Effects of Family Health Shocks on Food Insecurity:

Evidence from Two National Surveys

Nancy E. Reichman
Robert Wood Johnson Medical School
& Princeton University

Hope Corman
Rider University & NBER

Kelly Noonan
Rider University & NBER

Food insecurity, which represents deprivation of an essential aspect of human well-being, has increased substantially in the U.S. over the past decade (alongside the obesity epidemic) and the reasons for this trend have not been established. In 2001, the first year that the Current Population Survey started collecting food insecurity data consistently in December of each year, 10.7% of households in the U.S. were food insecure (defined by the USDA as not having consistent access to enough food for active, healthy lives for all members) at some point in the past twelve months; that figure increased to 14.5% in 2010 (Coleman-Jensen et al. 2011). Among U.S. households with children in 2010, 8.8% included one or more children who experienced food insecurity (defined by the USDA as having their food intake reduced and their normal eating patterns disrupted because the household lacked money and other resources for food) in the past 12 months (Coleman-Jensen et al. 2011). Income is perhaps the strongest known correlate of food insecurity, although many poor families do not experience food insecurity and some non-poor families are food insecure (Rose 1999; Gundersen & Gruber 2001).

Gundersen and Gruber presented a theoretical model in which households make consumption decisions over multiple periods based on their expectations of future income, their current income, their stock of savings, and their ability to borrow. They argued that unexpected negative changes to a household's budget can make a family vulnerable to food insufficiency (a term somewhat narrower but closely related to food insecurity, as discussed by Scott and Wehler (1998), and therefore, it is necessary to move beyond current or average income to consider other aspects of financial wherewithal as explanations for food insufficiency.

Another, seemingly unrelated, literature has focused on the effects of health shocks on economic outcomes, as distinct from the reverse and much more studied question, of how economic circumstances affect health. This literature has generally focused on the elderly. Very few studies have investigated the effects of health shocks on economic outcomes at younger ages, when there may be less financial buffer to overcome the expenses and potential loss in income resulting from health shocks. Notable exceptions focus on effects of two types of health shocks—severe infant health conditions and depression—on family economic outcomes. Recent studies based on the Fragile Families and Child Wellbeing birth cohort study have found that infant health shocks reduce parents' labor supply (Corman et al. 2005; Noonan et al. 2005) and increase homelessness (Curtis et al. 2013), which is strongly associated with food insecurity (Gundersen et al. 2003). These studies used a combination of methods to address the potential endogeneity of health (that is, to characterize health shocks). Other studies have found adverse effects of female depression on labor market outcomes. For example, using nationally representative data from 1990 to 1992 and addressing the potential endogeneity of depression by using family members' history of mental health problems as identifiers for depression in 2-stage models, Marcotte, Wilcox-Gok and Redmon (2000) found negative effects of female depression on both earnings and employment.

The theoretical arguments posited by Gundersen and Gruber, along with the economic literature on the effects of health on individuals' economic outcomes, suggest that exogenous health shocks would have adverse effects on food insecurity. We will test these propositions, which have rarely been explored in research on food insecurity, and as far as we know, never on children's food insecurity. Exploiting shocks is important for establishing the temporal order of events and because observed changes in health status or income may reflect unobserved tastes and risk preferences. Specifically, we will investigate the effects of different types of health shocks, one at the individual level (postpartum depression) and another at the family level (the birth of a child with a severe medical condition), on children's and families food insecurity.

The two health shocks we will investigate, severe infant health conditions at birth and maternal postpartum depression, both defined later, have large random components based on what we know from medical science and previous research and also affect family resources. As such, they can be considered income-related shocks and used to test the Gundersen and Gruber theory. The potential effects of health shocks on food insecurity are also interesting and important in their own right: According to Gundersen, Kreider and Pepper (2011), " In the main, the literature on the effects of food insecurity on health outcomes has implicitly assumed that food insecurity has an influence on health outcomes, rather than the other way around…Research on the impact of health care limitations on food insecurity would be of interest, especially when the causal direction is mixed, both in terms of improved estimates of the impact of food insecurity and in terms of further delineating the causes of food insecurity (p. 298)." In this vein, the analyses of the effects of infant health shocks and postpartum depression will point to the importance of health as a determinant of food insecurity as well as contribute to the literature on the effects of food insecurity on physical and mental health by highlighting the potential importance of reverse pathways.

