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Common Illness and Preschooler's Experiences in Child Care

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Abstract

The majority of young American children regularly spend time in non-parental care settings. Such arrangements are associated with their experiences of common childhood illnesses. Why this linkage exists, how it varies across the socioeconomic spectrum, and whether it has implications for how parents arrange care are all important theoretical and policy issues. This study, therefore, applied a fixed effects design within structural equation modeling to data from the NICHD Study of Early Child Care and Youth Development ($N = 1,364$). Results revealed that children were sick more often when cared for in a center and had more peer exposure in their primary care settings, although this latter association was observed only among children of the least educated mothers. Net of such factors, children in multiple arrangements did not experience more illness, but illnesses tended to decrease subsequent peer exposure as parents changed children's care arrangements.

The vast majority of preschool aged children in the U.S. spend significant portions of their weeks in some form of non-parental care. In national estimates, 65 percent of three-year olds and 80 percent of four-year olds experienced at least 10 hours of non-parental care per week (Mulligan et al. 2005). Such care supports women's labor force participation as well as workforce development strategies targeting low-income families (Duncan et al. 2008). Moreover, depending on the type and quality of care, non-parental child care can help children get ready for school (NICHD ECCRN 2003 NICHD ECCRN 2005). Yet, such settings are also primary sites for disease spread among children (Hurwitz et al. 1991; Johansen et al. 1988), which can disrupt the cognitive benefits of center care (e.g., parents will avoid it out of concerns of exposing their children to illness) and interfere with parents' work schedules (Gordon et al. 2008; Waldfogel 2006). Unfortunately, sociologists have not considered child care as a setting of child health as much as they have the neighborhood, family, or school.

As a result, the bulk of knowledge on the connection between child care and illness comes primarily from public health research. This literature has taken an important first step by

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providing a general consensus on the health risks associated with non-parental care. Specifically, children in center care experience more bouts of ear infections, gastrointestinal tract illnesses, and upper respiratory tract infections than children cared for in family day cares or at home (Alexander et al. 1990; Arnold, Makitube, and Istre 1993; Bradley and Vandell 2007; Cote et al. 2010; Hardy and Fowler 1993; Hildesheim, Hoffman, and Overpeck, 1999; Hurwitz et al. 1991; Johansen et al. 1988; Louihiala et al. 1995 Nafstad et al. 1999; NICHD ECCRN 2001, 2003; Paradise et al. 1997; Wald et al. 1991). At the same time, these studies have used limited controls, focused only on the child's primary care arrangement, and emphasized the link between child care and illness without considering how child illness affects parental care choices or varies across subsets of the population. Insights into whether such settings may be linked to children's illness (or are merely correlated with it), why, and for which groups remain limited. What is needed is a sociological perspective that recognizes the widespread use of secondary care arrangements among families today, provides more attention to issues of selection, bidirectionality, and heterogeneity, and gives greater theoretical attention to why non-parental care might have implications for child health.

To address these needs, this study teases out the risks associated with types of care arrangements from the number of children they typically serve, investigates whether multiple arrangements contribute to children's illness, considers whether parents change their care arrangements in response to children's illness, and explores variation in these associations by parents' socioeconomic background. These questions are informed by the integration of epidemiological, ecological, and population frameworks. The analysis applies a sophisticated longitudinal modeling strategy that incorporates fixed effects into structural equation modeling (SEM) to account for key sources of unmeasured selection (e.g., stable genetic traits) and test for bidirectionality (e.g., parental responses to child illness) (Bollen and Brand 2010). Data come from a multi-state prospective sample of children participating in the NICHD Study of Early Child Care and Youth Development (SECCYD), which contains quarterly reports on children in all their care arrangements and their histories of specific illnesses.

Drawing on such strengths, the results of this study will help to elucidate how and why a central facet of modern life in American families, the use non-parental care, matters for the early health of children. Doing so informs the policy push to expand child care services and improve child care quality at a time when demand is great and recognition of the multiple developmental benefits of quality care is growing (Waldfogel 2006; Zigler, Marsland, and Lord 2009).

Background

Children's exposure to illness in non-parental child care is of great concern to parents and has been widely discussed in the media, beginning with a flurry of interest in the 1980s and 1990s (Chicago Sun Times 1992 New York Times 1983). In response, public health researchers have compiled significant evidence that child care centers, and to a lesser extent family day care (e.g., licensed home arrangement with many children), put children at greater risk for many common child illnesses, including ear infection (Hardy and Folwer

1993), gastrointestinal illness (Alexander et al. 1990), and upper respiratory problems (Presser 1988). This study aims to go beyond this basic understanding. To do so, we draw on three theoretical frameworks that highlight other complexities associated with children's child care experiences that could influence their health. As such, these theories serve to guide the current investigation and provide new insights into this basic link.

The Epidemiological Model

The epidemiological model suggests that children's greater contact with sick peers in group settings is what increases their odds of getting sick (Anderson and May 1991). Yet, studies have not adequately disentangled the role of child care type from the number of children cared for in different care settings. Instead, they have used categorical measures of the setting (child's home, other home, center) or the number of children typically served (e.g., none, less than five, more than five) (Hardy and Fowler 1993; NICHD ECCRN 2006; Paradise et al 1997). Larger settings have been associated with more illness, and child care centers typically serve the largest number of children. Home based arrangements (e.g., relative, neighbor) generally serve the fewest. Thus, one explanation for why children in center care (and then family day care) experience more infectious illness than children cared for in their own home is that they are surrounded by more peers and exposed to more pathogens (Presser 1988; Nafstad et al. 1999; NICHD ECCRN 2003).

Combining data on children's arrangement types *and* the number of children they serve over multiple periods, this study tests the hypothesis that increased peer exposure is associated with more common illness—specifically colds, flus, and ear infections—among preschool-aged children, net of arrangement type. Addressing this question is critical to understanding why children in non-parental care experience more illness, but it also has applied relevance. Specifically, it can help health policy makers who set licensing standards evaluate the importance of group size and practitioners who organize child care referral services (e.g., Child Care Aware of America) weigh the factors most relevant to child health.

Our investigation of whether peer exposure affects child health also highlights an important yet overlooked issue: bidirectionality. Considering bidirectionality is critical within an epidemiological framework, since child illness might affect peer exposure. In other words, some parents may avoid pathogenic risks in large settings, choosing smaller settings because they have fewer risks of common illnesses. They may also attribute their children's illnesses to larger settings and switch to smaller ones. Our study addresses whether child health influences parents' decisions surrounding care and the broader challenges they face arranging children's care (Kisker and Ross 1997). This issue has not been previously explored because the cross-sectional data used by the majority of studies linking child illness to child care (such as the Child Health Supplements to the National Health Interviews, the basis of many of these studies) could not capture this dynamic process (e.g., Alexander et al 1990; Johansen et al 1988). The SECCYD, which contains closely spaced (quarterly) data collections, is up to the task.

