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The Persistence of Food Security Status Across Generations[*]

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Abstract

The persistence of disadvantage across generations is a central concern for social policy in the United States. While an extensive literature has focused on income mobility, much less is known about the mechanisms for mobility out of material hardship. This study uses the Panel Study of Income Dynamics to provide the first point estimates of the intergenerational transmission of food insecurity. Childhood food insecurity is associated with about 20 percentage points higher probability of food insecurity as an adult (or around 10 percentage points higher conditional on family earnings and wealth during childhood).

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1. INTRODUCTION

A major concern for public policy in the United States is the extent to which childhood poverty predetermines economic outcomes in future generations. Recent evidence has shown that income inequality is rising (Piketty, Saez, and Zucman, 2018), absolute economic mobility—doing better than one's parents—is falling (Chetty et al., 2017), and yet relative economic mobility has remained stable (Chetty et al., 2014b; Lee and Solon, 2009). Rising inequality and falling absolute mobility are complementary findings, while stable relative mobility suggests that policy successes in public education or safety net programs may have limited the negative effects of high inequality on upward mobility. However, little is known about intergenerational mobility out of material hardship, much less the social and political mechanisms related to persistent hardship. Since the foundational work of Becker and Tomes (1979, 1986), most intergenerational studies have focused on comparisons of income measures for parents and children, yet measures of consumption and material hardship are particularly relevant for understanding the role of policy interventions to support families rising out of poverty. In particular, food security is a critical measure of family well-being that has testable implications for the effects of childhood development on later adult outcomes as well as the effects of food assistance programs, which comprise one of the largest components of the U.S. safety net. About 4 out of 10 children experience poverty before age 18 (Ratcliffe, 2015), and spending on the 15 major federal food assistance programs has averaged over 100 billion dollars since the onset of the Great Recession (Hoynes and Schanzenbach, 2016; Oliveira, 2018). Food insecurity is a fundamental issue for health, well-being, and policy (see Gundersen, Kreider, and Pepper, 2011), and given the prevalence of childhood food insecurity, potential long-run consequences warrant greater attention

for better understanding of private and public investments in nutrition (Gundersen and Ziliak, 2014).

This study provides the first point estimates of the intergenerational transmission of food insecurity.[1] Policymakers and researchers have long been interested in the ways socioeconomic status is passed from one generation to another, and recent advances have extended beyond the standard measures of income mobility (Black and Devereaux, 2011; Solon, 1999). For example, new studies have documented the intergenerational transmission of wealth (Charles and Hurst, 2003; Fox, 2015; Scholz and Levine, 2004; Wolff, 2002), health (Black, Devereaux, and Salvanes, 2007; Currie and Moretti, 2007; Halliday, Mazumder, and Wong, 2018), consumption (Charles et al., 2014; Waldkirch, Ng, and Cox, 2004), education, (Carneiro, Meghir, and Parey, 2013; Magnuson, 2007; Oreopoulos, Page, and Stevens, 2006; Page, 2006), and welfare dependence (Hartley, Lamarche, and Ziliak, 2022). The question addressed here is how childhood food insecurity influences the probability of food insecurity for the child as an adult.[2] Food security status can be correlated across generations primarily because of correlations in income or earning ability; however, plausible causal pathways may exist with implications for effective policy intervention. For example, food insecurity transmission could result from lower nutritional intake during childhood leading to lower human capital development. Another example may be patterns of food acquisition or preparation learned during childhood that may differ in food insecure versus food secure households as different families engage in different resource management strategies. Many American children will experience poverty at some point before age 18, yet the long-run

[1] There is a concurrent working paper by Gundersen, Kreider, and Pepper (2018) using partial identification to estimate bounds on the intergenerational transmission of food insecurity.

[2] The broader literature on economic mobility has focused on relative measures such as the intergenerational elasticity (IGE) or rank-rank slope within a given distribution of income or wealth (notably Chetty et al., 2014a, among others). Alternative measures with more relevance for upward mobility out of poverty include the conditional transition probability and directional rank mobility (Bhattacharya and Mazumder, 2008).

effect of their poverty experience may depend on whether families are equipped to smooth consumption when disposable income runs low.

