Title: **Dyadic and Dynamic Relationships: An Extension of the SES-Health Framework**

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Much research has focused on the complex web of the determinants and consequences of individual socioeconomic status (SES) and health over the life course (Adler et al, 1994; Link and Phelan, 1995; House and Williams, 2000; Lynch, 2003; Palloni, 2006; Herd et al, 2007; Warren and Hernandez, 2007). Families are also an important component for investigating the determinants and consequences of individual SES and health outcomes. Previous research has examined the association of parental health, well-being, and SES with child health, well-being, and SES (Elo and Preston, 1992; Conley and Bennett, 2000; Finch, 2003; Hayward and Gorman, 2004).

Rather than viewing health as an individual process, a dyadic perspective posits that the health of each member of the family system will affect the health, well-being, and other life factors of the other members of that system. In order to fully explicate the relationship between SES and health for an individual, the dyadic association between parent-child SES and health should be extended to account for the how child health may affect parental SES and health. This analysis seeks to determine the impact of child health on maternal health and mental health using nationally representative and longitudinal data—women from the National Longitudinal Study of Youth 1979 cohort and their children. Prior research finds that poor child health may present an additional risk for maternal health, mental health, and socioeconomic outcomes because poor child health can place physical, financial, time, and psychological burdens on the family. This analysis will expand upon prior research by using regression analyses to explore the extent to which child health modifies the effect of maternal SES on maternal health and mental health.

The mother-child relationship when the child lives at home is a critical stage in the lifecourse, where the health of a child has particular ramifications for the SES and health of the mother. However, this stage in the lifecourse lasts for several years and can consist of several changes in health and SES for both mother and child. In addition to considering the relationship between child health at one time and subsequent maternal outcomes, this analysis will explore the dynamic relationship between child health and maternal SES and health by examining how the trajectory of child health interacts with maternal SES to affect subsequent maternal health and mental health. In particular, this analysis will use growth mixture modeling to group children into meaningful classes based on their health trajectory over at least three points in time, and then use these classes as an independent variable in the regression analyses that explore the extent to

which child health modifies the effect of maternal SES on maternal health and mental health (Jung and Wickrama, 2008; Muthén, 2004; Wang and Bodner, 2007). Using child health trajectories in the analysis will help to determine whether child health has a cumulative exposure relationship to subsequent maternal outcomes, where poor child health over time is a cumulative disadvantage and good child health over time is a cumulative advantage (DiPrete and Eirich, 2006).

Literature

The analytic question is grounded in social ecological systems theory (Bronfenbrenner, 1977), which describes the nested hierarchy of the family and social contexts in considering adaptations to chronic illness. The theoretical framework posits that there are mutually influencing effects among the proximal (members of the family) and more distal (culture, school, labor markets) environments in which members of the family are embedded, such that outcomes of interest are a function of interplay of these heterogeneous and interdependent components over time (Diez Roux, 2007; Thompson and Gustafson, 1996). Particular to this analysis, stress on any person in the family system (in this case, a child with health conditions) will influence the health, mental health, and socioeconomic outcomes of members of the family (in this case, the mother).

Prior studies document the effect of child health on parental health and mental health and socioeconomic outcomes (Baker et al, 2002; Glidden and Schoolcraft, 2003; Hastings et al, 2006; Kulthau and Perrin, 2001; Singer, 2006). However, many of these studies come from convenience samples or families that are seeking health care at a single clinic. Such studies may be biased and therefore ungeneralizable if the referral patterns of the families in the study is different from families who do not participate in the study yet have a child with a similar condition (Barlow and Ellard, 2006). Furthermore, many of the studies are cross-sectional, leaving the direction of the relationship to be determined. As a result, population-based and longitudinal studies are needed for representative and statistically powerful samples of children and families.

A few studies have utilized longitudinal, population-based data to demonstrate and association between having a child with health conditions and poor maternal health and mental health as well as an increased number of lost workdays or reduced number of hours worked compared to parents of children without such limitations (Witt et al, 2009; Witt, Riley, Coiro, 2003).

Hypotheses

The current study proposed expands upon prior studies in two ways. While studies have established the association of child health with maternal health, mental health, and socioeconomic characteristics, no study has explore the extent to which child health conditions modify the effect of maternal SES or other known maternal health covariates on maternal health and mental health. It is expected that the effect of maternal SES on maternal health and mental health will depend on child health, such that poor child health exacerbates the effect of poor socioeconomic characteristics on maternal health and mental health.