The Ecological Model

Of course, non-parental care may matter to health beyond exposure to pathogen-carrying peers. Ecological frameworks emphasize the significance of interactions between children and their environments and other processes that are relevant to health (Shonkoff and Phillips 2000; Sameroff 1983). For example, the risks associated with center care could be due to the fact that children in center care typically have more physical contact with toys and surfaces (e.g., work centers) that harbor germs because centers are larger than homes, with more dispersed and varied spaces; children in centers receive less adult monitoring of sanitation practices (e.g., hand washing after blowing one's nose) due to larger child-teacher ratios; and have greater exposure to other sources of traffic in centers beyond the number of children in their classroom (i.e., more parents at drop off and pick up, food service workers, teachers and children in other classrooms) (Larson et al. 2004; Wrigley and Debry 2005).

Although we cannot explicitly study these features of center care, we do consider whether center care type, net of preschool-aged children's current and previous peer exposure, is associated with more bouts of communicable illness. In doing so, we assess whether ecological factors associated with different arrangement types may present independent risks to children's health and identify the arrangements that present the greatest risk. Findings from this analysis step will point to the importance of developing site-specific practices for the reduction of disease spread (Larson et al. 2004). We also consider the possibility that, after accounting for peer exposure, children in family day care could in fact experience *more* illness; for example because food and play spaces are in near proximity, children can attend when sick, and caregivers are less professionalized (and thus, for example, receive less training in infection control practices) (Wrigley and Debry 2005).

Inspired by the ecological framework, this study also recognizes the reality that many children experience multiple care arrangements, not just one. This phenomenon is true among mothers who combine part-time high quality center care with informal options, either because center care is expensive or part-day (like many Head Start and state pre-kindergarten programs) (Chaudry, Pedroza, and Sandstrom 2012; Gordon et al. 2008). It is also true for those who rely on a patchwork of informal arrangements (i.e., in the child's own or another home) based on their often unpaid caregivers' availability and hospitality (Clarke-Stewart and Allhusen 2004; Morrissey 2008). Yet, prior research linking child care and child health has typically completely overlooked this reality by focusing on primary arrangements, excluded children with more than one care arrangement from their analyses, or failed to account for the correlation between multiple arrangements and greater peer exposure (Chen 2013; Hurwitz 1991; Wald et al. 1991). Our expectation is that children in multiple care settings will encounter more diverse sources and types of infection and thus experience more illness, net of their cumulative peer exposure or placement in center or family day care. We can examine this question because the SECCYD asked parents to report about up to five care arrangements.

The Population Model

Finally, a population framework suggests the potential for differences in how subgroups experience and respond to health problems associated with child care. Prior research has

explored variation in the link between child care and illness across different stages of development (e.g., before and after age 3) but not across segments of the child population defined by families' socioeconomic circumstances (Alexander et al., 1990; Hurwitz 199; Presser 1988). Family socioeconomic status (SES), however, is one of the greatest predictors of children's health through its association with poor neighborhood or housing quality, access to preventative health care and nutritious food, and maternal stress and investment, among other environmental influences (Kimbrow, Brooks-Gunn, and McLanahan 2011; Northridge et al. 2010; Turney 2011). Thus, we might also expect that disadvantaged children, specifically poor children or children living with less educated mothers, experience more illnesses in their care settings.

One reason for this expectation is that poor children have less access to health care, live in less healthy (and sometimes crowded) housing conditions, and have parents with fewer resources (e.g., money, workplace flexibility) to allow them, or a hired caregiver, to stay home with a sick child (Heyman and Earle 1999; Newacheck, Hughes and Stoddard 1996). Thus, when they are sent to care, such children will exhibit symptoms of illness for longer and expose their peers, who generally share their socioeconomic circumstances, to their illness. Another reason is that disadvantaged children are in care settings with caregivers that have less education and formal training. Such human capital correlates with use of sanitation practices (Churchill and Pickering 1997), especially in informal family settings (Dowsett et al. 2008; Hynes and Habasevich-Brooks 2008). Caregiver human capital also correlates with mothers' own human capital (NICHD ECCRN 2005), which is associated with access to social networks and other resources that help women identify higher quality and presumably healthier care settings (Augustine, Cavanagh, and Crosnoe 2009).

To explore whether child care effects on disease transmission may be greater for children of low-income families or mothers with less education, we use data from a socioeconomically diverse sample and statistical interactions to test whether family SES moderates the links of care type, peer count, and number of arrangements with illness. These results may help expand current discussions surrounding the health of the population beyond targeting specific groups of children to also targeting their care settings (Heyman and Earle 1999).

Study Summary

In sum, we draw on three theoretical traditions to test new questions about the link between children's early child care and illness. The epidemiological framework highlights the transmission of illness between peers and informs our investigation of whether the health risks of early care are linked to the number of children they are exposed to in their care setting, as well as the impact of illness on children's subsequent care arrangements. The ecological framework informs our analysis of how children in certain types of care or multiple care arrangements, net of peers, might also have more illness, although we do not explicitly test ecological mechanisms driving this process. Last, the population framework brings in to question whether the risks associated with these different dimensions of care—peers, type, and number—are greater for children from disadvantaged segments of the population.

Data and Methods

Data and Sample

The SECCYD is a birth cohort study designed to answer questions about the link between children's experiences in child care and their developmental outcomes. Data collection began in 1991, when families were recruited from hospitals in ten U.S. cities. During 24-hour sampling periods, 8,986 women were visited in the hospital shortly after giving birth to assess their eligibility for the study. The mother had to be over age 17 and conversant in English. She had to have a healthy pregnancy, have given birth to a healthy singleton, and be willing to participate in the study (less than 4% refused to participate). A total of 5,265 women met these eligibility criteria (58% of women contacted).