In 2019, approximately 12.5 percent of children under age 18 lived in families with economic resources below the Supplemental Poverty Measure (SPM) threshold, and another 33.2 percent of children lived in low-income families with resources above poverty yet below twice the SPM threshold; that is, nearly half of all children were in below-poverty or low-income families (Fox, 2020).[3] For the same year, 14.6 percent of children lived in food-insecure households (Coleman-Jensen et al., 2020). U.S. food insecurity from 1998 to 2007 averaged around 17.9 percent for families with children until the Great Recession when it reached as high as 23.2 percent, an increase of about 30 percent that remained high 5 years after the recession's end (see Figure 1). Trends in poverty and food insecurity tracked very closely until the Great Recession, when food insecurity increased and the SPM poverty rate continued on the same trend line. In part, this divergence during a time of heightened need reflects the fact that SPM poverty status considers a family's total resources, which includes cash transfers and the value of in-kind transfers such as Supplemental Nutrition Assistance Program (SNAP, or food stamps).[4] During the Great Recession, families may have received increased public assistance that countered any decrease in earnings. Another reason that these measures may diverge is that poverty rates are income-based indicators of well-being and not direct measures of material hardship or deprivation (see, e.g., Dhongde and Haveman, 2017). Incomes may be low for some families who are otherwise doing well, for example, using savings to smooth living expenses while forgoing income to pursue

[3] The SPM definition of poverty is often used by the research community because of its needs threshold adjusted by family structure and geography, and it accounts for a family's total economic resources after taxes, transfers, and work-related and medical expenses.

[4] Note, however, that despite receiving food or cash assistance, most children receiving benefits are far more likely to experience food insecurity relative to those not receiving benefits (see Appendix Figure A1).

education or other socially beneficial goals. At the same time, other families may have above-poverty income yet experience hardship because a large proportion of that income is needed to service debts or support elderly or disabled family members (or poverty thresholds may simply be too low). For households that report some deprivation, such as skipping meals because money is tight, an indicator of food insecurity can provide a more direct measure of well-being.[5] Food insecurity and other measures of material hardship provide another way to understand poverty in America, including how disadvantage may be transmitted intergenerationally as well as the potential role of social policy.

[Figure 1 here]

The standard instrument for measuring food security is an 18-item questionnaire developed by the U.S. Department of Agriculture's Economic Research Service (USDA ERS). USDA produces official measures using its own nationally-representative survey that is implemented in the December supplement to the Current Population Survey (CPS) (see Coleman-Jensen et al., 2020), and the same questions have been implemented in other major public-use surveys such as the Panel Study of Income Dynamics (PSID; for comparisons with CPS measures, see Tiehen, Vaughn, and Ziliak, 2020). The ideal U.S. dataset for intergenerational comparisons is the PSID, which has fielded consistent questions on food security as early as 1997 (in its Child Development Supplement) and subsequently in select main family surveys. These data allow comparisons of food security in childhood over 4 survey years from 1997 to 2003, and again in adulthood over 4 survey years from 2014 to 2019. In typical use, responses to the 18 questions are each recoded as binary indicators by which a positive response indicates some degree of food insecurity, and the

[5] A recent White House report has sparked debate about whether the War on Poverty, begun in the era of President Johnson in 1964, has solved poverty in America (see Council of Economic Advisers, 2018). The premise of this argument is based on trend comparisons for income and consumption-based poverty measures that are anchored to a given reference year (by which the trend comparisons depend on the relative values in the chosen reference year).

number of positive responses can be converted into a summary indicator of food security status (see Appendix A for a full list of questions). In the main estimates of this study, we explore the intergenerational correlations across various measures of food security status and a Rasch measure of latent food security based on item response theory.

Across a variety of measures of food security status and latent measures of food security, the estimated intergenerational correlation of food insecurity is approximately 0.2. Conditional on individual characteristics, including controls for first-generation earnings, this correlation lowers to around 0.1. Persistence in food security is similar in magnitude to estimates for the persistence of self-reported health (Halliday, Mazumder, and Wong, 2018), and it is about half the magnitude as persistence in earnings across generations. Although low earnings and food deprivation measure different indicators of well-being, there is some evidence that childhood food insecurity leads to lower adult earnings, which supports the hypothesis of a childhood development mechanism. A child growing up with food insecurity is associated with an earnings-to-needs penalty of about 6 percentile ranks and about 12 percentage points greater chance of having below-poverty earnings.

