health care factors are: current health insurance (percent of children currently insured); coverage consistency (percent children lacking consistent insurance coverage in the past year); preventive health care (percent of children with a preventive medical visit in the past year); and mental health care (percent of children with chronic emotional, developmental, or behavioral problems who received mental health care in the past year).

**The Child's School and Activities:** A child's health (in particular mental health) is also determined by her/his activities in and outside of home. Such activities include: early childhood school (percent of children aged 3-5 who attend nursery school, preschool, or kindergarten); activities outside of school (percent of children aged 6-17 who participate in activities outside of school); and religious services (percent of children who attend religious services at least weekly).

**The Child's Family Characteristics and Behaviors:** It includes breastfeeding (percent of children aged 0-5 who were ever breastfed), reading to young children (percent of children aged 0-5 who are read to every day), household smoking (percent of children who live in households where someone smokes), and mother's health (percent of children whose mother's physical and emotional health is excellent or very good).

**The Child and Family’s Neighborhood:** To operationalize neighborhood structure and collective efficacy, we use an indicator of supportive neighborhood, measured by percent of children living in neighborhoods that are supportive; safety of child in neighborhood, measured by percent of children living in neighborhoods that are usually or always safe; and issues with child care, measured by percent of children aged 0-5 whose parents had to make different child care arrangements in the past month and/or a job change for child care reasons in the past year.

Table 1 reports the basic statistics of variables included in the analysis. A careful examination of Table 1 suggests that there is wide variation in children’s health outcomes as well as their associated factors across 50 states of the United States.

## 4 Empirical Framework and Findings

### 4.1 Income Inequality, Race, and Children’s Health and Well-being

We begin by replicating prior research on the effects of income inequality on well-being. To examine the effect of income inequality on children’s health and well-being, we estimate the following regression equation:

$$h_i = \alpha + \beta_1 * Gini + \beta_2 * Income + \epsilon_i \quad (2)$$

The equation 2 includes only income inequality and per capita state family income as predictors. Past studies have shown that with increasing income inequality, health declines. Thus, we expect that  $\beta$  is negative and statistically significant. However, to test the robustness of effects of income inequality on child health outcomes to controls for racial composition, we

estimate this equation:

$$h_i = \alpha + \beta_1 * Gini + \beta_2 * Income + \delta_1 * ProportionBlack + \delta_2 * ProportionHispanic + \epsilon_i \quad (3)$$

Both equation 2 and 3 are estimated by OLS techniques. Table 2 presents OLS regression coefficients from two sets of models for each of the four children's health outcomes. In the absence of controls for racial composition of the population, income inequality was significantly associated with four of the four child health outcomes. Per capita state family income also had consistent association with child outcomes (with the one exception of percent of children affected by asthma) such that states with high family incomes had lower levels of child health problems, or better outcomes for children's health and well-being. Based on these results alone, we would conclude that income inequality and per capita state family income are both important predictors of children's health and well-being at the state level.

The bottom half of Table 2 lists the coefficients from OLS regression models that added proportion black and proportion Hispanic as predictors. Three inferences from the bottom half of Table 2 are unmistakable:

*First*, the addition of these variables to models rendered the coefficients for income inequality in regression models for overall child health status, percent of children affected by asthma, and parent's concern their child's learning, development, or behavior, statistically insignificant. Thus, consistent with previous studies, we do find that the effect of income inequality on children's health and well-being is not robust to controls for racial composition of the population. The racial composition of the population was itself a significant predictor of three of the four child health outcomes: percentage children in excellent or very good health, percentage of children aged 0-5 whose parents have at least one concern about their child's learning, development, or behavior, and percent of children aged 3-17 with moderate or severe difficulties in the areas of emotions, concentration, behavior, or getting along with

others. In other words, states with relatively large black population have relatively poor overall child health status, and higher incidences of parent's concern about their children's learning, development, or behavior.

In comparison, results for states with relatively large Hispanic population is mixed. The states with relatively large Hispanic population have poor overall child health status, but have lower socio-emotional difficulties of children, consistent with prior individual-level research.<sup>15</sup> However, we note that the previous studies looked at broad indicators of children's health and well-being such as rates of teen births, high school dropouts, and infant mortality rates. Thus, even though our findings are consistent with their findings, we obtained results by analyzing the self-rated health and well-being indicators of children instead of aggregate indicators of mortality and morbidity. Thus, it constitutes new evidence for differential children's health outcomes for states with higher concentration of black and Hispanic population.

*Second*, whereas the effects of income inequality on children's health and well-being are, in some cases, largely explained by the racial and ethnic composition of the population, the effects of per capita state family income is uniformly significant (except percent of children affected by asthma) in the presence of those controls. This means that children in less affluent states had lower levels of well-being than children in more affluent states not just because of differences in the racial composition of the state populations but also because state wealth in and of itself was associated with children's health and well-being. These aggregate results mirror individual-level analyses that find significant, independent effects of race and income on health and well-being (Williams and Collins, 1995).

*Third*, contrary to previous findings, our results show that income inequality does have an independent effect on children's health and well-being. From Table 2, we observe that even after controlling for the effects of racial and ethnic compositions, the coefficient for income

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<sup>15</sup>See McLeod, Nonnemaker and Call, 2004; Driscoll et al., 2001; Fernandex et al., 1989; and Forbes et al., 2000.

inequality is still statistically significant for the variable representing the socio-emotional difficulties of children. In fact, the coefficient of inequality after controlling for racial and ethnic composition of population, is larger than the coefficient without controls, though it is statistically significant at ten percent level of significance, as opposed to 5 percent of level of significance. So does income inequality have an independent effect on children's health and well-being? The answer is both 'Yes' and 'No'. It depends on what domains of children's health and well-being are analyzed. If the focus of analysis is on physical health and social performances of children, income inequality does not have an independent effect. But if it is concerned with the emotional well-being of children (such as socio-emotional difficulties, and mental health), income inequality has an independent, strong, statistically significant effect. Children in states with higher income inequality have higher levels of socio-emotional difficulties. In other words, income inequality is an independent predictor of children's mental and emotional well-being, consistent with 'income inequality hypothesis'.

The income inequality hypothesis says that disparities in income among members of a community affect their health and, specifically, that economically egalitarian communities or societies have better health outcomes than more unequal communities (Wilkinson, 1996; Lynch et al., 2000; and Marmot and Wilkinson, 2001). Wilkinson (1996) argues that inequality in income is a stronger determinant of health than the income of individuals or families. Initial support for the income inequality hypothesis came from aggregate level studies of total mortality or cause specific mortality (Wilkinson, , 1992, 1996; Rogers, 1979; Flegg, 1982; Le Grand, 1987; Kaplan et al. 1996; Kennedy et al., 1996; Mellor and Milyo, 2001). More recent studies at the level of the individual confirm the positive correlation between inequality and self-rated health or mortality at the population level, but show mixed results once individual characteristics are included in the analysis.<sup>16</sup>

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<sup>16</sup>See Fiscella and Frank, 1997; Dayly et al., 1998; Kennedy et al., 1998; Soobader and LeClere, 1999; Fiscella and Frank, 2000; Kahn et al., 2000.