Very few studies have investigated the effects of health on food insecurity. She and Livermore (2007) and Huang, Guo and Kim (2010) studied the effects of adult work disability and found that households of disabled adults are at increased risk of experiencing food insecurity. Neither study explicitly addressed the potential endogeneity of disability status. That is, disability was not measured as a random shock. Sullivan, Turner and Danziger (2008) investigated the effects of physical health status and mental health disorder on food insufficiency, using panel data on current and previous welfare recipients. To address the possibility that important unobserved characteristics may be correlated with both health and food insufficiency, they estimated a fixed effects model wherein they controlled for time-invariant characteristics of the mother that may affect both health and food insufficiency. They also estimated Ordinary Least Squares (OLS) models, which did not address potential endogeneity. In both specifications, they found that mental health disorders had a positive effect on food insufficiency.

As far as we know, no studies have assessed the effects of health *shocks* on food insecurity or the effects of health on food insecurity of children. This study will address this gap by separately estimating the effects of two different types of family health shocks—infant health shocks and maternal postpartum depression—on various measures of household and child food insecurity. The findings will establish the importance family health events in triggering food insecurity and have broad implications for the persistent knot between socioeconomic status and health over the lifecourse.

To characterize infant health shocks, we will use measures of severe infant health conditions that were coded by a pediatric consultant to be those that are considered by the medical community to be random in the population (in particular, unrelated to maternal prenatal behavior) and associated with substantial morbidity. These measures have been shown in much previous research to be unrelated to maternal characteristics and to “pass” many stringent model specification and falsification tests (e.g., Corman et al. 2011; Curtis et al. 2010; Curtis et al. 2013; Reichman et al. 2006; Schultz et al. 2009).

Maternal postpartum depression, defined as moderate to severe depression in a woman after she has given birth, is experienced by 10-20% of women within 6 months of delivery (Miller 2002). A fairly recent meta-analysis found that postpartum depression is not significantly related to maternal age, marital status, length of relationship with partner, education, number of children, parity, or pregnancy employment status, and that the associations between postpartum depression and both income and occupation, though statistically significant, are small (O’Hara & Swain 1996). Despite the seeming randomness of postpartum depression based on sociodemographic characteristics, however, the largest risk factor for postpartum depression is past history of psychopathology (O’Hara & Swain 1996)—an issue we will explicitly address in our modeling strategy.

Data

We use two national datasets for this study—the Fragile Families and Child Wellbeing study (FFCWB) and the Early Childhood Longitudinal Study—Birth Cohort (ECLS-B).

Fragile Families and Child Wellbeing Study (FFCWB)

The FFCWB study follows a cohort of parents and their newborn children in 20 large U.S. cities (in 15 states). The study was designed to provide information about the conditions and capabilities of new (mostly unwed) parents, the determinants and trajectories of their relationships, and the consequences of welfare reform and other policies. Births were randomly sampled births in 75 hospitals between 1998 and 2000. By design, approximately 75% of the mothers were unmarried. Face-to-face interviews were conducted with 4,898 mothers while they were still in the hospital after giving birth (see Reichman et al., 2001 for a description of the research design). The postpartum (baseline) response rate was 86% among eligible mothers.

Follow-up interviews were conducted over the telephone approximately 1, 3, and 5 years after the birth of the focal child (there was also a 9 year follow-up that we will not be using for this project because it includes very few questions about food insecurity). Eighty nine percent of the mothers who completed postpartum interviews were re-interviewed when their children were 1 year old, 86% of mothers who completed baseline interviews were re-interviewed when their children were 3, and 85% of mothers who completed baseline interviews were re-interviewed when their children were 5 years old.