2. Conceptual Foundations and Methodology

Economic approaches to measure the transmission of economic status across generations draw mainly on Becker and Tomes' (1979, 1986) human capital model. This model is commonly used to explain parental investment in children based on a utility function that accounts for the children's future economic outcomes. The empirical approach in the literature typically identifies a reduced-form effect of the parent's outcome on the child's outcome as an adult, where the transmission mechanism is related to some unobserved parental investment or child learning. For example, nutritional intake is a specific investment for healthy child development and skill formation that affect long-run labor outcomes (Duncan et al., 1998; Elango et al., 2016; Heckman

and Mosso, 2014; Ziol-Guest et al., 2012). Also, if a child experiences food insecurity, then this environmental exposure may reinforce certain behavioral patterns. Does the family skip meals or find ways to make food stretch? Is it acceptable to visit food pantries, receive support from friends, or take up public assistance? Based on a given set of family experiences, childhood food insecurity might have a direct effect on later food insecurity beyond the mechanical pathway of intergenerational correlations in income or wealth (Drèze and Sen, 1989; Lindbeck, Nyberg, and Weibull, 1999).

Food security is a latent outcome, so modeling the transmission of food insecurity across generations requires defining either an indicator for a family's food security status or an estimate of the underlying measure that is not observed. A food security status indicator is typically constructed from the raw score total based on household responses to the 18-question USDA survey instrument.[6] The first 10 questions are specific to adults in the household, and the last 8 questions are directed toward children if any are present. Each of the 18 questions is recoded as a 1 if the response indicates some degree of food insecurity, and a 0 otherwise. Families with a raw score of 0 to 2 are considered food secure, although any positive response could be classified as marginal food insecurity. Families with a score of 3 or more are considered low food secure, and a status of very low food secure corresponds to a score of 6 or more for childless households or 8 or more for households with children (since households with children have a higher possible score out of 18 questions instead of 10). These score thresholds are chosen to fit the underlying model of latent food security; however, it is also possible to use estimates of the latent security directly. Since the raw score is derived from 18 separate questions, each with an inherently different measure of severity, the latent measure of food security can be estimated using methods from item

[6] See Coleman-Jensen et al. (2020) for an overview. For reference, the 18 questions are listed in Appendix A.

response theory (see, e.g., Rabbitt, 2013, 2018). For certain specifications, we use a latent food security measure estimated based on the Rasch (1960) model used by the USDA. Further, the total raw score is a sufficient statistic for characterizing the latent food security of a household; even though any individual responses may not be equivalent in terms of severity, the total score creates an envelope of responses indicating increasing severity.

Following the Becker-Tomes framework and an empirical literature on intergenerational dependence (see Black and Devereaux, 2011), we consider a statistical model for adult outcomes (food security and family earnings) relative to childhood food security measures (food security status, latent food security, and food spending per needs). The adult outcome F_{it} of individual i at time t can be expressed as

$$F_{it} = \beta F_{i,t_0} + \boldsymbol{x}_{it}'\theta + \varepsilon_{it} \tag{1}$$

where F_{i,t_0} is the individual's childhood food security corresponding to time period t_0, $\boldsymbol{x}_{it}$ is a set of control variables, and ε_{it} is an idiosyncratic error term. The hypothesized value for the parameter of interest is a non-negative transmission effect of intergenerational food insecurity, $\beta \geq 0$. The key question is how childhood food insecurity transmits to adult food insecurity, which the model can address by using indicator variables for food security status, $F_{it} \in \{0,1\}$, or by using continuous measures for latent food insecurity for which the linear estimates could be mapped back into average partial effects for discrete changes in security status or interpreted generally as mobility estimates. Food security status is defined by indicators for marginal food insecurity (any positive response to the food questionnaire), food insecurity (low or very low food security), or very low food security. Additionally, we characterize continuous measures for food security based on an estimate of the latent food security scale and a percentile rank of the latent scale, or

alternatively with a measure of food spending relative to needs according to the USDA Thrifty Food Plan adjusted for state-year price variation.