Contrary to these studies, in a seminal contribution Sturm and Gresenz (2002) find no evidence for the hypothesis that income inequality is a major risk factor for common disorders of physical or mental health.<sup>17</sup> We contest Sturm and Gresenz (2002)' result of no relationship between income inequality and the mental health of population, by arguing that their result of no statistically significant relationship between mental health and income inequality is true only for adults<sup>18</sup>, but not for the relationship between children's mental health and income inequality. The results in Table 2 and Table 6, clearly establish a strong relationship between children's mental health (soci-emotional difficulties) and income inequality. Contrary to their claim, this correlation does not disappear even after controlling for the households' neighborhood characteristics, parent's health, income level, religious participation by children, access to mental health care, and the racial/ethnic composition of population.

## 4.2 Neighborhood Characteristics and Children's Health

Neighborhoods are commonly believed to influence behavior, attitudes, values, and opportunities. Children who grow up in disadvantaged neighborhoods fare substantially worse than those who grow up with more affluent neighbors on a wide variety of health and socioeconomic outcomes. A fundamental question in the design of appropriate education, health, and social policies for low income families and communities is the extent to which these correlations reflect the causal impacts of neighborhoods as opposed to family and individual attributes that are not directly affected by the residential environment (Kling, Liebman, and Katz, 2007).

In developmental psychology, neighborhood influences are a part of ecological models

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<sup>17</sup>They re-examined the income inequality hypothesis with measures of health that reflect the presence or absence of 17 chronic physical conditions and specific disorders of mental health, by using data from a survey carried out in 1997-98 in 60 metropolitan or economic areas across the United States.

<sup>18</sup>They analyzed the relationship between mental health and income inequality using data for 9,585 adults.

(Bronfenbrenner, 1989). Ecological models view individuals in the context of a series of ecological systems in which they reside (e.g. extended family, peer group, neighborhood, community, and institutions such as the school or the workplace). Given the fact that development occurs within contexts, ecological models are based on the premise that individuals cannot be studied without a consideration of the multiple ecological systems in which they operate. While this premise has been well accepted in developmental theory, most of developmental research has focused on the most proximal environments, specifically the family and peer group (Hartup, 1983; Maccoby and Martin, 1983), and neighborhood contexts have been largely ignored or not considered.

Using contextual models similar to the ecological models favored by developmental psychologists, both economists and sociologists have begun to map out an agenda for the study of neighborhood influences, as well as to detail some of the ways in which neighborhoods affect behavior. Jencks and Mayer (1990) develop a taxonomy of ways in which neighborhoods might affect child development. They distinguish (1) ‘contagion’ theories, based primarily on the power of peer influences to spread problem behavior, (2) theories of ‘collective socialization’, in which neighborhood role models and monitoring are important ingredients to a child’s socialization, (3) ‘competition’ theories, in which neighbors compete for scarce neighborhood resources, and (4) theories of ‘relative deprivation’ in which individuals evaluate their situation or relative standing vis-a-vis their neighbors. The first two theories predict that affluent neighbors confer benefits to children, especially low income children, while competitive and relative deprivation theories lead to the opposite prediction.<sup>19</sup>

In this paper, we draw on collective efficacy theory (Sampson, Raudenbush, and Earls, 1997)<sup>20</sup> and Wilson’s theory of neighborhood decline (Wilson, 1987; 1996)<sup>21</sup>, and investigate

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<sup>19</sup>Brock and Durlauf, 2001; Duncan and Raudenbush, 2001; Ellen and Turner, 1997; Leventhal and Brooks-Gunn, 2000; Sampson, Morenoff, and Gannon-Rowley, 2002 summarize the more recent literature.

<sup>20</sup>Collective efficacy theory emphasizes mutual trust, and solidarity (social cohesion) and shared expectations for informal social control in theorizing the impact of neighborhood social organization on local resident’s well-being.

<sup>21</sup>Wilson’s theory of neighborhood decline or social isolation draws attention to the potential for structural



the ways in which neighborhood contexts affect child health and well-being in the U.S. states. The pathways through which neighborhood collective efficacy may influence health include the social control of health-risk behavior, access to services and amenities, and the management of neighborhood hazards, have demonstrated the effects of collective efficacy on rates of violence, suggesting that health may be influenced by high levels of collective efficacy through limiting the health damaging consequences of violent victimization.

The empirical investigation to follow considers impact of affluence (income level), economic isolation (income inequality), and ethnic heterogeneity on health. The Collective efficacy is operationalized through using measures of social cohesion and informal social control. They are captured by indicators of supportive neighborhood, measured by percent of children living in neighborhoods that are supportive; safety of child in the neighborhood, measured by percent of children living in neighborhoods that usually or always safe; and issues with child care, measured by percent of children aged 0-5 whose parents had to make different child care arrangements in the past month and/or a job change for child care reasons in the past year. To investigate the effect of neighborhood characteristics on children's health and well-being, we regress measures of child health on a constant, indicators of neighborhood characteristics, and a set of control variables, and it is specified as follows:

$$h_i = \alpha + \beta * NeighborhoodCharacteristics + \delta * Controls + \epsilon_i \quad (4)$$

Tables 2-5 contain OLS results of regression of measures of child health on neighborhood characteristics and other control variables. In the preceding section we already discussed the contributing roles of states's levels of income, income inequality, and racial/ethnic com-

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features of communities to interact in their influence on individual well-being. According to him, the flight of middle class residents of inner city communities results in the declining viability of local institutions including churches, schools, voluntary organizations, and the family, and corresponding deficits in the capacity of residents to maintain informal social controls. As the regulatory capacity of the community diminishes, residents are increasingly exposed to problem behaviors. In turn these potentially health compromising behavioral orientations may be precept, further contributing to neighborhood decline.

position of population. Therefore, we will not repeat the interpretation of their effects on child health. Instead, we focus on neighborhood characteristics that were not discussed in the preceding section.