As part of an "add on" study to the core survey, data from medical records (from the birth hospitalization) of the mother and child were collected using a detailed instrument based on the U.S. Standard Certificate of Live Birth and that also included other information including the mother's physical and mental health history. The availability of medical record data depended, for the most part, on administrative processes of hospitals rather than decisions on the part of survey respondents to make their records available. Medical record data, needed for the analyses of health shocks, were available for 3,684 (75%) of the 4,898 births in the FFCWB sample.

Early Childhood Longitudinal Study—Birth Cohort (ECLS-B)

The ECLS-B is a nationally representative panel study of over 10,000 children born in the United States in 2001. Births were sampled from Vital Statistics records and consist of children born in 2001 who were alive at 9 months, had not been placed for adoption, and were born to mothers aged 15 years or older (Bethel et al. 2005). Twins, low birthweight infants, and American Indian/Alaskan Natives and Asian/Pacific Islanders were oversampled. The initial (baseline) survey was conducted when the child was 9 months old, and follow-up surveys were completed at 2, 4, and 5 years. Additionally, the ECLS-B includes detailed data on maternal and infant health from the infants' birth records (as recorded in the Standard Certificate of Live Birth). Data can be weighted to produce nationally representative results.

Measures of food insecurity

Both the 3- and 5-year waves of FFCWB and all waves of the ECLS-B include the Core Food Security Module needed to create measures of low food security households, very low food security households, low food security among children, and very low food security among children. In addition, in each follow-up wave of the FFCWB study we will be using (1, 3, and 5 years) mothers were also asked whether they received free food in the past 12 months because there wasn't enough money for food, and at 1 and 5 years they were also asked about their own hunger as well as the hunger of their child in the past 12 month period. These ancillary questions will be used to create measures of not being able to afford food and hunger. We will focus our analyses primarily on food insecurity of children, but will also explore other household food insecurity measures in order to gain a more complete picture of the effects of the health shocks we examine on food insecurity of families with young children.

Rationale for using the two datasets

Both FFCWB and ECLS-B are highly appropriate for studying the effects of infant health shocks and PPD on young children's food insecurity. That said, each has unique strengths and minor limitations.

The key advantage of FFCWB is that it allows us to construct better measures of health shocks than is possible with the ECLS-B. The FFCWB include detailed data on the child's health at birth from hospital medical records as well as from mother's survey reports, allowing us to construct measures of infant health conditions that are present at birth and considered by the medical community to be random in the population. The measures of infant health shocks available in the ECLS-B come from the birth certificate module and from similar maternal survey questions as in FFCWB. However, many newborn conditions are seriously underreported in birth records, as has been shown in many studies comparing birth records to medical records, including two studies of our own (Reichman & Hade 2001; Reichman & Schwartz-Soicher 2007). For PPD, the only measure of depression during the mother's postpartum year in the ECLS-B is based on a scale administered at the 9 month interview and pertaining to the past week, and the study does not include any measures of the mother's history of depression (before the birth of the focal child). In contrast, FFCWB includes an assessment of depression at the 1 year follow-up interview that pertains to the past 12 months and includes information on documented mental illness prior to the birth from the mother's medical record, allowing us to create measures of not only of *being depressed* during the postpartum period, but also measures of *becoming depressed* after the birth of the child. More specifics about the measures of infant health shocks and PPD from each of the two datasets are provided in the Methods section below.

Other advantages of the FFCWB data are that: (1) The initial (baseline) interviews took place at the time of the birth, allowing us to control for pre-birth sociodemographic variables when analyzing the effects of health shocks that stem from the birth of the child. In the ECLS-B, most sociodemographic characteristics of parents (e.g., living arrangements, father's employment) were assessed 9 months after the focal child was born, and thus (based on our past research and that of others—e.g., Reichman, Corman & Noonan 2004; Corman, Noonan & Reichman 2005, Noonan, Reichman & Corman 2005) may represent potential pathways through which the health shocks affect food insecurity, as opposed to pre-existing differences between those experiencing and not experiencing health shocks. As such, including those factors as controls may underestimate the effects of health shocks on food insecurity. (2) The oversampling of nonmarital births resulted in a relatively socioeconomically disadvantaged (and policy relevant) sample that may be particularly susceptible to the effects of health shocks, allowing us to detect effects (should there be any) in a relevant population. (3) We have access to spatial coordinates of the respondents' residential addresses, allowing us to calculate distances from institutions to use as instrumental variables (described later in the Methods section).