Identifying the transmission parameter of interest requires the ability to distinguish the effects of childhood food insecurity separately from unobserved heterogeneity that may be related to correlated earning ability or financial security across generations. Specifically, does any intergenerational transmission mechanism for food insecurity remain after controlling for current income or wealth? Childhood food security can be expected to be correlated with some fixed endowment of ability that is unobserved, which would bias the estimated effects on current food insecurity. For example, estimates of the transmission parameter for childhood food insecurity would be biased if $\mathbb{E}\left[F_{i,t_0}\varepsilon_{it}\right] \neq 0$. Beyond controlling for fixed and time-varying characteristics for each individual, we also control for mean family earnings and wealth endowments during childhood. If the only confounding factor for identifying β is related to the persistence in earning ability across generations, then the role of childhood food security becomes more evident.

When interpreting the parameters from the model in equation (1), a primary interest is the degree to which food insecurity persists across generations without conditioning on any covariates. This general parameter for persistence can be thought of as the total intergenerational correlation inclusive of the direct transmission effect of childhood food insecurity and any other related factors. Therefore, the unconditional estimate $\breve{\beta}$ (corresponding to the model $F_{it} = \beta F_{i,t_0} + \upsilon_{it}$) can be decomposed into the conditional estimate $\hat{\beta}$ from equation (1) plus the sum of contributions explained by other sources, such as age profiles across generations, individual-level and state-level controls, childhood family earnings, and childhood family wealth. Gelbach (2016) formalized this insight with a decomposition method to identify how much of the difference $\breve{\beta} - \hat{\beta}$ can be attributed to different covariates, or groups of covariates. This approach accounts for correlations

between explanatory variables while avoiding the ambiguity of sequential comparisons by covariate subgroups. Following Gelbach's decomposition, we define the amount of explained variation across generations as $\breve{\beta} - \hat{\beta} = \hat{\Gamma}\hat{\theta} = \hat{\delta}$, where the total difference is the sum of the components explained by each subgroup of covariates, $\hat{\delta} = \sum_{k=1}^{4} \hat{\Gamma}_k \hat{\theta}_k$.[7] The overall persistence of food insecurity, $\breve{\beta}$, can be compared with other estimates for socioeconomic persistence in the literature, such as income or health. With a conditional model using Gelbach's decomposition, we then gain a clearer understanding of the transmission pathways for food insecurity.

The baseline set of time-varying, exogenous controls in $\boldsymbol{x}_{it}$ includes quadratics in the child's, parent's, and/or household head's age, indicators for number of family children (1, 2, 3, 4 or more), indicators for the individual's sex, race/ethnicity, state-level controls for the SPM poverty rate, unemployment rate, state fixed effects, and mean measures of childhood family earnings and wealth. The earnings variable represents the log of family earnings as a ratio to the U.S. Census poverty needs threshold (or, where applicable, the percentile rank of family earnings-to-needs ratio), and wealth represents the log of the family's net equity.[8]

Intergenerational analysis is complicated by important sources of potential estimation bias related to the 'window problem' when observing outcomes for limited ranges of the full lifetimes

[7] Gelbach's decomposition draws from the formulation for omitted variable bias. To illustrate, using matrix notation, our unconditional model can be written as $f = F\beta + \upsilon$, and the conditional model as $f = F\beta + X\theta + \varepsilon$. A quick and practical derivation, as noted by Gelbach, is found by multiplying through the fitted conditional equation by $(F'F)^{-1}F'$, which yields $\breve{\beta} = \hat{\beta} + (F'F)^{-1}F'X\hat{\theta}$ where $(F'F)^{-1}F'f = \breve{\beta}$ from the unconditional model, $(F'F)^{-1}F'F\hat{\beta} = \hat{\beta}$, and $(F'F)^{-1}F'\hat{\varepsilon} = 0$ by construction assuming a well-specified model. Therefore, we can express the decomposition as $\breve{\beta} = \hat{\beta} + \hat{\Gamma}\hat{\theta}$ with the notational simplification $\hat{\Gamma} \coloneqq (F'F)^{-1}F'X$. In practice, estimation is straightforward. Estimates for $\breve{\beta}$ and $\hat{\beta}$ are obtained from the unconditional and the conditional models, respectively, and the difference yields $\hat{\delta}$. Then we obtain the coefficients from regressing F on each covariate within a subgroup X_k (with models including an intercept), and these coefficients form a vector $\hat{\Gamma}_k$. For each subgroup, the full model conditional on all covariates provides estimates for $\hat{\theta}_k$, so the explained difference in intergenerational transmission corresponding to that group is simply $\hat{\delta}_k = \hat{\Gamma}_k\hat{\theta}_k$, and these k subgroup differences precisely account for the decomposed difference between unconditional and conditional estimates: $\breve{\beta} = \hat{\beta} + \hat{\delta} = \hat{\beta} + \sum_{k=1}^{4} \hat{\delta}_k$.