Table 3 presents the results of regression of overall child health status. There are two key findings. First, we find that the coefficient associated with the variable, safety of child in the neighborhood (Table 3, columns 3-6), is positive and statistically significant. This coefficient is also robust to inclusion other alternative sets of controls and specification. In fact the magnitude of effect more or less remains the same. This implies that the states with higher percent of children living in neighborhood that are usually or always safe, have higher percent of children who are in excellent or very good overall health. Second, the association between children's overall health and safety of child in neighborhood, is stronger than the corresponding association between child's overall health status and income level. This means that neighborhood characteristic is a more powerful predictor child health and well-being than income. Table 4 presents the results of regression of childhood asthma on a constant, neighborhood characteristics, a set of controls consisting of household smoking and maternal health. From this table, it is clear that both indicators of neighborhood characteristics have statistically significant effects on childhood asthma.<sup>22</sup> This means that the states with higher percent of children living in neighborhood that are supportive and safe, have lower percent of children affected by asthma. Similarly, from table 5, we observe that the states with higher percent of children living in neighborhood that are safe, have lower percent of children aged 0-5 whose parents have at least one concern about their child's learning, development, or behavior. Once again, we find that the effect of safety of child in neighborhood is greater than the effect of income. Table 6 presents the results of regression of children's socio-emotional

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<sup>22</sup>We note that both indicators of neighborhood were not included together in any of the specifications because of their high multicollinearity. In other words, the variables supportive neighborhood and safety of child in neighborhood are highly correlated with each other, and therefore, to avoid biased estimate of the results, we did not include both together in any of the specifications.

difficulties on neighborhood characteristics, and other control variables. From this table, we observe that safety of child in neighborhood is an insignificant factor in explaining the socio-emotional difficulties of children across the U.S. states.

To summarize, neighborhood characteristics have significant effects on child health and well-being in the United. Although, their effects vary across domains of child health outcomes. Most importantly, wherever both income and neighborhood characteristics are statistically significant predictors of child health, the effect of neighborhood is more powerful than income. This highlights the fact the economic studies that examined the determinants of child health but ignored neighborhood characteristics, may have overestimated the effect of socioeconomic status.

### **4.3 Maternal Health and Children's Health**

Health is a commodity for which there is no market and must be produced within the household. Conditions within household are therefore expected to be important determinants of child health. The mother plays the central role in household domestic activities especially those which pertain to child rearing. As a result, the mother has been commonly described as the most important health worker (Barrera, 1990). How well a mother performs this task may depend on her health. Therefore, we might expect maternal health to contribute positively to child health.

Is this expectation supported by empirical evidence? The pediatric and psychiatric research generally show a positive association between parental health and child health. However, the pathways and processes by which parental health-related problems affect children are quite varied.<sup>23</sup> There is very limited economic literature on the contribution of parental health to child health. The notable example is study by Case et al. (2002). They listed the

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<sup>23</sup>For an excellent review of Pediatric literature on this topic, see the paper by Drotar (1994), *Journal of Pediatric Psychology*, Vol. 19, No.5, pp. 525-536.

three possible channels through which children's health might be affected by parental health: an inherited susceptibility to different diseases, a less healthy uterine environment, and lower quality care by sick parents. Pediatric psychologists and their colleagues in related disciplines face extraordinary challenges in understanding, managing, and preventing childhood psychological and health problems that are influenced in some way by parental health. Because not all children whose parents experience health problems are affected in the same way, data concerning individual variation in the psychological impact of parental health problems are particularly important. Methodological issues in this area of research that are important include sample selection and bias, confounding factors, and limited assessment of family influences, and therefore, the methodology of most of these studies is inadequate because conclusions are drawn from simple cross tabulations. They do not control for other important factors which may be highly correlated with parental health, such as income, thereby imputing too much to parental health. Also studies which do use multivariate regression, including Case et al. (2002), often are unsatisfactory. Their estimates are biased because of important omitted variable problems. For example, the study by Case et al. (2002) in their exhaustive list of control variables, did not have any controls for income inequality, household behavioral factors such as household smoking, neighborhood characteristics and protective influence of religious participation by children or their parents. Additionally, not all health outcomes of children are equally affected by maternal health. For instance, the role and importance of maternal health in child health may vary across domains of child health outcomes, as some aspects of child health are more responsive to mother's health than others.

In this paper, we examine the contribution of maternal health to children's health and well-being in cross-state framework and consider four child health outcomes: overall health status; incidences of asthma; parental concern about child's learning, development, or be-

havior; and socio-emotional difficulties of children.<sup>24</sup> We ask the following question. Are children’s health outcomes better in the states with higher percent of mothers with excellent or very good physical and mental health, as opposed to the states with lower percent of mothers with excellent or very good physical and mental health? If so, is the association between two variables robust to the inclusion of other contributing factors? To examine the effect of maternal health on child health, we rely on a linear form of relationship. That is, for state  $i$ , the indicators of children’s health are regressed on a constant, maternal health and a set of control variables:

$$h_i = \alpha + \beta * MaternalHealth + \delta * Controls + \epsilon_i \quad (5)$$

In Table 3, column 2 presents OLS results for the regression of the overall child health status on a constant, maternal health and a set of control variables consisting of per capita state family income, income inequality, and racial/ethnic composition of population of states. We find that maternal health positively contributes to overall child health status. More specifically, the states with one percent more mothers with excellent or very good physical and mental health, have approximately 49 percent more children in excellent or very good health.

In Table 4, columns 4-6 contain OLS results for the regression of percent of children affected by asthma on a constant, maternal health, and alternative sets of control variables. Column 4 in Table 4 includes only one control variable, i.e., household smoking. We note that the states with one percent more mothers with excellent or very good physical and

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<sup>24</sup>We note that children may experience very different effects of mother’s health problem, owing to age-related differences in their coping repertoires, roles in their families, and opportunities for peer interactions (Rutter, 1981). Wills et al. (1994) noted adolescents expressed the impact of their parents’ substance use through greater tolerance for deviance, lower behavioral control, and affiliation with peer substance users. The effect of parental substance use might be expressed very differently among school age children who have different coping resources and opportunities for peer contact (Rutter, 1981). We do not address this issue in this paper. Our future work will examine the role and importance of maternal health in child health, and how the effects of maternal health varies across different child age groups.

mental health, have approximately 9 percent less children affected by asthma. However, this significant association between childhood asthma and maternal health is rendered insignificant after including additional controls for neighborhood characteristics such as percent of children living in neighborhoods that are supportive (Table 4, column 5), and percent of children living in neighborhoods that are usually safe or always safe (Table 4, column 6). These additional control variables for neighborhood characteristics are statistically significant on their own. That is the states with greater percent of children living supportive and safe neighborhoods, have lower problems of childhood asthma. This means that if we control for neighborhood characteristics, there may be nothing genetic about childhood asthma.<sup>25</sup>

Table 4, column 3 presents the OLS results for the regression of percent of children aged 0-5 whose parents have at least one concern about their child's learning, development, or behavior on a constant, maternal health, and a set of control variables consisting of per capita state family income, income inequality, and racial/ethnic composition of states's populations. Consistent with preceding discussion, result shows the beneficial effect of maternal health on child's learning, development, or behavior.