Advantages of ECLS-B are that: (1) It includes the full USDA food security module at every follow-up wave, allowing us to investigate the effects of infant health shocks on food insecurity at time points earlier than age 3 (specifically, at 9 months and 2 years) and to better assess persistence of food insecurity over time. In FFCWB, the full food security module is available only at 3 and 5 years after the birth of the focal child. (2) It is nationally representative, allowing us to include, and/or conduct separate analyses of, families in rural areas. In contrast, FFCWB sampled an exclusively urban population. (3) It has a larger sample size than FFCWB (approximately 10,000 in the overall sample, compared to about 5,000 in FFCWB), better allowing us to study rare outcomes, such as very low food security among children.

Both data sets include rich measures to use for control variables or as stratifiers (see Methods section below for specifics); state of residence at each wave (city in FFCWB), which allows us to control for potential state level confounders; and geocodes (spatial coordinates, census tracts, and zip codes for FFCWB; zip codes for ECLS-B), which allow us to attach local contextual measures (such as availability of mental healthcare providers at the zip code level). Both include measures of the infant's father's depression (FFCWB at the time of the birth of the focal child; ECLS-B at 9 months and pertaining to the past week) and information on family member's history of depression (mother's parents in FFCWB; any blood relative in ECLS-B). Overall, these two rich datasets will allow us to conduct analyses that overlap as well as provide unique dimensions (e.g., ECLS-B will allow us to study rural populations). Consistent results across the two data sets would provide strong and robust results, while inconsistent results would be less conclusive but would provide important context for interpreting our results.

Methods

As indicated in the background section, the goal of the proposed project is to investigate the effects of health shocks on children's and families' food insecurity. We will exploit shocks that are arguably exogenous, explore exogeneity assumptions, use rich control variables, and employ econometric techniques designed to address potential endogeneity that may remain.

Our basic specification, generalized as Equation 1 below, will be a multivariate equation model that estimates the impact of a health shock at time *t* on food insecurity one or two time periods in the future.

(1) $\textit{Food Insecurity}_{t+1 \text{ or } t+2} = f\,(\textit{health shock}_t$*, maternal characteristics, family characteristics, neighborhood characteristics, city characteristics).*

As indicated earlier, we will separately focus on two birth-related health shocks that occurred either at the time of birth or during the postpartum year —(1) the birth of a child with a serious health condition that is considered random in the population (compared to the birth of a healthy child), and (2) maternal postpartum depression. We will use functional forms consistent with the categorical nature of the dependent variables; e.g., we will estimate probit and/or logit models for dichotomous dependent variables.

Characterizing infant health shocks

With our goal of isolating causal effects of infant health shocks on food insecurity, we will consider four different measures of poor child health and compare estimates based on the different measures. The ideal measure of poor child health would: (1) characterize a health shock that was both present at birth and unlikely a function of parental behaviors, and (2) capture conditions that are strongly associated with long-term morbidity (as opposed to brief, one time, episodes). We will rely on the coding of specific health conditions by an outside pediatric consultant who was directed to classify each infant health condition listed in the infants' medical record or reported by the mother at 1 year according to degree of severity (in terms of expected significant long-term morbidity) and likelihood, according to the medical community, of having been caused by parental behavior (see Appendix A for more information on the coding scheme). Our goal was to capture severe conditions that are for the most part random (e.g., Down Syndrome, congenital heart malformations), given that the pregnancy resulted in a live birth. That way, we could be reasonably confident that our estimated effects of poor child health on food insecurity are unbiased.