This study also expands upon prior research by dynamically defining child health, using growth mixture modeling techniques to define classes of child health trajectories to be used as the measure of child health for analysis. The analysis will first examine the association between child health trajectories and subsequent maternal health, mental health and SES, then examine the interaction between child health trajectories and

maternal SES in their effect on maternal health and mental health. Growth mixture modeling is expected to yield different child health trajectories, including a trajectory class of cumulative exposure to having a child in good health at every wave and a trajectory class of cumulative exposure to having a child in poor health at every wave. The latter is expected to modify the effect of poor maternal SES on poor maternal health and mental health when the trajectory classes are included in the analysis as the main independent variable. The growth mixture models are also expected to yield more heterogeneous trajectory classes, such as poor health that has resolved over time or poor health that is newly reported, and it will be interesting to see how these trajectory classes compare to the cumulative exposure classes in terms of their interaction with maternal SES and subsequent effects on maternal health and mental health.

Study design, population, and data sources

Data are from the National Longitudinal Study of Youth 1979 (NLSY79), a nationally representative sample of 12,686 men and women who were between the ages of 14 and 22 when first surveyed in 1979 (http://www.bls.gov/nls/nlsy79.htm). Data were collected yearly from 1979 to 1994, and biennially from 1996 to the present, initially to chronicle the labor force experience of this cohort. However, other sets of questions have been added over the years and broadened the scope of the survey. Starting in 1986, data on the children of NLSY79 female respondents have been collected from both the mothers and children (http://www.bls.gov/nls/nlsy79ch.htm).

The analytic sample is made up of mother-child dyads, and includes mothers of children aged 0 to 18 years who were interviewed about their health in the over-40 health module that took place in five waves between 1998 and 2006. The sample is restricted to mothers of children aged 18 and under who answered the maternal health and mental outcomes of interest, self-reported health and depressive symptoms. Among households where only one child has an activity limitation (the measure of child health in this analysis), that child is selected to represent the household. In households where more than one child has a limitation, one child with a limitation is randomly selected. One child is randomly selected to represent the household in households where no child has activity limitations.

Measures

Dependent variables

The maternal health outcome of interest for this analysis is self-reported health, because it is one of the best predictors of subsequent health and mortality (Idler and Benyamini, 1997). The maternal mental health outcome of interest is having depressive symptoms, based on the sum of nine items from the Center for Epidemiologic Studies Depression scale (Radloff, 1977). Other maternal health outcomes gathered during the over-40 health module will also be considered for analysis.

Independent variables

Child health is operationalized as having activity limitations in this analysis. Questions about activity limitations capture how children are physically, emotionally, or cognitively limited in a way that affects their age-appropriate activities, regardless of any medical conditions or diagnoses (Witt et al, 2009). A recent study estimates that 15.6% of parents reported that they are caring for a child with an activity limitation (Witt et al, 2009). Eleven percent of the mothers in the proposed sample reported having a child with an activity limitation at baseline. However, there appears to be variation in activity

limitation status over time. Looking at two waves of data, 9% of the sample reported a child activity limitation in the first wave but not the second wave, 11% of the sample reported a child activity limitation in the second wave but not the first wave, 8% reported activity limitations in both waves, and 72% reported no activity limitations in either wave. Several waves of the NLSY data will be used to create an independent variable of trajectory classes, in order to assess the association between child health trajectories and maternal health, mental health, and socioeconomic outcomes, and the interaction between child health trajectories and maternal SES in their effect on maternal health and mental health.

Maternal SES is the other key independent variable of interest, and there are several socioeconomic variables in the NLSY that will be used as separate measures of SES in this analysis: Family poverty status, any time unemployed, any time out of the labor force, number of days of work missed, number of hours worked, and job satisfaction ratings.

Other demographic and baseline variables will included as controls in the analysis where appropriate, including child age and maternal race, age, education, smoking, BMI, marital status, poverty status, any time unemployed or out of the labor force, household income, health condition that limits working for pay, depressive symptoms, number of children in the household, and number of children with activity limitations.

Statistical analyses

All analyses will be conducted with Mplus and use survey procedures to correct for the complex sample design of the NLSY. Ordered logistic regressions will be performed when maternal health is the dependent variable, and OLS regression will be performed when maternal mental health is the dependent variable.

Growth mixture modeling will be used to create the child health trajectory independent variable. Growth mixture modeling is a method that captures information about interindividual differences in intraindividual change over time, taking into account that there is unobserved heterogeneity (subgroups) within the larger population. More specifically, growth mixture models use categorical latent variables that represent subgroups that are not known but inferred from the data, and these subgroups correspond to different latent trajectory classes, rather than one trajectory class representing the entire population as in conventional latent growth modeling (Jung and Wickrama, 2008; Muthén, 2004; Wang and Bodner, 2007).

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