Table 6, column 6 contains the OLS results for the regression of percent of children aged 3-17 with moderate or severe difficulties in the area of emotions, concentration, behavior, or getting along with others on a constant, maternal health, a set of controls including states' income level, income inequality, reading to young children, religious services, safety of child in the neighborhood, access to mental health care, and racial/ethnic composition of population. The result shows that even after controlling for these variables, states with higher percent of mothers in excellent or good physical and mental health, have lower percent of children with socio-emotional difficulties.

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<sup>25</sup>A simple genetic story is that parents who are healthier have healthier children. We only suggest that there may be nothing genetic about childhood asthma, but we cannot infer it for sure. In order to say something definitive, we will have to look at the relationship between childhood asthma and parental asthma.

We noted in section 1, that inclusion of maternal health might eliminate the income gradient in child health, for the reasons discussed earlier. Looking at relevant results in Table 3-4, we note three key findings. First, there are large 'effects' of maternal health on children's health. Second, effects of maternal health on child health varies across domains of child health. Third, the inclusion of control for maternal health eliminates the statistical significance of the coefficients of per capita state family income. This provides evidence that may be maternal health is a proxy for permanent income or long-run income. This result is consistent with findings by Case et al. (2002).

#### **4.4 Religious Services and Children's Health**

Do religious children have better health? Alternatively, is there any association between children's mental health and social functioning and their (or parents) religious participation? The role of protective influences in the lives of children is increasingly of interest to clinicians and the general community. Family and cultural norms and activities are gaining acceptance as critical influences in the development of competent and resilient youth (Nettles et al., 1994; Rutter, 1985). Despite the recognition that family routines and values are crucial to children's development, past studies rarely addressed the contribution of children's or parental religious activities to children's health (more specifically, mental health) and social competence.

There have been some efforts in the field of psychiatric research to address this issue. Varon and Riley (1999) examined the relationship between maternal church attendance and adolescent mental health and social functioning, and concluded that youths whose mothers attended religious services at least once a week had greater satisfaction with their lives, more involvement with their families, and better skills in solving health-related problems and felt greater support from friends compared with youths whose mothers had lower levels of participation in religious services. Our study differs from the study by Varon and Riley

(1999) in two respects: first, we examine the relationship between mental health and religious participation of children aged 3-17 instead of only adolescents; and (2) while examining this relationship, we are more specific than their study. That is we explore the association between children's mental health and their religious participation instead of the maternal religious participation, even though we recognise that the religious participation by children is the direct measure of parental religious participation.<sup>26</sup>

We are interested in the possibility that level of participation in religious services by childrens (thereby parents) may also be a useful indicator of child functioning and mental health outcomes. It has been shown that religious activity is stable family sociodemographic characteristic.<sup>27</sup> Why should participation in religious services by childrens or their parents at all matter for children's mental health outcomes? Longitudinal studies of child and adolescent development have suggested that infrequent church attendance by family members is related to unstable family patterns and is predictive of early sexual activity, teenage pregnancy, substance use and abuse, and delinquency among adolescents (Dryfoos, 1990). In an urban population of African-American adolescents, the development of substance abuse was linked to low levels of church attendance by family members (Oyemade and Washington, 1990).

In this paper, we examine the relationship between percent of children aged 3-17 in the U.S. states who attend religious services at least weekly and percent of children aged 3-17 in the states with moderate or severe difficulties in the area of emotions, concentration, behavior, or getting along with others. We focus on two questions. First, what influence does children's participation in religious services have on their socio-emotional difficulties?

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<sup>26</sup>Participation by children in religious services necessarily means parental religious participation, but not the vice-versa. It is not necessarily the case that children also participate in religious services if parents are participating in the religious services. The religious participation by children is measured as the percent of children who attend religious services at least weekly. It can be interpreted as the extent of parental religious participation.

<sup>27</sup>Gallup surveys conducted between 1939 and 1995 found that between 37 and 47 percent of adult americans had attended church or synagogue in the seven days before the interview; however, between 1975 and 1995, the range was between 40 and 43 percent (Princeton Religion Research Center: Religion in America. Princeton, NJ, Trenton Printing, 1996).



Second, how does the influence of their religious participation compare with that of standard socio-demographic variables in the strength of association with the variable measuring their socio-emotional difficulties?<sup>28</sup>

To examine the effect of children’s participation in religious services on their socio-emotional difficulties, we rely on a linear form of relationship. That is, for state  $i$ , the percent of children with socio-emotional difficulties will be regressed on a constant, income level, income inequality, participation in religious services and the racial/ethnic composition of state’s population:

$$h_i^S = \alpha + \beta_1 * Income + \beta_2 * Gini + \beta_3 * ReligiousServices + \delta_1 * ProportionBlack + \delta_2 * ProportionHispanic + \epsilon_i, \quad (6)$$

where the variable on the left-hand side is percent of children aged 3-17 in a state reported to have moderate or severe difficulties in the area of emotions, concentration, behavior, or getting along with others. In this model  $\beta_3$  has the interpretation of being the average percent change in the socio-emotional difficulties associated with an increase in percent of children who attend religious services at least weekly. One possible reason for the link between socio-emotional difficulties and religious participation is that there are possibly strong associations between religious participation, the racial/ethnic composition of state’s population, income, and income inequality. This could lead to an association between socio-emotional difficulties of children and their religious participation, because there are strong cross-state relationship between socio-emotional difficulties, racial/ethnic composition of population, income level, and income inequality. Therefore, in equation 4 we control for state’s income level, inequality of income, and racial/ethnic composition of population.

The socio-emotional difficulties of children are also associated with other factors that are

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<sup>28</sup>We do not assess religious beliefs and attitudes. Consequently, no inference can be made about the relationship between attendance at church or temple services and religious commitment.

not included in equation 4. It will be naive to suggest that emotional well-being of children in states is affected only by income level, income inequality, religious participation, and racial/ethnic composition of states. We discussed and presented supportive evidence in the preceding section that children’s health is also affected by parental health status. Parental involvement (in our case it is measured by the variable representing percentage of children who are read to every day). In section 3.2 we showed that neighborhood characteristics are important factors for children’s health and well-being. Additionally, past studies have shown results supporting the role of access to health care in children’s health status. In general, children with access to mental health care should have better mental health status, as compared to children who do not have any access to such health care facilities. Therefore, we modify equation 4 to allow for such factors in the determination of children’s socio-emotional difficulties across-states, and it is as follows:

$$\begin{aligned}
 h_i^S = & \alpha + \beta_1 * Income + \beta_2 * Gini + \beta_3 * ReligiousServices + \beta_4 * Reading + \beta_5 * \\
 & MaternalHealth + \beta_6 * Safety + \beta_7 * Mental^{Care} + \delta_1 * ProportionBlack + \delta_2 * \\
 & ProportionHispanic + \epsilon_i,
 \end{aligned} \tag{7}$$

The inclusion of these socio-demographic and economic factors in equation 5 serves two purpose. First, it allows us to interpret  $\beta_3$  as an independent contribution of children’s religious participation to their emotional well-being. Second, it facilitates comparison of the influence of their religious participation with influences of standard socio-demographic variables in the strength of association with the children’s socio-emotional difficulties in states.