The first measure, *severe child health condition,* includes any condition that is severe, chronic, and unlikely caused by parents' prenatal behavior, and in the case of 1-year maternal reports, likely present at birth. This measure best meets our "gold standard," but captures conditions that are relatively rare. The second measure of poor child health, *severe child health condition or VLBW* is measured as *severe child health condition* and/or was very low birthweight (<1500 grams). Very low birthweight is associated with a number of serious and long-term child health conditions (Reichman 2005). The advantage of this measure is that we gain more analysis cases with poor child health. The disadvantage is that the VLBW component may not be truly exogenous, as lower birthweight is associated with poverty and prenatal behavior (Reichman 2005). The third measure, *moderate or severe child health condition,* includes any abnormal condition that meets the criteria for *severe child health condition* or is less severe but still considered random (not a function of parental behavior). The disadvantage of this measure, which characterizes approximately 20% of the projected sample (versus in the single digits for the first two measures), is that it is very broad; that is, it includes conditions that may or may not have poor long-term prognoses (examples are hydrocephaly and cleft palate). The fourth measure is *low birthweight* (< 2500 grams). This measure is readily obtained from maternal reports or medical records, but is not very specific because few moderately low birthweight children (the majority of low birthweight children), those weighing between 1500 and 2500 grams, have severe health problems (Reichman 2005). A distinct disadvantage, as mentioned above, is that low birthweight is associated with poverty and prenatal behavior. The value of using low birthweight as a measure of poor infant health is that it is a widely used index and is comparable across studies. We will include it strictly for comparison purposes.

We have found in our past work that the *coded* measures of poor child health (i.e., those not based on birthweight)—severe child health condition and moderate or severe child health condition)—are unrelated to sociodemographic characteristics (i.e., race/ethnicity, immigrant status, education, Medicaid birth, census tract poverty, employment, marital status, and number of children), while low birthweight is strongly associated with almost all of these characteristics in the expected directions (Curtis et al. 2013). This pattern of results is validating and provides some support for our contention that the coded conditions capture infant health shocks.

Characterizing postpartum depression

Following Mitchell et al. (2011), who used the FFCWB data to study gene-environment interactive effects on postpartum depression, we will measure postpartum depression using a dichotomous indicator for whether the mother met the diagnostic criteria for major depression in the past 12 months according to the Composite International Diagnostic Interview Short Form (CIDI-SF) Version 1.0 November 1998, which was embedded in the mother's 1-year follow-up interview. We will use two different validated measures (FFCWB 2012), one which is "conservative" and one which is "liberal." Each measure is a count of number of depressive symptoms ranging from 0 to 7, with a major depression episode defined as the experience of three or more symptoms of dysphoria or anhedonia. The conservative measure characterizes respondents who reported experiencing symptoms (sad, blue, depressed or complete loss of interest) for most of the day for a period of at least 2 weeks. The liberal measure characterizes respondents who reported experiencing symptoms for at least half the day for a period of at least 2 weeks. Models using these two measures of postpartum depression to predict the effects of postpartum depression on food insecurity will control for diagnosed mental illness before the focal child was born (from the mother's prenatal medical record) as well as the grandmother's history of depression. We will also consider measures of "becoming depressed" (not having had any diagnosed mental illness before the focal child was born but screening positive for depression at the 1-year follow-up).

Covariates

The FFCWB data allow us to control for a rich set of maternal and family characteristics, measured at baseline whenever possible, that may be associated with both health (non-random components) and food insecurity. These include maternal age, race/ethnicity, immigrant status, education, prenatal employment status, whether the birth was financed through Medicaid (a proxy for poverty), father's relationship with the mother (married, cohabiting, romantic but not cohabiting, friends, or no relationship), maternal prenatal physical and mental health, and father's education and employment status, as well as father's incarceration which has been linked to poor health (Schnittker & John 2007; Massoglia 2008; Curtis 2011) and material hardship (Schwartz-Soicher, Geller & Garfinkel 2011) in the family. As indicated above, in models estimating the effects of maternal postpartum depression, we will control for not only the mother's prenatal mental illness, but also the grandmother's (the mother's mother) history of depression. We will also include family background characteristics of the parents that may be related to both health and hardship later in the lifecourse; these include whether the mother lived with both of her biological parents when she was 15 years old, whether the father lived with both of his biological parents when he was 15, and the education levels and immigrant status of the focal child's grandparents.