[8] Since wealth can be zero or negative, we use the inverse hyperbolic sine transformation, $\ln\left(x + (x^2 + 1)^{1/2}\right)$, which can be interpreted similarly to the natural log transformation given that it closely approximates $\ln(2x) = \ln(2) + \ln(x)$.

of each generation (Grawe, 2006; Wolfe et al., 1996). In the intergenerational income literature, the ideal transmission parameter would be closely related to the "permanent income" concept. Income can vary considerably over a lifetime, so using only one observation year in each generation, for instance, would provide a noisy proxy for average income over a lifetime (see Solon, 1992). In the food security context, childhood exposure to one year of marginal food security could be quite different from exposure to insecurity throughout childhood. In the descriptive analysis, we examine the actual persistence of food insecurity throughout childhood, and in the main analysis we use multiple-year averages from the childhood period.

Another source of bias depends on the relative timing of the generational windows of observation within the life cycle. That is, if the parent's generation is observed later in life, incomes may be higher and food insecurity prevalence lower; however, if the child is observed earlier in life as an adult, then the implications may be reversed.[9] The scenario just described is often referred to as life-cycle bias (Haider and Solon, 2006; Lee and Solon, 2009), and it is common given data constraints on the length of panel observations for both parent and child. For this study, the timing of the first-generation observation is restricted to the individual during childhood ages 0 to 17, which will necessarily restrict the adult observation years to under age 35 based on the current data available. Lee and Solon (2009) suggest implementing an age adjustment in the estimation in order to address life-cycle bias. However, given that the childhood period in this study is well observed, focusing on transmission of food insecurity into young adulthood is not necessarily a disadvantage in that this point in the life cycle is arguably a primary interest for social policy. Therefore, our

[9] The true relationship between food security over the life cycle is not well established in the data. Tiehen, Vaughn, and Ziliak (2020) show that age profiles in food security status are not consistent comparing estimates using data from the Current Population Survey relative to using the Panel Study of Income Dynamics.

estimates can be interpreted as the persistence of food insecurity during individuals' transitions to early adulthood conditional on their childhood food security.

Lastly, correlations of food security across generations may depend on the choice of measurement given multiple observation periods as well as potential measurement error in self-reporting that may systematically understate actual prevalence at a point in time. This threat is relevant for the definition of food security as an outcome in either generation. For example, identical families with the same food budget and consumption may disagree as to whether they did not eat because there was not enough money for food in the last 12 months. For indicators of food security status, we aggregate results over each time period, childhood and adulthood, by taking the mean status (or proportion of years with a given status), or alternatively using an indicator for whether the individual has any observations with a given status. For continuous measures, we simply use the mean estimate for each period. We use multiple definitions of self-reported food security, and we contrast these outcomes with the ratio of food expenditure to budgetary needs based on the Thrifty Food Plan adjusted for state-year price variation. Aggregating outcomes over multiple years should improve our estimation of intergenerational effects, and the food spending-to-needs estimates provide a check against subjective self-reports of food hardship.