Two weeks after women returned home from the hospital, data coordinators called them in their order on a randomly generated list. Adjustments were later made to the order of the list to increase the representation of various subgroups (e.g., at least 10% mothers with less than a high school education; at least 10% ethnic minority mothers). This conditionally random procedure yielded a sample of 3,015 families, of which 641 refused to participate. Others were excluded because they could not be reached, the mother was planning to move within three years, or their child was hospitalized postpartum for seven or more days. The resulting final sample included 1,364 families that closely resembled the catchment sample by having modest representation of low-income, less educated, and minority families (24% race/ethnic minority children, 11% mothers without high school degrees, 22% poor), although overrepresented women with college degrees compared to national estimates. Missing data estimation techniques (explained shortly) that address sample attrition—which was more common among minority, low-income, and less educated families in the SECCYD—and other potentially biasing sources of data loss allowed us to retain all 1,364 cases in our analyses.

Measures

Child illness—Information about children's colds, flus, and ear infections was collected during the 36 and 54 month home interviews and during the 42, 46, and 50 month telephone interviews. The measure of children's illnesses summed maternal responses to questions regarding whether the child experienced any ear infections that required medicine, respiratory problems (runny nose, cough, cold), and/or intestinal trouble (vomiting, diarrhea, not eating) since the last interview (1 = *yes*, 0 = *no*). This summary measure, which ranged from 0 (no illness) to 3 (problems in all categories), mirrored summary measures used in other studies intended to provide a general sense of one's overall health (e.g., Gorman and Read 2006). Extant research has also examined and affirmed the validity and reliability of parent reported measures of children's health (Currie and Stabile 2003; Case, Lubotsky, and Paxson 2002).

Child care setting—During the same interviews, mothers were asked about their children's current care arrangements. At most waves, they could report up to five arrangements (up to three at 36 months; fewer than 3 percent reported more than three arrangements at later assessments). An indicator variable identified children who had more

than one non-parental care arrangement (*multiple arrangements*). In addition, dummy variables designated the setting in which the child spent the most hours (*center*, *child's home*, or *family day care* such as the home of a relative or licensed home care provider). Children in exclusive maternal care were placed into the *child's home* category. Lastly, binary measures captured whether children experienced *any center* or *any family day care* across all arrangements. This coding captures children for whom center care or family day care may be a secondary arrangement. Thus, some children could have a “1” on both.

Peer exposure—Mothers also estimated the number of other children typically present in each arrangement (the child's room for care in a center or the home for care in a home), allowing us to capture *peer exposure in the primary arrangement* and then *total exposure* by summing across all arrangements. Peer exposure is also measured for children in homes where their mothers were themselves the child care providers (ranging from 4–9% across waves). Children in exclusive maternal care with no unrelated children present had a value of 0 on these measures. Because the continuous variables for peer exposure (modeled as independent and dependent variables) were highly skewed (e.g., 0 – 65 at 54 months accumulated across all arrangements, which may include multiple centers), we transformed this measure by taking its natural log (after adding .01 because the natural log of 0 is undefined). This logged measure also approximates the appropriate functional form of peer exposure, given how differences between 1 and 2 children are likely more meaningful than differences between, say, 11 and 12 children. For descriptive purposes, measures of total peer exposure were categorized into quintiles. A measure of peer exposure change between waves was also calculated for descriptive purposes. We also controlled for number of hours spent in the primary setting for models focusing on primary arrangements and hours spent across all non-parental care setting for models of all arrangements.

Socioeconomic circumstances—Mothers reported their total family income during in-person interviews at 36 and 54 months. These reports were converted into income-to-needs ratios for each family by dividing by the federal poverty threshold appropriate to the family's household size for the year of data collection and then grouped into quartiles. We use this categorical measure in our interaction models given the repeated finding that child care quality is non-linearly associated with family income, with middle income parents having incomes too high to qualify for subsidies but too low to pay out of pocket the high fees associated with quality care (Phillips et. al 1994; Fuller et. al 2004). When simply controlling for income, we use average measure of these two reports. Mother reports of years of education when the child was born (dummy coded into categories for *less than high school*, *high school graduate*, *some college*, or *college graduate*) were also used to assess known associations between higher education and better health behaviors (Mirowsky and Ross 2003).

Covariates—To account for possible immunity effects, we controlled for age of entry into non-maternal care and children's history of illness prior to 36 months by summing all illnesses reported at in-person and phone interviews at 6, 9, 12, 15, 18, 24, 27, and 33 months (NICHD ECCRN 2003; Arnold et al. 1993; Ey et al. 1995; Kramer et al. 1999). To account for children's predisposition to illness, we measured whether the mother breastfed

the child, the number of days she spent in the hospital after the birth, and her reports of her child's health at birth (coded as 1 = *fair/poor*, 0 = *good/excellent*). To account for mothers' perceptions of their children's health and use of care, we controlled for number of episodes of depression, based on mother reports at 6, 15, 24, 36, and 54 months on a questionnaire adapted from the Center of Epidemiologic Studies – Depression Scale (range 0–5). Finally, many mother, child, and family characteristics associated with children's care arrangements and/or their illnesses were taken into account, including measures of the child's race (1 = *Black*, 1 = *other*, with white as the reference) and birth order (1 = *first birth in the family*, 0 = *later order*). Time-varying covariates included binary markers of whether mothers worked non-standard schedules and the child's biological father was present in the home (NICHD ECCRN 2001, 2003; Gordon et al. 2007). Finally, models included dummy variables designating the ten study sites (i.e., site fixed effects) to adjust for contextual variation; for example, in local child care regulations and health services.

Other health-related measures were considered but ultimately dropped from the final analyses because preliminary modeling steps indicated that they were not associated with the peer exposure measures or child illnesses at any data point. We did so to present the most parsimonious model (Frank 2000). Dropped measures included child gender, prematurity or low birth weight status, exposure to cigarette smoke during pregnancy, pregnancy planfulness and complications, maternal ratings of her own and the child's father's health, and mothers' age at birth, time-varying measures of mothers' current marital and work statuses, coresidence with an adult relative or employed partner, and number of children in the home.

Plan of Analysis

The first analytical step was to assess the bivariate associations among child care type (e.g., center vs. family day care vs. child's home, single vs. multiple arrangements), total exposure to peers in all child care settings, children's health outcomes, and children's subsequent peer exposure. To this end, one set of descriptive calculations associated child care type, peer exposure quintile, and exposure to multiple arrangements (1 vs. 2 or more) with child health in order to describe the child care characteristics with the greatest level of child illness. The second set examined child health by changes in peer exposure to look for descriptive evidence as to whether parents altered their children's care in response to health issues. Finally, we estimated the multivariate associations between children's experiences in child care—that is, primary care type, peer exposure in that arrangement, and use of more than one arrangement—and their health outcomes. These multivariate models also included interactions between the child care and socioeconomic status measures (education and income) to test for subgroup differences.