Table 6, columns 3 and 6 contain the estimated results of equations 4-5. First, let us look at the equation 4 (Table 6, column 3). Consistent with discussion in section 3.1, we find that income inequality is a strong predictor of children’s socio-emotional difficulties across

states. That is, states with less egalitarian distribution of income have greater percent of children who have socio-emotional difficulties. There is significant, negative correlation between socio-economic difficulties of children and the level of per capita income across states. Both together imply that the states with higher level of income and relatively egalitarian distribution of income have much lower percent of children with socio-emotional difficulties. The extent of religious participation by children in a state has a strong (-0.054), negative effect on their socio-emotional difficulties. In other words, a one percent increase in the percent of children who attend religious services at least weekly, is associated with 5.4 percent decrease in the percent of children aged 3-17 with moderate or severe difficulties in the area of emotions, concentration, behavior, or getting along with others. This strength of association is the marginal contribution of children's religious participation to their emotional well-being, after controlling for the state's income level, income inequality, and racial/ethnic composition of population. The variables representing the racial/ethnic composition of state population are statistically significant on their own. Specifically, we observe from Table 6, column 3 that the states with relatively large share of black population, have higher problem of children's mental health; while the states with relatively large share of Hispanic population, have lower problem of children's mental health.

However, if we look at the estimated result of equation 5 (Table 6, column 6), we find that the inclusion of variables such as reading to young children, mother's health, safety of child in the neighborhood and the access to mental health care, rendered insignificant the negative association between the levels of socio-emotional difficulties of children in the states and their levels of per capita income. While we find that mother's health has very strong beneficial effect on children's mental health. That is one percent increase in the percent of children whose mother's have excellent or very good physical and mental health, is associated with 12.5 percent decrease in the percent of children with socio-emotional difficulties across states. As we pointed out in section 1, parental health may serve as a

proxy for the income levels experienced by children at earlier ages. Also, if the effect of health of parents is affected by their income levels, and income is measured with error, then the ‘effects’ of parental health may simply reflect the effects of income. This is the reason why inclusion of mother’s health in equation 6, eliminated the income effect in the determination of children’s socio-emotional difficulties across states. Similarly, the variable representing the safety of child in the neighborhood is also statistically insignificant. Partly this can also be explained by the fact there is strong correlation between the income level of a neighborhood and level of safety in the neighborhood. At the state level this means that states with higher level of income are more safer for children as compared to states with lower level of income. Therefore, with the inclusion of mother’s health in the regression of children’s socio-emotional difficulties, we expect that the variable, safety of child in the neighborhood, to be statistically insignificant. The child’s access to mental health care also does not have statistically significant association. However, we note that even though the variables reading to children, safety of child in the neighborhood, the access to mental health care and per capita state family income have statistically insignificant effect on socio-emotional difficulties of children in the states, their estimated values have expected signs. Similar results we find for proportion of black population in the total population of the states. It’s statistical association with socio-emotional difficulties of children, was also rendered insignificant in the presence of other factors. However, its negative association with proportion of Hispanic population among states remained significant.

Most importantly, even after controlling for various socio-demographic, income and mental health care variables, the beneficial effect of children’s participation in religious activities on their emotional well-being still remained strong and statistically significant. In other words, the protective influence of participation in religious activities by children is robust to inclusion of numerous control variables. Thus, we have a robust statistical evidence to claim that the states with higher percent of children participating in religious activities, have lower

percent of children with socio-emotional difficulties.

## 4.5 Breastfeeding, Household Smoking, and Children's Health

### 4.5.1 Breastfeeding and Child Health

The beneficial effects of breastfeeding on child health have been widely established.<sup>29</sup> Breastfeeding confers both nutritional and immunological benefits, and it is also more sanitary than bottle feeding in most developing countries. Medical and public health organizations strongly encourage breastfeeding.<sup>30</sup> To the best knowledge of authors, there is no study that has documented the beneficial effects of breastfeeding using aggregate data for the United States. Thus, in this paper we test the validity of past findings using aggregated data for 50 United States. To examine the beneficial effects of breastfeeding child health outcomes, we regress measures of child health on a constant, breastfeeding, and a set of control variables, and it specified as follows:

$$h_i = \alpha + \beta * Breastfeeding + \delta * Controls + \epsilon_i \quad (8)$$

In Table 3, column 3 contains the OLS estimates of regression of overall child health status on a constant, breastfeeding (percent of children aged 0-5 who were ever breastfed), and a set of control variables consisting of income, activities of children outside school, safety of child in neighborhood, and racial/ethnic composition of population. The result shows that the states with higher percent of children who were ever breastfed, have higher percent of children in excellent or very good overall health status. Thus consistent with past studies,

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<sup>29</sup>Berg, 1973; Jelliffe and Jelliffe, 1978; Report of the Task Force on Assessment of the Scientific Evidence Relating to Infant Feeding Practice and Infant Health: Executive Summary, 1984; Victora, et al. 1987; Barrera, 1991; Cunningham and Jelliffe, 1991; The Cebu Study Team, 1992; Dewey et al., 1995; Senauer and Kassaouf, 2000.

<sup>30</sup>The World Health Organization (WHO) of the United Nations recommends exclusive (unsupplemented) breastfeeding for the first 4-6 months of an infant's life and continued breastfeeding for up to 2 years or beyond, appropriately supplemented.

this result strengthens the compelling case for breastfeeding.

In Table 4, columns 2, 4, and 5 present the OLS results of regression of percent of children aged 0-5 whose parents have at least one concern about their child's learning, development, or behavior on a constant, breastfeeding, and alternative sets of control variables. There are three key findings. First, there is a large beneficial 'effect' of breastfeeding on children's learning, development, or behavior. That is the states with higher percent of children who were ever breastfed, have lower percent of children with problems of learning, development, or behavior. Second, this result is robust to inclusion of various control variables for economic status of the states, neighborhood characteristics, and issues with child care, and racial/ethnic composition of states's populations. Third, the quality of child's relationship with compensatory caregiver(s), may be a key variable that allows the child some respite and perhaps even some escape from risk. On the other hand, children who have exclusive, negative, and/or conflictual relationships with overburdened caregivers would be expected to experience their parent's health problems very differently than children who have both the ability and opportunity to develop positive relationships with alternative caregivers (Drotar, 1994). Is this expectation supported by empirical evidence? Our result shows that it is the case. The variable issues with child care (percent of children aged 0-5 whose parents had to make different child care arrangements in the past month and/or a job change for child care reasons in the past year) has statistically significant, negative influence on child's positive learning, development, or behavior.