3. DATA

The Panel Study of Income Dynamics (PSID) is the longest-running longitudinal survey in the world, and it is the only data source that would allow a comparison of household food insecurity across generations.[10] For the first generation, we use four years of survey data that correspond to an individual's childhood before age 18. The first PSID questions on food security were

[10] Public-use version of these data were obtained via the University of Michigan Survey Research Center (Panel Study of Income Dynamics, 2018).

implemented in the 1997 Child Development Supplement (CDS), which was randomly offered to a subset of PSID families with children ages 0 through 12. Subsequently, the next three main family surveys, fielded biennially in 1999, 2001, and 2003, included the same set of food security questions for all families. The next survey to include food security questions was the 2014 CDS, which was fielded to all children under age 18 (since the questions correspond to the household, individuals observed in this survey can include adults who were previously observed during childhood in the earlier food security surveys). The food security questions returned to the main family surveys for the following main survey years, 2015, 2017, and 2019.

The main PSID surveys collect a wide range of individual and family characteristics as well as income, program participation, and expenditure measures for the prior year (T-1). After the 1997 survey, the main survey has been fielded every other year with some questions included for the year before the prior year (T-2). For the main variables of interest, family earnings measures are available in each year (using both T-1 and T-2 measures), and food expenditure measures are available in the T-1 years beginning with the 1999 survey. The estimation sample is restricted to individuals who are observed as children under age 18 during the earlier survey years, 1997–2003. Specifically, we restrict the sample to a cohort of individuals born from 1985 to 1997, and we only use those observed in the core PSID subsamples: Survey Research Center (SRC) sample and Survey of Economic Opportunity (SEO) sample. These individuals (N = 2109) are followed for all subsequent years in which their food security status is observable as an adult (at least 18 years old) who has started their own family unit and has at least 2 adult observations of food security and at least 3 childhood observations.

Food security measures in the PSID are constructed based on the standard set of 18 questions used by the USDA, such as whether the family has skipped meals during the last 12

months, for example. The food security questions are conceptually related to deprivation from lack of income, so it is not sufficient that someone indicates they skipped a meal unless it was due to a lack of economic resources. The first 10 questions are directed toward adults in the household, and the last 8 questions are directed toward children if any are present. Each household has a raw score that totals the positive responses, that is, each question to which the respondent admits to some degree of food insecurity. Following standard category cutoffs established in the literature, we define three levels of food insecurity using these raw scores ranging from 0 to 18: marginal food secure or food insecure (1-18), food insecure (low or very low food secure, 3-18), and very low food secure (6-18 for families without children, or 8-18 for families with children given the additional child-focused questions). We also consider a definition for food-insecure children, which is distinct from children living in food-insecure households. Coleman-Jensen et al. (2020) classify food-insecure children—or food insecurity among children—for households reporting at least two affirmative responses to the 8 questions focused on children, items 11-18.

Table 1 provides descriptive statistics for the estimation sample by generational life stage: childhood and adulthood. On average, when individuals reach early adulthood, their families have younger heads of household and are less likely to be married or have children, yet more likely to have more than a high school education. Early adulthood relative to childhood is also associated with less economic resources, higher prevalence of SNAP participation and food insecurity, and higher poverty rates if children are present. The average ratio of food spending to needs is higher in early adulthood but the rate of spending below the needs threshold is higher among those with children present relative to when those individuals were themselves children.

[Table 1 here]

For the estimation sample, 81.6 percent of observation-years in childhood are represented by food-secure families, while this drops in early adulthood to 69.2 percent, or 64.4 percent among those in early adulthood with children present in the family. Very low food security increases from 2.4 percent in childhood to 7.2 percent in early adulthood (6.0 percent if children present). Partly, the change in food security status (and economic status, more generally) is related to younger household heads in this transition to adulthood period, yet it is also related to changes in economic status trends over time. Figure 1 emphasizes the poverty status and food security status among children from 1997 to 2019. While food security rose during the Great Recession and stabilized to previous levels by around 2015, trends in PSID samples show higher rates of insecurity post-Great Recession than rates from survey years 1997 to 2003. Differences between official food insecurity rates in the CPS and rates in the PSID are well documented by Tiehen, Vaughn, and Ziliak (2020), and as Figure 1 shows, PSID rates are lower, especially in the earlier years. Because the PSID follows families over many years, the longitudinal sample tends to include families who are economically better off; however, to the extent that childhood food insecurity is underrepresented in the data, intergenerational estimates may understate the true dependence.