Our multivariate analyses used fixed effects within SEM and the statistical software package Mplus (Muthen and Muthen 2010). Fixed effects models rely on within-child (versus between-child) variability by drawing on repeated measures of children's health and child care. This approach allows us to difference out unmeasured variance that may be associated with both children's health and their experiences in care, such as a stable genetic trait predisposing children to respiratory illness and certain care situations. It also provides

correct standard errors that, otherwise, could be too low due to the non-independence of multiple observations for each child over time (Allison 2009).

Key distinctions between fixed effects models in SEM and other regression frameworks is that the unmeasured within-child variation (i.e., the error term) is modeled as a latent variable in SEM; and, time-invariant factors do not drop out of the model in fixed effects SEM. Fixed effects SEM still assumes correlations between the time-varying covariates and unobserved fixed factors, equal impact of covariates across waves, and equal distribution of the error term across waves and individuals (Bollen and Brand 2010). These assumptions are imposed in SEM by allowing correlations between the latent variable and all time varying measures to be estimated, assigning the latent error term a coefficient of 1 and a correlation of 0 with all the time invariant predictors, and constraining residual variances and model coefficients to be equal across time.

Fixed effects SEM allows us to model lagged dependent variables *and* include fixed effects. Thus, we can estimate how child health might lead to subsequent changes in peer exposure in child care (Bollen and Brand 2010). Unlike standard fixed effects regression models, fixed effects SEM models the correlation between the error term at each point and the future values of the time-dependent measure. The use of lagged dependent variables with conventional fixed effects would create serious estimation problems because the lagged dependent variable is likely correlated with the error term (Allison 2009). Our approach addresses these well-documented problems with dynamic panel models (Nickel 1981; Hsiao 2003).

SEM has the additional advantage of using full information maximum likelihood (FIML) to address missing data. Like other acceptable approaches to dealing with missing data (i.e., multiple imputation), the main assumption of FIML is that data are MAR (missing at random) (Allison 2001; Johnson and Young 2011). When this assumption is met, both FIML and MI are unbiased strategies for dealing with attrition (11% of SECCYD families had attrited by 36 months; 21% dropped out by 54 months) and item nonresponse (which never exceeded 6%, except for peer exposure at 36 months which was missing for 21% of children). Yet FIML is easier to use and does not require a user-specified imputation model (which must be congenial to the analysis model and is likely to vary across analysts) (Allison 2001; Johnson and Young 2011). Results based on a sample restricted to children remaining in the study through 54 months ($n = 1,083$) also revealed a similar overall pattern of significant effects. We refer readers to Appendix A for these results.

Unless stated, all models were estimated using linear regression and robust standard errors to correct for any non-normality in the dependent variable, although our summary measure of child health had low to adequate levels of skewness and kurtosis (< 1.0) across all time points and could be used in analyses that assumed normality (Angrist and Pische 2008; Miles and Shevlin 2001). Standardized regression coefficients, which quantify how many standard deviations of change in the dependent variable are associated with a 1 SD change in the independent variable, are presented in the text as a representation of effect sizes of continuous predictors. For dummy variables, partially standardized coefficients, which quantify the SD change in the dependent variable associated with a 1 unit change in the

predictor, are presented (Hedges 2008). We also compared the size of the standardized results to those for women with a college degree (versus high school) based on a reduced model that omitted endogenous child care factors that would absorb some of the education effect (Augustine et al. 2009). These comparisons provide a useful metric to judge the magnitude of the child care effects relative to another policy amenable and theoretically relevant variable.

Results

Descriptive Statistics

Table 1 presents time-invariant characteristics of the sample. Children were fairly evenly split by gender, three-quarters were White (13 percent Black, 11 percent coded as other), and 45 percent were first-born. Few mothers reported that their child had fair or poor health at birth (2.93%). The average age of mothers at the child's birth was nearly 30, and family income-to-needs was 3.63, although nearly a quarter of the sample was poor. Roughly 35 percent had college degrees (compared to 21 percent who were high school graduates or 11 percent that were high school dropouts), and 77 percent were married at the time of the child's birth.

Table 2 presents key time-varying characteristics of the sample. In terms of health, children averaged from 0.95 to 1.37 reports of illness across time periods. Fully 79 percent of variation was within children (not shown). The most common child illness (not shown) was respiratory infection (3.58 total reports across all time periods), followed by gastrointestinal illness (1.50 reports) and ear infection (1.07 reports). In terms of child care, nearly half of children were in more than one care arrangement at all waves, except 36 months. Across all waves, children's total peer exposure across arrangements was nearly double their exposure in the primary arrangement. Also, as children got older, peer exposure increased. For example, the average child had about seven total peers in her/his care settings at 36 months but about 13 peers at 54 months. The proportion of children in centers also increased, while the proportion of children in family day care and own-home care decreased. Children spent an average of 23–25 hours per week in non-maternal care across waves. A total of 65% of the variation in multiple arrangements and 67% of the variation in total peer exposure was within children (not shown).

The results from the bivariate analysis in Table 3 revealed a pattern of increased incidence of colds, flus, and ear infections as children experienced greater exposure to peers in all of their care arrangements. At 46 months, the difference between children in the lowest and highest quartiles (1.46 versus 0.99) was 85% of a standard deviation of the mean of child health across all waves. This pattern persisted across all study waves and was similar when looking at peer exposure in the primary arrangement (not shown). Importantly, the bivariate statistics also suggest that child illness was linked to other aspects of care arrangements that could correlate with peer exposure but also may exert independent effects on health. Specifically, children with more than one arrangement had higher levels of illness across all assessment periods than children in a single arrangement, a difference that peaked at 47% of a standard deviation at 50 months. Based on analyses not shown, we confirmed that children in multiple arrangements had a high likelihood of experiencing center care (ranging from 51

percent at 36 months to 86 percent at 54 months) and were exposed to more peers overall. Children who experienced any center care or primary center care also suffered more colds, flus, and ear infections than children in family day care or own-home care settings, except at 54 months (when children primarily in family day care experienced the most illness). Again, this pattern could be due to peer exposure or to environmental factors associated with their care settings or diverse (i.e., multiple) arrangements, and our multivariate models allow us to better separate these possibilities.