#### **4.5.2 Household Smoking and Child Health**

Two articles published in the *Lancet* in 1974<sup>31</sup> alerted readers to a possible link between parental smoking and the risk of respiratory illness in infancy. There are numerous studies that have documented adverse effects from exposure of children to environmental tobacco

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<sup>31</sup>Harlap and Davies, 1974; Colley et al., 1974.

smoke.<sup>32</sup> Strachan and Cook (1997) reviewed evidence relating parental smoking to acute lower respiratory illness in the first three years of life, and concluded that the relationship between parental smoking and acute lower respiratory illness in infancy is likely to be causal. Rivard et al. (1999) specifically analyzed the relation between maternal smoking and clinically diagnosed incident cases of childhood asthma and found significant relationship. However, the methodology of most of these medical and public health studies is inadequate because conclusions are drawn from simple cross tabulations. They do not control for other important factors which may be highly correlated with parental or maternal smoking, such as parental health or neighborhood characteristics, thereby overestimating effect of parental smoking on child health.

In this paper, following past studies we examine the effect of parental or household smoking on childhood asthma, and test the robustness of the effect of parental smoking to inclusion of controls for maternal health, and neighborhood characteristics. That is for state  $i$ , percent of children affected by asthma is regressed on a constant, parental smoking (percent of children who live in households where someone smokes), and a set of control variables, and it is specified as follows:

$$Asthma_i = \alpha + \beta * HouseholdSmoking + \delta * Controls + \epsilon_i \quad (9)$$

The results are presented in Table 4. The key finding is as follows: parental or household smoking has a large effect on incidences of childhood asthma. In other words, the states with higher percent of children living in households where someone smokes, have greater percent of children affected by asthma. And this result is robust to inclusion of controls for neighborhood characteristics such as supportive neighborhood (Table 4, column 2 and 5), safety of child in neighborhood (Table 4, column 3 and 6), maternal health (Table 4,

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<sup>32</sup>Cameron et al., 1969; Norman and Dickinson, 1972.

columns 4-6). We emphasize that not only the effect of household smoking on childhood asthma is significant and robust to controls, but magnitudes of effects remains more or less the same across alternative specification. Thus, consistent with the medical and public health literature, we find conclusive evidence supporting the link between parental smoking and risk of childhood asthma.

## 5 Concluding Remarks

This paper investigates determinants of children's health and well-being in the United States, using aggregated data for the 50 U.S. states, derived from the National Survey of Children's Health. Using insights from diverse disciplines such as economics, pediatrics, psychology, and sociology, we examine the effects of income, income distribution, participation in the religious services, maternal health, breastfeeding, household smoking, neighborhood characteristics, and racial/ethnic composition of states's population. The underlying conceptual model behind estimation of determinants of child health is an integration of biomedical approach with a model of the family (Becker, 1981). In this framework, we estimate reduced form child health functions.

We find that independent effects of income inequality on children's health and well-being vary across domains of child health outcome. If we are concerned with physical and social performances of children, income inequality does not have an independent effect, and its effect on child health is largely explained by the racial/ethnic composition of the population. But if our concern is with the emotional well-being (mental health), income inequality has an independent, strong, statistically significant effect. The states with higher income inequality have higher levels of socio-emotional difficulties. In other words, income inequality is not an independent predictor of children's physical health, but it is an independent predictor of children's mental health and emotional well-being. This finding is consistent with 'income



inequality hypothesis'. We contest Sturm and Gresenz (2002)'s result of no relationship between income inequality and the mental health of population. We argue that their result of no statistically significant relationship between mental health and income inequality is true only for adults, but not for the relationship between children's mental health and income inequality. Contrary to their claim, the statistical association between emotional well-being of children and income inequality does not disappear even after controlling for neighborhood characteristics, maternal health, income level, religious participation by children, access to mental health care, and the racial/ethnic composition of population.

Drawing on collective efficacy theory and Wilson's theory of neighborhood decline, we investigate the ways in which neighborhood contexts affect child health and well-being in the United States. The collective efficacy is operationalized through using measures of social cohesion and informal social controls. They are captured by indicators of supportive neighborhood, safety of child in the neighborhood, and issues with child care. The results show that neighborhood characteristics have significant effects on child health and well-being in the United States. Although, their effects vary across domains of child health outcomes. Most importantly, wherever, both income and neighborhood characteristics are statistically significant factors of child health, the effect of neighborhood is more powerful than income. This suggests that past economic studies that examined the determinants of child health but ignored neighborhood characteristics, may have overestimated the effects of socioeconomic status.

The pediatric and psychiatric research have shown a positive association between parental health and child health. However, the methodology of most of these studies is inadequate because conclusions are drawn from simple cross tabulations. They do not control for other important factors which may be correlated with with parental health, such as income, thereby imputing too much to parental health. Also studies which do use multivariate regression, including Case et al. (2002) often are unsatisfactory. Their estimates are biased because

of important omitted variables problems. Moreover, not all health outcomes of children are equally affected by maternal health. For example, the role and importance of maternal health in child health may vary across domains of child health outcomes, as some aspect of child health are more responsive to maternal health than others. In this paper, we examine the contribution of maternal health to child health and consider four child health outcomes. There are three key findings. First, there are ‘large’ effects of maternal health on child health. Second, effects of maternal health on child health varies across domains of child health. Third, the inclusion of control for maternal health eliminates the statistical significance of the coefficients of per capita state family income. This provides supportive evidence for the observation made by Case et al. (2002) that maternal health may be a proxy for permanent income or long-run income.

The role of proactive influences in the lives of children is increasingly of interests to clinicians and the general community. Family and cultural norms and activities are gaining acceptance as critical influences in the development of competent and resilient youth. Despite the recognition that family routines and values are crucial to children’s development, past studies rarely addressed the contribution of children’s or parental religious activities to children’s health and social competence. There have been some efforts in the field of psychiatric research and it has been found that parental religious activities have protective influence on child health and well-being (Varon and Riley, 1999). This paper also examines the potentially protective influence of religious participation on child health. However, our study differs from the study by Varon and Riley in two respects: first, we examine the relationship between mental health of child and religious participation of children aged 3-17 instead of only adolescents; and (2) while examining this relationship, we specifically investigate the role of religious participation by children instead of maternal religious participation. Our results show that children’s religious participation in a state has a strong protective influence on their socio-emotional well-being. In other words, a one percent increase in the

percent of children who attend religious services at least weekly, is associated with 5.4 percent decrease in the percent of children aged 3-17 with moderate or severe difficulties in the area of emotions, concentration, or getting along with others. Most importantly, even after controlling for various socio-economic-demographic and mental health care variables, the beneficial effect children's participation in religious activities on their emotional well-being still remains strong and statistically significant.