We will include variables related to the focal child, including gender and multiple birth, both of which are related to infant health (Verbrugge 1982; Luke & Keith 1992), may be related to postpartum depression (Choi, Bishai & Minkovitz 2009) and may also be related to material hardship (e.g., Dahl & Moretti 2008 found that child gender affects resources devoted to the child). In addition, we will include the number of mother's biological children in the household, number of other children in the household, and whether the father has other children residing in another household, as family structure is associated with both health and hardship (Bzostek & Beck 2011; Bass & Warehime 2011; Osborne et al. 2011).

We will incorporate a number of contextual variables measured at the individual level. These include the poverty rate in the family's census tract, the availability of supermarkets and grocery stores in the zip code, and city indicators (which represent an amalgam of the city characteristics that could potentially be associated with both health and food insecurity) or city-level characteristics such as cost of living index and MSA-level unemployment rates.

We will estimate both parsimonious models and those with large sets of covariates, and assess robustness of our estimates (to the extent that we have characterized true health shocks, the estimates should be stable).

Addressing the potential endogeneity of health shocks

First and foremost, we will focus on health conditions that are considered to have large random components. Despite our best efforts, however, it is important to assess whether we have truly captured random shocks and to provide convincing evidence that we have been successful at isolating causal effects. Thus, we will include a rich set of covariates as described earlier, explore exogeneity assumptions though "falsification tests," and conduct supplemental analyses using 2-stage modeling techniques. In terms of covariates, the FFCWB data set is extremely rich and allows us to include many variables, such as detailed paternal and relationship characteristics and pre-existing maternal medical conditions, which are typically unobserved. For falsification tests, we will estimate the impact of the current health situation (having a child with a serious health problem or having postpartum depression) on hardship status before the child was born (the postnatal shock should have no impact on prenatal hardship, controlling for other factors). Finally, we will estimate 2-stage models wherein we will identify poor child health (using each of the four different measures) with individual-level variables (such as distance to the birth hospital and/or distance to a hospital with a level-3 neonatal intensive care unit) and/or neighborhood-level variables (such as numbers or concentrations of prenatal care providers and family planning clinics), and identify postpartum depression with individual-level variables (such as mental health of the baby's grandparents) and/or neighborhood-level variables (such as numbers or concentrations of mental health providers). Given the dichotomous nature of our food insecurity dependent variables, we will use bivariate probit models and/or 2-stage linear probability models. We will select instruments that are both theoretically valid and correlated with the health shock but uncorrelated with the error term in the food insecurity equation when controlling for the health shock. We will perform appropriate tests to assess the validity of our identifiers (e.g., overidentification tests), run models with alternate sets of identifiers to assess the robustness of our 2-stage estimates, and test our single-stage estimates for consistency.

References

Bass, L.E., & Warehime, M.N. (2011). Family Structure and Child Health Outcomes in the United States. *Sociological Inquiry, 81*(4), 527-548.

Bethel J, Green J, Kalton G, et al. Early Childhood Longitudinal Study, Birth Cohort (ECLS–B), Sampling. Volume 2 of the ECLS-B Methodology Report for the 9-Month Data Collection, 2001–02 (NCES 2005–147). Washington, DC: U.S. Department of Education, National Center for Education Statistics 2005.

Bureau of Labor Statistics. (2012a). Labor Force Statistics from the Current Population Survey. Labor force data. Retrieved from Bureau of Labor Statistics database.

Bureau of Labor Statistics. (2012b). Civilian Labor Force and Unemployment by State and Metropolitan Area. Labor force data. Retrieved from Bureau of Labor Statistics database.

Bzostek, S.H., & Beck, A.H. (2011). Familial Instability and Young Children's Physical Health. *Social Science and Medicine, 73*, 282-292.

Choi, Y., Bishai, D., & Minkovitz, C.S. (2009). Multiple Births Are a Risk Factor for Postpartum Maternal Depressive Symptoms. *Pediatrics, 123*(4), 1147-1154.