The bivariate statistics in Table 4 look at the associations between children's health at each wave and subsequent changes in peer exposure between that wave and the following one; for example, children's health at 36 months and subsequent change in peer exposure between 36 and 42 months. For children's primary arrangements, more incidences of colds, flus, and ear infections were generally followed by less increase in peer exposure. The results for the estimates of children's health by total peer exposure revealed a similar picture, where children with more illness were exposed to fewer peers in subsequent waves of data collection than they were in the wave in which their health was assessed compared to children with less illness. These patterns are interesting, given the cross-sectional association between illness and *more* peer exposure, but they were not generally marked by statistically significant differences (indicated by the same superscript within columns). Thus, we turn to our multivariate models, which account for various confounds that may mask associations.

Multivariate Models

The multivariate analyses aim to tease out the significance of child care type, number of arrangements, and peer exposure for children's illness, explore whether these patterns varied by family SES, and assess any feedback of child illness to subsequent peer exposure in child care. Table 5 provides estimates of these associations net of observed time-varying and time invariant controls and fixed effects that accounted for unmeasured time-invariant factors. Note that the fixed effects specification restricted the analysis to within-child variation. Thus, estimates for type captured the distance between a child's mean levels of illness in center care or family care compared to that child's average level of illness in his or her own home. Estimates of peer exposure captured the child's average change in health associated with a unit change in that child's peer exposure. Model coefficients represent the average value of such child-specific differences for the entire sample.

We begin by mirroring the approach taken by prior studies looking at the type of primary care arrangement. The results of Model 1 suggest that illness increased when children were in a center ($b = .14$; $B = .08$) compared to their own home (as well as compared to the family care setting; not shown) but not when children were in family day care compared to being at home ($b = .09$; $B = .04$). Extending prior studies by adding peer exposure in the primary arrangement (Model 2) reduced the coefficient for center care to non-significance. Yet, peer exposure in the primary arrangement was significantly associated with child illness ($b = .11$, $B = .13$). Thus, children exposed to 5 more peers (an average group size) experienced, on average, .18 more illness, while children exposed to 25 more peers (a typical center size) experienced .35 more illnesses. The size of this standardized coefficient for peer exposure in the primary arrangement was 33% of the size of the standardized coefficient for the total

effect of mothers' college degree ($b = -.77$, $B = -.39$), a key demographic variable linked to child health that provides a benchmark for the salience of this peer effect. These findings suggest that the association of center care with more colds, flus, and ear infections is driven by the greater number of children in these settings, which appears to have major implications (relative to another important factor) for health.

Given the prevalence of multiple arrangements during the preschool years, Models 3 and 4 extended previous studies by examining *any* center and family day care use, children's *total* peer exposure across care arrangements, and the association between multiple care arrangements and child illnesses. The results in Model 3 captured a larger association between *any* center care and children's colds, flus, and ear infections ($b = .28$; $B = .16$) compared to Model 1, in which center care reflected the *primary* arrangement. There was no significant association for any family day care or multiple arrangements with illness (although multiple arrangements was significantly associated with more illness when type of care was not controlled). Adding total peer exposure to the model (Model 4) reduced the size of the coefficient for any center care ($b = .22$; $B = .12$), but only modestly, and it remained significant and was roughly 31% the size of the effect of mothers' college degree. This effect size for any center suggests that children average .22 more illnesses when experiencing any center care than exclusive parental care. In contrast to Model 2, the measure of total peer exposure was not significant.

Supplemental analyses of Model 4 in which peer exposure in the primary arrangement replaced the measure of total peer exposure revealed a statistically significant effect of peer exposure. This finding suggested that peer exposure in the primary arrangement may be associated with more child illness but that additional peer exposure beyond the primary arrangement does not seem to present additional risk of illness. Coefficients of any family care and multiple arrangements remained nonsignificant in this supplemental model.

We next considered interactions with SES. Most were nonsignificant and are not shown in the tables, including interactions between quartile measures of family income-to-needs and peer exposure and interactions between both measures of socioeconomic background (maternal education and family income-to-needs) and multiple care arrangements or arrangement type. The significant interactions between maternal education and peer exposure are shown in Models 5 and 6. Results from Model 5 revealed that peer exposure in the primary arrangement appeared to be associated with more illness only among children whose mothers did not have a high school degree. The significance of peer exposure for children of mothers with at least a high school degree was negligible. Model 6 produced similar findings, although the association between total peer exposure and illness for children of women without high school degrees was weaker.

Finally, Models 7–8 present the estimates of whether increases in children's illness led parents to move their children into smaller care arrangements. Peer exposure in the primary arrangement (Model 7) and all arrangements (Model 8) are now dependent variables, with lagged health (e.g., measured at the previous period) the independent variable. Time-varying covariates were measured at the time of peer exposure. These models revealed that children's illnesses were not significantly associated with their subsequent exposure to peers

in their primary care arrangement but were significantly and inversely associated with their subsequent exposure to peers in all care settings ($b = -.06$; $B = -.07$). We probed this pattern further by testing whether child health was associated with having multiple child care arrangements or any center care (versus all other types) at the following wave using logistic regression. These models revealed significant negative associations, suggesting that, as a result of children's incidence of illness, parents may limit their children's exposure to other peers by placing them in a single or non-center care arrangement. Interactions between the lagged measure of health and family socioeconomic variables (maternal education and income) were not statistically significant.

Discussion

Early child care is a pressing social issue, driven by the rise in families with two working parents and single parent families headed by labor force participants, and push toward reducing kindergarten readiness gaps (Casper and Bianchi 2002; Magnuson et. al 2004). For child care research looking at children's outcomes, most often the focus has been on the benefits of formal care arrangements for cognitive and socioemotional development. Yet non-parental care also comes with some risks to health that could chip away at these benefits. This possibility has drawn little interest from sociologists. As such, our knowledge of the subject is largely limited to correlational conclusions in the public health literature about associations between center care and children's increased risk of common illness. Our study demonstrates how sociologists can contribute important insights about this linkage by drawing on our understanding of contemporary family life and patterns of non-parental care usage, cutting edge statistical techniques, and theoretical frameworks central to medical sociology and related subfields.

To begin, findings from this study separated peer exposure from type of care as risks to preschool aged children's health. These findings have relevance to epidemiological frameworks, highlighting the risk of contagion associated with larger child care settings. They also have implications for parents, as media attention surrounding the risks of child care for health has targeted centers without clarifying whether centers with smaller versus larger sized classrooms might pose different degrees of risk (Chicago Sun Times 1992; New York Times 1983). Because center care, compared to all other arrangements, provides the greatest opportunity for children to acquire school readiness skills, this singular focus on type runs counter to current efforts that encourage center care use as a strategy for reducing early achievement gaps (Magnuson et. al 2004). These findings also suggest that policymakers should pay attention to health alongside the cognitive or psychosocial aspects of child development when setting group size limits for child care licensing standards and direct parents attention to group size when evaluating different care settings of the same type.