For initial descriptive evidence, Table 2 shows a transition probability matrix for food security status across generations. In order to define distinct categories of food security status representing multiple childhood years, we estimate the average latent food security scale during childhood and create status cutoffs based on the distribution of the childhood mean relative to per-year food status categories. To illustrate by example, to separate between low food security and very low food security, we let the cutoff be the average value between the 25th percentile of the childhood mean latent scale among children in very low food secure families and the 75th percentile among those in low food secure families. There is little overlap across the opposing

extremes of interquartile ranges for the mean latent measure by current-year food security status, so this approach conceptually resembles the status definitions by year (see Appendix Figure A2 for comparisons). In adulthood, we use the observed yearly food security status. Among individuals we identify as food secure during childhood, the probability of being food secure as an adult is about 76 percent. For a low food secure childhood, the probability of being food secure as an adult drops to nearly a 50-50 chance. Individuals who were very low food secure as a child are more likely to be food secure as an adult than those who are low food secure in childhood—perhaps as some regression to the mean—yet these children also have the highest probability (15 percent) of being very low food secure in adulthood. These probabilities are age-adjusted conditional on quadratics in the ages of the individual as an adult and the parent's age when the individual was a child. Overall, these descriptive probabilities are strong motivation for understanding how childhood food security relates to outcomes as an adult.

[Table 2 here]

As an additional measure of food sufficiency, we use food expenditures as a proportion of the USDA recommended Thrifty Food Plan (TFP), which corresponds to the nutrient intake needs that vary by individuals' age, sex, and family size. Based on evidence of the importance of the real purchasing power for food spending and food assistance, we adjust the dollar amounts of food needs using state-year price indices (Basu, Wimer, and Seligman, 2016; Bronchetti, Christensen, and Hoynes, 2018; Ziliak and Gundersen, 2016).[11] For the expenditure amount, we include food spending for consumption at home as well as away or delivery, and we also include the amount of in-kind food assistance from SNAP benefits.

[11] For USDA food plans by month, see https://www.cnpp.usda.gov/USDAFoodPlansCostofFood. These estimates use guidelines for June 2015. Consumer price indices for urban consumers by region and Census division are used to adjust values by year and location. To compare the distribution of food expenditure as a ratio of the Thrifty Food Plan by reported food security status, see Appendix Figure A3.

4. Persistence in Food Insecurity

We begin with descriptive evidence on the persistence of food insecurity within families over time by showing year-by-year correlations to an initial observation from the 1997 CDS survey for a cohort of children ages 0 to 12. The results in Figure 2 correspond to correlations estimated for food security status interacted by year conditional on a set of exogenous covariates.[12] During the early years following each child, the within-family persistence of food insecurity is around a correlation of 0.25. At nearly 20 years after the initial period, the individuals are aged 18-34, and some have started their own families by this time. In 2014, the food security correlations are around 0.14, and there is little difference in correlation by the degree of food security indicated by status. As the years progress from 2015 to 2019, the difference between correlations of food insecurity and very low food security widen. These estimates do not condition on the followed individual entering into adulthood by starting a new family unit, and the persistence of food insecurity by 2019 is about 0.19.[13]

[Figure 2 here]

As a comparison, we next reproduce Figure 2 estimates with alternative measures of economic status by showing low food spending defined as food expenditure less than the USDA Thrifty Food Plan alongside correlations in relative food spending and family earnings (see Figure 3). Persistence in food expenditure and family earnings each decay faster than persistence in food insecurity as defined by the USDA questionnaire. The estimates in Figure 3 rely on three-year averages for the initial reference period, based on survey years 1995-1997, and from 1999 to 2019

[12] For these correlations, we exclude measures of earnings and wealth, which we later include as averages during childhood.

[13] We use weights throughout to account for potentially endogenous heterogeneity related to oversampling low-income and racial minority families (for detailed discussion on this practice, see Solon, Haider, and Wooldridge (2015). Appendix Figure A4 shows results for marginal food secure, low food secure, and very low food secure status using the same four panels for estimates that are unconditional/conditional, weighted/unweighted.

the correlations fall from 0.30 to 0.06 for low food spending, rise from 0.32 to 0.36 for food spending-to-needs, and fall from 0.73 to 0.37 for earnings-to-needs. The change in persistence for self-reported food insecurity in Figure 2 was a decrease of about two-fifths, from a correlation of 0.33 to 0.19, a much flatter gradient relative to low food spending and somewhat flatter than changes in earnings correlations. While certain economic shocks are expected to be transitory, which would correspond to declining persistence of economic hardship over time, food insecurity appears to have longer-lasting implications for childhood and early adulthood hardship.