Coleman-Jensen, A., Nord, M., Andrews, M., & Carlson, S. (2011). Household Food Security in the United States in 2010 (Economic Research Report No. 125). Retrieved from United States Department of Agriculture website: http://www.ers.usda.gov/Publications/ERR125/err125.pdf

Corman, H., Noonan, K., Reichman, N.E, & Schwartz-Soicher, O. (2011). Life Shocks and Crime: A Test of the "Turning Point" Hypothesis. *Demography, 48*(3), 1177-1202.

Corman, H., Noonan, K., & Reichman, N.E. (2005). Mothers' Labor Supply in Fragile Families: The Role of Child Health. *Eastern Economic Journal*, *31*(4), 601-616.

Curtis, M.A. (2011). The Effect of Incarceration on Urban Fathers' Health. *American Journal of Men's Health*, *5*(4), 341-350.

Curtis, M.A., Corman, H., Noonan, K., & Reichman, N.E. (2013). Life Shocks and Homelessness. Demography (available online ahead of press).

Curtis, M.A., Corman, H., Noonan, K., & Reichman, N.E. (2010). Effects of Child Health on Housing in the Urban U.S. *Social Science and Medicine*, *71*, 2049-2056.

Dahl, G., & Moretti, E. (2008). The Demand for Sons. *Review of Economic Studies*, *75*(4), 1085-1120.

Fragile Families and Child Wellbeing Study. Core Scales Documentation. Available at: http://www.fragilefamilies.princeton.edu/documentation/core/scales/ff_1yr_scales.pdf [Accessed January 3, 2012).

Gundersen, C., & Gruber, J. (2001). The Dynamic Determinants of Food Insecurity, in *Second Food Security Measurement and Research Conference, Volume II: Papers.* Food Assistance and Nutrition Research Report 11-2, pp. 92-110. Margaret Andrews and Mark Prell (eds.), USDA, Economic Research Service.

Gundersen, C., Kreider, B., & Pepper, J. (2011). The Economics of Food Insecurity in the United States. *Applied Economic Perspectives and Policy*, *33*(3), 281-303.

Gundersen, C., Weinreb, L., Wehler, C., & Hosmer, D. (2003). Homelessness and Food Insecurity. *Journal of Housing Economics, 12*(3), 250-272.

Huang, J**.,** Guo, B., & Kim, Y. (2010). Food Insecurity and Disability: Do Economic Resources Matter? *Social Science Research, 39*(1), 111–124.

Luke, B., & Keith, L.G. (1992). The Contribution of Singletons, Twins and Triplets to Low Birth Weight, Infant Mortality and Handicap in the United States. *The Journal of Reproductive Medicine, 37*(8), 661-666.

Marcotte, D., Wilcox-Gok, V., & Patrick Redmon, D. (2000). The Labor Market Effects of Mental Illness—The Case of Affective Disorders. *Research in Human Capital and Development*, 13, 181-210.

Massoglia, M. (2008). Incarceration as Exposure: The Prison, Infectious Disease, and Other Stress-Related Illnesses. *Journal of Health and Social Behavior,* 49, 56-71.

Miller, L. (2002). Postpartum Depression. *Journal of the American Medical Association*, *287*(6), 762-765.

Mitchell, C., Notterman, D., Brooks-Gunn, J., Kotenko, I., Jaeger, K., Hobcraft, J., Garfinkel, I., & McLanahan, S. (2011). The Role of Mother's Genes and Environment on Postpartum Depression. *Proceedings of the National Academy of Sciences, 108*(20), 8189-8193.

Noonan, K., Reichman, N.E., & Corman, H. (2005). New Fathers' Labor Supply: Does Child Health Matter? *Social Science Quarterly, 86*(5), 1399-1417 & 19.

Osborne, C., Berger, L., & Magnuson, K. (2011). Family Structure Transitions and Changes in Maternal Resources and Well-Being. Center for Research on Child Well-Being, Princeton University, Princeton, NJ. Working Paper 10-09-FF. Retrieved from: http://crcw.princeton.edu/publications/publications.asp

O'Hara, M.W., & Swain, A.M. (1996). Rates and Risk of Postpartum Depression: A Meta Analysis. *International Review of Psychiatry, 8,* 37-54.