At the same time, when we looked across all care settings, we verified that center care posed an independent risk to children's illness, net of the number of peers served there. This finding is important because it reflects the nearly one-quarter of the children who had experienced some center care, but for whom center care was not the primary arrangement. It also captured the fluidity in children's secondary arrangement. On average, 24% of children

in the study were in a center at one wave but not the previous or subsequent waves. Yet, children's primary arrangement was typically more fixed (i.e., less than 13% switched between centers and non-centers as the primary arrangement between waves). Given our fixed effects approach, reduced variability in the primary center variable is likely why we did not detect a significant effect. Our explanation for why transmission rates are greater in centers than other settings is based on ecological theory (Sameroff 1983), which led us to consider how such settings offer a multitude of play materials in many different spaces; have larger child-staff ratios that challenge caregivers' monitoring of children's hygiene practices (e.g., children's own hand washing); and expose children to children, teachers, and parents connected to other classrooms and ancillary parts of the center care system (e.g., office staff). As such, these results recognize how the structure of centers is different from other arrangements and how the development and implementation of strategies to reduce disease spread in centers may need to be somewhat different for homes (Larson, Lin, and Gomez-Pichardo, 2004; Wrigley and Dreby 2005).

After accounting for care type and peer exposure, this study found that children who experienced multiple arrangements were not sick more often. This finding was counter to our expectation. Drawing on an ecological model, we theorized children in multiple arrangements would in each context be introduced to diverse sources of disease, thus increasing exposure to different types of illness (e.g., see Chen 2013). We find that multiple arrangements do not appear to pose additional health risks after accounting for other correlated factors, particularly whether the child spent time in a center. Indeed, an average of 70% of families in the SECCYD that relied on multiple arrangements had their child in a center. Although we did not find that multiple arrangements predicted health, the use of multiple arrangements remains salient to policymaking for other reasons, both positive (providing access to part-day preschool to reduce disparities in school readiness) and negative (parents' reliance on patchworks of arrangements because informal care options are unreliable or unavailable) (Clarke-Stewart and Allhusen 2004).

Additionally, we did not find that SES moderated the links of arrangement type or multiple arrangements with children's illness. Yet, we did find that the health consequence of peer exposure in care, particularly in the primary arrangement, was concentrated among children of mothers that did not have high school degrees. We suspect that this pattern has to do with the types of jobs available to less educated mothers that are often unstable, do not provide sick time, and are not salaried—and the fact that children of women with low levels of education are likely to be in care settings with children of similar circumstances. Thus, compared to settings attended by other children, there is likely more illness being transmitted in care settings of children of the least educated women. Although we could not test this idea with our data, which would require information on the other children in the setting and their parents, we hope to in the future. Doing so would provide support for proposed federally funded facilities to care for sick children and the need for improved sick leave benefits (Bright Horizons Family Solutions 2012; Ho 2000).

We should acknowledge that the same pattern was not observed for income. Our education-related finding may, therefore, also be partly explained by evidence which suggests education is a more powerful predictor of parents' ability to identify higher quality and

presumably healthier care environments than income (Clarke-Stewart and Allhusen 2004). Thus, this finding additionally underscores the importance of increasing less educated parents' access to quality care options and providing them with information about what to look for when evaluating health aspects of care. Returning to the population framework that inspired this analysis, it also reflects the increasing salience of education as the primary determinant of population-level health disparities today (Mirowsky and Ross 2003).

Finally, parents seemed to adjust their children's care arrangement as a result of illness. Previous research has focused on the link from care setting to illness. Our findings underscore the importance of future attention to this bidirectional association. Topics of inquiry could be how parents rework their children's care when dealing with illness, or the impact of this type of disruption on parents' labor market outcomes. Given the difficulty of rearranging children's care, particularly for working parents (Heyman, Toomey, and Furstenberg 1999), such studies could include attention to the private, and proposed federally funded, facilities to care for sick children mentioned above (Bright Horizons Family Solutions 2012; Ho 2000). Such findings also suggest that resource and referral resources and state Quality Information and Ratings Systems should provide parents with separate information about the quality of a setting for supporting child health versus other domains of development (Layzer and Goodson 2006; Zaslow et al. 2011). Doing so may increase consumer attention to disease transmission and encourage providers to better implement infection control practices.

Of course, this study has shortcomings that need to be acknowledged. Foremost, our measures of child health were mother-reported. Although the fixed effects models captured stable confounds that may have influenced such reports, we could not account for unmeasured time-varying confounds (e.g., associated with changes in family circumstances) that could have altered parents' perceptions of their children's health or access to health professionals that diagnose certain illnesses. We also could not account for factors that may protect children from illness at home but not in other arrangements (e.g., parental caregivers are most committed to protecting their children's health). As such, although we could adjust statistically for measured characteristics and unmeasured fixed characteristics, we still could not infer cause from these estimates. We also acknowledge that we measured children's peer exposure in their classrooms and could not capture children's contact with peers and adults from other classrooms during transition periods, multi-class activities, or in common spaces. Future studies that measured exposure to all children and adults in every context could test this potential mechanism for the effect of center care. Lastly, although we expect that the mechanisms linking children's exposure to pathogens in care and their health (as well as parents' concerns about health risks associated with group-based care) have been stable across the last few decades, we recognize that our data are from the 1990s and that the collection of more recent similarly fine-grained longitudinal data would be desirable.

Devoting more attention to the health dimensions of child care is an important goal, not only because common illnesses are unpleasant for children but because they can be disruptive to children's development, parents' work schedules, and public efforts to position child care as a mechanism for reducing social inequality. This study took steps toward this goal by highlighting the independent risks of disease transmission associated with greater peer

exposure, especially for children of the least educated mothers; the environmental risks associated with center care but not multiple care arrangements; the impact that illness has on how families organize their children's care; and the broader implications of these findings for health policy and intervention.