The beneficial effects of breastfeeding on child health have been widely established. However, to the best knowledge of authors, there is no study that has documented the beneficial effects of breastfeeding using aggregated data for the entire United States. Thus, this paper tests the validity of past findings using aggregated data for the 50 U.S. states. Regarding this, we have two key findings. First, there is large beneficial effect of breastfeeding on children's learning, development, or behavior. It also has positive influence on the overall health status of children. That is the states with higher percent of children who were ever breastfed, have lower percent of children with problems of learning, development, or behavior; and have higher percent of children who are in excellent or very health overall health.

There are numerous medical studies that have documented adverse effects from exposure of children to environmental tobacco smoke. However, the methodology of most of the medical and public health studies is inadequate because conclusions are drawn from simple cross tabulations. They do not control for other important factors which may be highly correlated with parental or maternal smoking, such as parental health, neighborhood characteristics, thereby overestimating effect of parental smoking on child health. In this paper, following past studies we examine the effect of parental or household smoking on childhood asthma, and test the robustness of its effect to inclusion of controls for maternal health and neighborhood characteristics. We find that not only the effect of household smoking on childhood asthma is significant and robust to controls, but magnitudes of effects remain more or less the same across alternative specifications of regression model. Thus, consistent

with the medical and public health literature, we find conclusive evidence supporting the link between parental smoking and childhood asthma.

In sum, child health is determined by diverse factors such as socioeconomic status, distribution of income, household behavior, neighborhood characteristics, maternal health, religious participation, and their complex interactions. Our results clearly demonstrated that the relative role of various constituent factors vary across domains of child health. In other words, some aspects of child health are more responsive to immediate family and neighborhood environment, while others are not.

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Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min	Max
Overall Child Health Status	86.076	3.495	77.200	93.100
Children Affected by Asthma	7.927	1.555	4.900	11.100
Parent's Concern	36.016	3.687	28.500	47.000
Socio-Emotional Difficulties	9.265	1.293	7.100	11.800
Children with Current Health Insurance	92.118	3.278	82.300	96.900
Children Lacking Consistent Insurance Coverage	13.671	4.191	7.000	24.800
Preventive Health Care	77.050	7.280	61.800	92.300
Mental Health Care	61.440	7.540	43.400	77.200
Early Childhood School	60.863	6.519	41.200	77.000
Activities Outside School	83.145	4.449	74.200	91.200
Breastfeeding	70.950	9.990	45.000	87.900
Reading to Young Children	49.844	5.961	38.100	67.600
Household Smoking	31.290	5.867	15.400	45.200
Religious Services	54.990	10.010	28.100	72.200
Mother's Health	60.816	4.527	50.400	68.300
Supportive Neighborhood	82.720	3.729	69.400	90.500
Safety of Child in the Neighborhood	86.131	5.605	61.200	94.500
Issues with Child Care	33.688	3.135	27.300	38.700
Gini Coefficient	0.416	0.031	0.372	0.562
Per Capita State Family Income	30,862	4,907	23,448	48,342
Poverty Rate	11.820	3.047	5.800	18.800
Proportion Black	11.240	11.720	0.380	58.770
Proportion Hispanic	8.490	9.330	0.690	43.210

**Definition of Variables:**

**Overall Child Health Status:** Percent of children in excellent or very good health. **Children Affected by Asthma:** Percent of children affected by asthma. **Parent's Concern:** Percent of children aged 0-5 whose parents have at least one concern about their child's learning, development, or behavior. **Socio-Emotional Difficulties:** Percent of children aged 3-17 with moderate or severe difficulties in the area of emotions, concentration, behavior, or getting along with others. **Children with Current Health Insurance:** Percent of children currently insured. **Children Lacking Consistent Insurance Coverage:** Percent of children lacking consistent insurance coverage in the past year. **Preventive Health Care:** Percent of children with a preventive medical visit in the past year. **Mental Health Care:** Percent of children with chronic emotional, developmental, or behavioral problems who received mental health care in the past year. **Early Childhood School:** Percent of children aged 3-5 who attend nursery school, preschool, or kindergarten. **Activities Outside School:** Percent of children aged 6-17 who participate in activities outside of school. **Breastfeeding:** Percent of children aged 0-5 who were ever breastfed. **Reading to Young Children:** Percent of children aged 0-5 who are read to every day. **Household Smoking:** Percent of children who live in households where someone smokes. **Religious Services:** Percent of children who attend religious services at least weekly. **Mother's Health:** Percent of children whose mother's physical and emotional health is excellent or very good. **Supportive Neighborhood:** Percent of children living in neighborhoods that are supportive. **Safety of child in the Neighborhood:** Percent of children living in neighborhoods that are usually or always safe. **Issues with Child Care:** Percent of children aged 0-5 whose parents had to make different child care arrangements in the past month and/or a job change for child care reasons in the past year. **Proportion Black:** Proportion of Black population in state's total population. **Proportion Hispanic:** Proportion of Hispanic population in state's total population.

Table 2: OLS Coefficients for the Regressions of Children's Health and Well-being on Income Inequality and State Racial Composition (N=50)

Variable	Overall Child Health Status	Affected by Asthma	Parent's Concern	Socio-Emotional Difficulties
<b>Model 1</b>				
Intercept	112.001*(23.19)	-0.094 (-0.03)	19.023* (3.06)	4.759* (2.09)
Per Capita State Family Income	0.255* (3.25)	-0.0016 (-0.04)	-0.228* (-2.26)	-0.074* (-2.00)
Income Inequality	-81.19* (-6.65)	19.146* (2.75)	57.78* (3.68)	16.335* (2.83)
R-Square	0.485	0.153	0.234	0.161
<b>Model 2</b>				
Intercept	90.44* (15.38)	2.59 (0.58)	34.41* (3.53)	4.454 (1.29)
Per Capita Family Income	0.245* (4.26)	0.001 (0.02)	-0.227* (-2.39)	-0.076* (-2.25)
Income Inequality	-20.18 (-1.28)	12.23 (1.02)	16.58 (0.64)	17.874** (1.93)
Proportion Black	-0.134* (-3.43)	0.033 (1.14)	0.154* (2.38)	0.014 (0.65)
Proportion Hispanic	-0.239* (-6.59)	-0.021 (-0.75)	0.0002 (.001)	-0.052* (-2.46)
R-Square	0.735	0.221	0.348	0.332

**Note:** Values in bracket are t-statistics of parameters.

\* Significant at 5 percent level of significance.