Reichman, N.E. (2005). Low Birth Weight and School Readiness. *The Future of Children, 15*(1), 91-116.

Reichman, N.E., Corman, H., & Noonan, K. (2004). Effects of Child Health on Parents' Relationship Status. *Demography, 41*(3), 569–584.

Reichman, N.E., Corman, H., & Noonan, K. (2006). Effects of Child Health on Sources of Public Support. *Southern Economic Journal, 73*(1), 136-156.

Reichman N.E. & Hade E.M. (2001). Validation of birth certificate data: A study of women in New Jersey's HealthStart Program. *Annals of Epidemiolology*, *11*(3), 186–93.

Reichman N.E. & Schwartz-Soicher O. (2007) Accuracy of birth certificate data by risk factors and outcomes: analysis of data from New Jersey. *American Journal of Obsteterics and Gynecology, 197*(1), 32-e1.

Reichman, N.E., Teitler, J., Garfinkel, I., & McLanahan, S. (2001). Fragile Families: Sample and Design. *Children and Youth Services Review, 23*(4), 303-326.

Rose, D. (1999). Economic Determinants and Dietary Consequences of Food Insecurity in the United States. *The Journal of Nutrition, 129*, 517s-520s.

Schnittker, J., & John, A. (2007). Enduring Stigma: The Long Term Effects of Incarceration on Health. *Journal of Health and Social Behavior, 48*(2), 115-130.

Schultz, J., Corman, H., Noonan, K. & Reichman, N. (2009). Effects of Child Health on Parents' Social Capital. *Social Science and Medicine*, *69*, 76-84.

Scott, R.I., & Wehler, C.A. (1998). Food Insecurity/Food Insufficiency: An Empirical Examination of Alternative Measures of Food Problems in Impoverished U.S. Households. Madison: Institute for Research on Poverty Discussion Paper #1176-98.

She, P., & Livermore. G. (2007). Material Hardship, Disability, and Poverty Among Working-Age Adults. *Social Science Quarterly*, *88*(4), 970-989.

Schwartz-Soicher, O., Geller, A., & Garfinkel, I. (2011). The Effect of Paternal Incarceration on Material Hardship. *Social Service Review, 85*(3), 447-473.

Sullivan, J., Turner, L, & Danziger, S. (2008). The Relationship Between Income and Material Hardship. *Journal of Policy Analysis and Management*, *27*(1), 63-81.

Verbrugge, L.M. (1982). Sex Differentials in Health. *Prevention, 97*, 417-37.

Appendix A: Coding of Measures of Poor Infant Health

The coding of abnormal conditions in the FFCWB data was designed to identify cases that were at least moderately severe, unlikely caused by prenatal behavior, had a poor long term prognosis, and were present at birth. A pediatric consultant was directed to glean information from the medical records (augmented with 1-year maternal reports) and to assign all infant conditions a number between 1 and 16 according to the grid below. After giving the consultant the grid and clear instructions, the investigators had no further input into how particular conditions were coded. If a child had multiple conditions, each condition was assigned a separate number.

Very Severe Infant Health Condition was coded as a one (yes) if the child had a health condition in cell #1. Examples of conditions in cell #1 are microcephalus, renal agenesis, total blindness, and Down Syndrome.

Severe Infant Health Condition was coded as a one (yes) if the child had a condition in cell #1 or the child was very low birthweight (less than 1500 grams).

Any Infant Health Condition was coded as a one (yes) if the child had a condition in either cell #1 or cell #2. Examples of conditions in cell #2, which are considered random at birth but may or may not have long-term health consequences, are malformed genitalia, hydrocephalus, cleft palate, shoulder dystocia, pneumomediastinum, and webbed fingers or toes.

Appendix Table: Coding Grid for Infant Health Conditions

	Severity			
	High	Medium	Low	Unknown
Not Behavior Related	1	2	3	4
Possibly Behavior Related	5	6	7	8
Likely Behavior Related	9	10	11	12
Not Enough Information To Determine if Behavior Related	13	14	15	16