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Appendix A

Fixed Effects Models of Child Illness and Child Care Variables for Children Present in the SECCYD at 54 Month Data Collection ($N = 1,083$)

	<i>b (SE) Child Illness</i>						<i>b (SE) Peers</i>	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7 ^a	Model 8 ^b
<i>Contemporaneous Peer Exposure</i>								
Peer exposure in primary arrangement	—	.12*** (.03)	—	—	.13* (.06)	—	—	—
Total exposure in all arrangements	—	—	—	.05 (.05)	—	.11 ⁺ (.06)	—	—
<i>Primary Care Variables (Reference = own home)</i>								
Center care primary arrangement	.15* (.07)	.09 (.07)	—	—	.06 (.05)	—	—	—
Family day care primary arrangement	.12 (.08)	.14 ⁺ (.07)	—	—	.05 (.06)	—	—	—
<i>All Care Arrangement Variables</i>								
Any center care	—	—	.28*** (.05)	.22* (.11)	—	.16* (.07)	—	—
Any family day care	—	—	.09 ⁺ (.05)	.09 (.08)	—	.08 (.05)	—	—
Multiple arrangements	—	—	.02 (.03)	.01 (.03)	—	.01 (.03)	—	—
<i>Maternal Education Interactions (Reference = less than high school)</i>								
High school degree (less than high school) × peers	—	—	—	—	-.16* (.05)	-.16* (.06)	—	—
Some college × peers	—	—	—	—	-.09 ⁺ (.07)	-.11 (.07)	—	—
College × peers	—	—	—	—	-.13 (.07)	-.11 (.07)	—	—
<i>Child Health</i>								
Lagged health problems	—	—	—	—	—	—	.01 (.02)	-.05* (.02)

Notes: Main effects of coefficients for education in Model 5 are: high school ($b=.28$, $SE=.10$), some college ($b=.16$, $SE=.10$), college ($b=.21$, $SE=.11$) and Model 6: high school ($b=.30$, $SE=.10$), some college ($b=.22$, $SE=.10$), college ($b=.16$, $SE=.12$). Other covariate coefficients not shown. Time-invariant covariates include child's race/ethnicity, health at birth, birth order, age of entry into non-parental care, total number of illnesses prior to 36 months, whether the mother breastfed the child, her education, average family income across waves, and the number of days she spent in the hospital following

the child's birth, and study site. Time-varying covariates include mothers' non-standard work schedule, the presence of the biological father in the home, and hours children spend in non-maternal care. Measures of peer exposure are logged. Model fit statistics presented for Model 1, but are similar for other models. $\chi^2=1963.82$, $df=197$, $p<.001$; CFI=.83; RMSEA=.02.

+ $p<0.10$.

* $p<0.05$.

** $p<0.01$.

*** $p<.001$.

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Table 1

Statistics for Time-Invariant Sample Characteristics and Factors Related to Children's Health and Experiences in Child Care ($N = 1,364$)

	<i>M (SD)</i>	Percent
<i>Children's Sociodemographic Characteristics</i>		
Gender (male)		51.65
White		76.42
Black		12.67
Other		10.92
Child first born		44.83
<i>Mothers' Sociodemographic Characteristics</i>		
Less than high school		10.70
High school graduate or less		21.39
Some college		33.33
College or greater		35.38
Married at birth		76.63
Average income-to-needs ^a	3.63 (2.93)	
Mother age at birth	28.11 (5.63)	
Number of spells of depression	.83 (1.25)	
<i>Child Health Factors</i>		
Health at birth fair or poor		2.93
Breast fed		71.42
Premature		5.12
Low birth weight		2.49
<i>Child Care Factors</i>		
Age of entry into child care ^b	11.83 (15.87)	

Notes:

^a Income-to-needs only measured at 36 and 54 month data collections.

^b Measured in months.

Table 2

Statistics for Selected Time-Varying Sample Characteristics and Factors Related to Children's Health and Experiences in Child Care ($N = 1,364$)

	Percent				
	36 Months	42 Months	46 Months	50 Months	54 Months
<i>Family Characteristics</i>					
Biological father in household	79.70	79.20	79.01	78.33	77.33
Mother non-standard work	15.49	19.44	18.35	18.52	17.84
<i>Child Care Arrangement</i>					
Multiple arrangements	26.59	51.05	53.01	48.86	50.13
Primary center care	32.24	43.16	45.52	43.03	46.34
Primary family day care	22.61	16.37	13.88	13.94	15.45
Primary own-home care	45.14	40.47	40.60	43.03	38.22
Any center care	35.77	51.13	55.67	54.90	73.70
Any family day care	28.70	25.02	24.23	21.24	21.55
bOnly child's own home	21.30	15.53	13.40	16.08	11.08
<i>M (SD)</i>					
<i>Peer Exposure</i>					
Peer exposure in primary arrangement	3.53 (2.32)	4.45 (2.37)	4.65 (2.32)	4.61 (2.41)	5.47 (2.18)
Peer exposure in all arrangements	7.30 (6.91)	9.10 (7.14)	9.59 (7.19)	10.17 (7.98)	13.15 (7.99)
<i>Hours in Care</i>					
Hours in primary arrangement	22.95 (18.46)	23.64 (17.22)	24.16 (17.05)	23.65 (17.79)	24.51 (16.18)
<i>Child Illness</i>					
Colds, flus and/or ear infections	1.29 (.89)	1.19 (.85)	1.21 (.88)	.95 (.85)	1.37 (.85)

Table 3

Bivariate Statistics of Child Illness by Child Care Variables (Total Peer Exposure, Primary Care Type, All Arrangement Types, and Number of Care Arrangements) at 36, 42, 46, 50, and 54 Month Data Collections ($N = 1,364$)

	<i>M of Colds, Flu and/or Ear Infections</i>				
	36 Months	42 Months	46 Months	50 Months	54 Months
<i>Total Peer Exposure (Coded into Quintiles)</i>					
Quintile 1	1.21 ^b	1.07 ^b	.99 ^b	.76 ^c	1.27 ^b
Quintile 2	1.25 ^b	1.06 ^b	1.15 ^b	.90 ^{cb}	1.37 ^{ab}
Quintile 3	1.36 ^{ab}	1.34 ^a	1.34 ^a	1.07 ^a	1.39 ^{ab}
Quintile 4	1.43 ^{ab}	1.36 ^a	1.32 ^a	1.12 ^a	1.43 ^{ab}
Quintile 5	1.40 ^{ab}	1.27 ^a	1.46 ^a	1.05 ^{ab}	1.46 ^a
<i>Number of Arrangements</i>					
One arrangement	1.25 ^b	1.11 ^b	1.10 ^b	.82 ^b	1.35 ^b
Multiple	1.40 ^a	1.27 ^a	1.32 ^a	1.08 ^a	1.39 ^a
<i>Primary Arrangement</i>					
Primary center care	1.42 ^a	1.26 ^a	1.31 ^a	.96 ^a	1.40 ^a
Primary family day care	1.21 ^b	1.15 ^a	1.21 ^{ab}	.94 ^a	1.46 ^a
Primary own-home care	1.24 ^b	1.14 ^a	1.11 ^b	.93 ^a	1.31 ^a
<i>All Care Arrangements</i>					
Any center care	1.43 ^a	1.31 ^a	1.35 ^a	1.07 ^a	1.41 ^a
Any family day care	1.25 ^b	1.22 ^a	1.22 ^{ab}	.96 ^{ab}	1.38 ^a
Only child's own home	1.21 ^b	1.05 ^b	1.03 ^b	.78 ^b	1.27 ^b