\*\* Significant at 10 percent level of significance.



Table 3: Determinants of Children's Health: Overall Child Health Status (Percent of Children in excellent or very good health)(N=50)

Variable	(1)	(2)	(3)	(4)	(5)
Intercept	77.80* (7.06)	56.683* (7.62)	42.19* (3.95)	37.65* (3.53)	35.77* (2.02)
Per Capita State Family Income	0.206* (3.22)	-0.133 (-0.21)	0.178* (2.50)	0.130** (1.75)	0.180* (2.46)
Income Inequality	-21.70 (-1.39)	4.44 (0.35)	...	...	1.68 (0.11)
Activities Outside School	...	...	0.198** (1.89)	0.242* (2.35)	0.141 (1.16)
Mother's Health	...	0.491* (5.72)	...	...	...
Breastfeeding	...	...	0.619** (1.79)	...	...
Reading to Young Children	...	...	...	0.126* (2.11)	...
Household Smoking	...	...	...	...	-0.068 (-1.11)
Safety of Child in Neighborhood	...	...	0.221* (2.10)	0.217* (2.09)	0.252* (2.15)
Child Currently Insured	0.154 (1.35)	...	...	...	0.156 (1.47)
Proportion Black	-0.134* (-3.45)	-0.071 (-2.25)	-0.018 (-0.450)	-0.003 (-0.06)	-0.052 (-1.17)
Proportion Hispanic	-0.204* (-4.59)	-0.130* (-3.66)	-0.156* (-3.27)	-0.086* (-1.84)	-0.132* (-2.22)
R-Square	0.746	0.847	0.809	0.814	0.808
Adjusted R-Square	0.717	0.830	0.783	0.789	0.772

**Note:** Values in bracket are t-statistics of parameters.

\* Significant at 5 percent level of significance.

\*\* Significant at 10 percent level of significance.

Table 4: Determinants of Children's Health: Percent of Children Affected by Asthma (N=50)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	4.76* (4.28)	19.244* (4.59)	15.546* (5.50)	10.480* (3.44)	19.245 (4.53)	15.082* (4.90)
Household Smoking	0.101* (2.89)	0.104* (3.29)	0.116* (3.78)	0.092* (2.68)	0.103* (3.20)	0.119* (3.72)
Supportive Neighborhood	...	-.176* (-3.56)	...	...	-0.175* (-2.79)	...
Safety of Child in Neighborhood	...	...	-0.131* (-4.06)	...	...	-0.141* (-3.38)
Mother's Health	...	...	...	-0.089* (-2.01)	-0.0002 (0.01)	0.21 (0.40)
R-Square	0.146	0.323	0.364	0.212	0.324	0.366
Adjusted R-Square	0.128	0.296	0.338	0.179	0.281	0.326

**Note:** Values in bracket are t-statistics of parameters.

\* Significant at 5 percent level of significance.

\*\* Significant at 10 percent level of significance.

Table 5: Determinants of Children's Health: Parent's Concern (Percent of Children aged 0-5 whose parents have at least one concern about their child's learning, development, or behavior) (N=50)

Variable	(1)	(2)	(3)	(4)	(5)
Intercept	34.410* (3.53)	48.26* (4.34)	60.51* (3.92)	98.08* (3.90)	92.06* (3.75)
Per Capita State Family Income	-0.227* (-2.39)	-0.107 (-1.02)	-0.027 (-0.21)	-0.189** (-1.76)	-0.257* (-2.34)
Income Inequality	16.58 (0.64)	-0.82 (0.03)	-2.46 (-0.09)	-25.52 (-0.93)	-29.05 (-1.09)
Breastfeeding	...	-0.147* (2.28)	...	-0.142* (-2.29)	-0.111** (-1.79)
Mother's Health	...	...	-0.379* (-2.13)	...	...
Safety of Child in the Neighborhood	...	...	...	-0.413* (-2.19)	-0.438* (-2.39)
Issues with Child Care	...	...	...	...	0.281** (1.98)
Proportion Black	0.153* (2.38)	0.112** (1.74)	0.105 (1.60)	0.027 (0.027)	0.027 (0.39)
Proportion Hispanic	0.0002 (0.01)	0.071 (1.09)	-0.083 (-1.20)	-0.028 (-0.37)	-0.020 (-0.27)
R-Square	0.348	0.416	0.408	0.474	0.517
Adjusted R-Square	0.292	0.351	0.343	0.402	0.439

**Note:** Values in bracket are t-statistics of parameters.

\* Significant at 5 percent level of significance.

\*\* Significant at 10 percent level of significance.

Table 6: Determinants of Children's Health: Socio-Emotional Difficulties (Percent of Children aged 3-17 with moderate or severe difficulties in the area of emotions, concentration, behavior, or getting along with others) (N=50)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	3.181 (0.88)	10.496** (1.86)	9.676* (2.53)	3.125 (0.32)	5.413 (1.51)	6.210 (0.69)
Per Capita State Family Income	-0.11* (2.54)	-0.029 (-0.63)	-0.144* (-3.51)	-0.074* (-2.01)	-0.060 (-1.59)	-0.044 (-0.77)
Income Inequality	16.40** (1.77)	13.468 (1.38)	16.792** (1.93)	18.54* (1.79)	18.687* (2.01)	18.26** (1.82)
Reading to Young Children	0.049 (1.20)	...	...	...	...	-0.012 (-0.24)
Mother's Health	...	-0.082 (-1.34)	...	...	...	-0.125** (-1.71)
Religious Services	...	...	-0.054* (-2.62)	...	...	-0.059* (-2.15)
Safety of Child in the Neighborhood	...	...	...	0.011 (0.15)	...	0.112 (1.36)
Child with Access to Mental Health Care	...	...	...	...	-0.026 (-0.98)	-0.019 (-0.76)
Proportion Black	0.033 (1.20)	0.004 (0.16)	0.041** (1.75)	0.017 (0.62)	0.007 (0.27)	0.041 (1.40)
Proportion Hispanic	-0.350 (1.39)	-0.072* (-2.81)	-0.048* (-2.42)	-0.50** (-1.81)	-0.064* (-2.64)	-0.062* (-2.11)
R-Square	0.353	0.358	0.420	0.332	0.346	0.474
Adjusted R-Square	0.281	0.287	0.356	0.258	0.274	0.359

**Note:** Values in bracket are t-statistics of parameters.

\* Significant at 5 percent level of significance.

\*\* Significant at 10 percent level of significance.