Notes: Values represents average number of total illnesses per child given their total peer exposure, number of arrangements, and exposure to different arrangement types. Quintile 1 represents lowest peer exposure group. Quintile 5 represents highest peer exposure group. The superscripts "a," "b," and "c" designate whether the within column mean values are significantly different from one another at the minimum probably level .05. The designation "a" is assigned to the coefficient with the highest value. The "b" designation thus indicates a statistically significant difference in means from the coefficients assigned the "a," that is also less in value. The "c" designation, which is less in value than "b" can be interpreted in the same way. Coefficients with the same superscript therefore do not significantly vary. These pairwise significance tests were determined by one-way ANOVA and Duncan's multiple range test. Any center care" and "any family day care" are not mutually exclusive groups, but children cared for only in their own home are not in either the "any center" or the "any family day care" group.

Table 4

Bivariate Statistics of Children's Change in Peer Exposure Between Adjacent Waves of Data Collection by Children's Number of Reported Illnesses at the Previous Wave ($N = 1,364$)

(M) Between Wave Change in Peer Exposure in the Primary Arrangement				
	36–42 Months	42–46 Months	46–50 Months	50–54 Months
<i>Child Illness at 36, 42, 46, or 50 Months</i>				
0 Illnesses	0.82 ^a	0.89 ^a	0.91 ^a	2.83 ^a
1 Illness	0.77 ^a	0.31 ^a	0.43 ^a	0.97 ^b
2 Illnesses	0.46 ^a	−0.26 ^a	−0.03 ^a	1.24 ^{ab}
3 Illnesses	0.52 ^a	0.01 ^a	0.32 ^a	2.34 ^{ab}
(M) Between Wave Change in Total Peer Exposure in All Arrangements				
	36–42 Months	42–46 Months	46–50 Months	50–54 Months
<i>Child Illness at 36, 42, 46, or 50 Months</i>				
0 Illnesses	2.37 ^a	1.66 ^a	1.66 ^a	3.90 ^{bc}
1 Illness	2.47 ^a	0.63 ^{ab}	0.48 ^{ab}	2.16 ^c
2 Illnesses	1.29 ^a	−0.18 ^b	0.37 ^{ab}	5.16 ^a
3 Illnesses	1.65 ^a	−0.33 ^b	−1.00 ^b	5.01 ^{ab}

Notes: Values represent average change in peer exposure between waves for children with different levels of illness. For example, peer exposure change for 36–42 months corresponds to children's illness at 36 months. Peer exposure change for 42–46 months corresponds to children's illness at 42 months. The superscripts "a," "b," and "c" designate whether the within column mean values are significantly different from one another at the minimum probably level .05. The designation "a" is assigned to the coefficient with the highest value. The "b" designation thus indicates a statistically significant difference in means from the coefficients assigned the "a," that is also less in value. The "c" designation, which is less in value than "b" can be interpreted in the same way. Coefficients with the same superscript therefore do not significantly vary from each other. These pairwise significance tests were determined by one-way ANOVA and Duncan's multiple range test.

Table 5

Fixed Effects Models of Child Illness and Child Care Variables ($N = 1,364$)

	<i>b</i> (SE) Child Illness								<i>b</i> (SE) Peers	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7 ^a	Model 8 ^b	Model 7 ^a	Model 8 ^b
<i>Contemporaneous Peer Exposure</i>										
Peer exposure in primary arrangement	—	.11*** (.03)	—	—	.13* (.06)	—	—	—	—	—
Total exposure in all arrangements	—	—	—	.04 (.04)	—	.11 ⁺ (.06)	—	—	—	—
<i>Primary Care Variables (Reference = own home)</i>										
Center care primary arrangement	.14* (.06)	.08 (.07)	—	—	.06 (.05)	—	—	—	—	—
Family day care primary arrangement	.09 (.07)	.10 (.08)	—	—	.05 (.05)	—	—	—	—	—
<i>All Care Arrangement Variables</i>										
Any center care	—	—	.28*** (.05)	.22* (.10)	—	.16* (.07)	—	—	—	—
Any family day care	—	—	.06 (.05)	.04 (.07)	—	.08 ⁺ (.05)	—	—	—	—
Multiple arrangements	—	—	.04 (.03)	.02 (.04)	—	.02 (.03)	—	—	—	—
<i>Maternal Education Interactions (Reference = less than high school)</i>										
High school degree (less than high school) × peers	—	—	—	—	-.17** (.07)	-.16* (.06)	—	—	—	—
Some college × peers	—	—	—	—	-.07 (.07)	-.11 ⁺ (.06)	—	—	—	—
College × peers	—	—	—	—	-.12 ⁺ (.07)	-.11 ⁺ (.06)	—	—	—	—
<i>Child Health</i>										
Lagged health problems	—	—	—	—	—	—	-.02 (.02)	-.06** (.02)	—	—

Notes: Main effects of coefficients for education in Model 5 are: high school ($b=.28$, $SE=.10$), some college ($b=.16$, $SE=.10$), college ($b=.21$, $SE=.11$) and Model 6: high school ($b=.30$, $SE=.10$), some college ($b=.22$, $SE=.10$), college ($b=.16$, $SE=.12$). Other covariate coefficients not shown. Time-invariant covariates include child's race/ethnicity, health at birth, birth order, age of entry into non-parental care, total number of illnesses prior to 36 months, whether the mother breastfed the child, her education, average family income across waves, and the number of days she spent in the hospital following the child's birth, and study site. Time-varying covariates include mothers' non-standard work schedule, the presence of the biological father in the home, and hours children spend in non-maternal care.

Measures of peer exposure are lagged. Model fit statistics presented for Model 1, but are similar for other models. $\chi^2=2543.85$, $df=201$, $p<.001$; $RMSEA=.07$; $SRMR=.05$.

⁺ $p < 0.10$.

* $p < 0.05$.

** $p < 0.01$.

*** $p < .001$.