[Figure 3 here]

5. Intergenerational Transmission of Food Insecurity

Next, we estimate equation (1) by defining the measure of childhood food insecurity where t_0 corresponds to years the individual is under age 18, and F_{i,t_0} is an average of any childhood observations in survey years 1997, 1999, 2001, and 2003. While equation (1) indicates that adult observations can vary by individual and year, there are little differences between estimates that use person-year observations and those that aggregate across adulthood. To provide cleaner interpretations of intergenerational estimates, we show the main results for adult observations aggregated over survey years 2014, 2015, 2017, and 2019, and we show results with repeated adult observations in the appendix. In Table 3, we provide the unconditional intergenerational food security estimates, $\breve{\beta}$, alongside the Gelbach (2016) decomposition showing the conditional intergenerational food security effects, $\hat{\beta}$, and the amounts that age profiles, other covariates, childhood family and wealth each explained, $\hat{\delta}_k$, for $k = \{1,2,3,4\}$. Recall that the $\breve{\beta} = \hat{\beta} + \sum_{k=1}^{4} \hat{\delta}_k$, so the unconditional estimates in the odd-numbered columns are equivalent to the sum of the point estimates in the even-numbered columns. Panel A shows correlations by mean food security status: marginal, low, or very low food secure in the first two columns, food insecure (low

or very low food secure) in the next two columns, and very low food secure in the remaining two columns. Panel B repeats the intergenerational estimates for continuous measures of food security and food spending.

[Table 3 here]

Based on the food security status indicators shown in panel A, the intergenerational transmission of food insecurity appears to decline with the degree of hardship. The unconditional correlation for any marginal insecurity is 0.380 (0.037), which falls to 0.109 (0.036) conditionally, with standard errors shown in parentheses. The decomposition estimates imply that the direct transmission of food insecurity accounts for about 29 percent of the unconditional correlation across generations, with about 8 percent explained by age profiles, 18 percent by childhood family earnings, 24 percent by childhood family wealth, and 21 percent by other covariates. For food insecurity (low or very low food security), the unconditional estimate of 0.243 (0.043) falls to 0.048 (0.043) and becomes statistically insignificant at conventional levels; and, for very low food security, the estimates for intergenerational transmission are smaller, from 0.145 (0.090) unconditionally to essentially zero with controls, 0.019 (0.087). For more severe categories of food security, childhood family wealth plays an increasingly large role in explaining correlations across generations. Children who are marginally food secure or food insecure are ten percentage points more likely to be marginally secure or insecure in adulthood, even conditional on childhood family earnings and wealth.

Panel B of Table 3 changes from discrete indicators of food security status to continuous measures of food security or spending per needs. Columns (1) through (4) use the latent food security scale estimates and their percentile ranks in the population, and columns (5) through (6) use percentile ranks of food spending relative to the state-year-price-adjusted TFP. The

intergenerational correlations in continuous food security measures are generally consistent with results by status indicators, yet the transmission effects are stronger when conditioning on covariates including childhood family earnings and wealth. Based on the latent scale measure, the unconditional correlation is 0.343 (0.047). Conditional on covariates, the intergenerational transmission in the latent measure is 0.116 (0.049), similar in magnitude to marginal insecurity as shown in panel A column (2). The rank-rank slope estimates shown in columns (2) through (6) of panel B are similar in magnitude to the food insecurity estimates in panel A, yet the rank-rank estimates are more robust to the inclusion of other covariates with the intergenerational pathway explaining 36 percent to 54 percent of the correlation across generations in columns (4) and (6), respectively. Conditional on age profile, first-generation earnings and wealth, and other covariates, a rank-rank slope estimate of 0.85 (0.026) in column (4) indicates that moving from the 25th to 75th percentile in latent childhood food security would correspond to about 4.25 percentile higher ranks of food security in early adulthood. Note that the unconditional correlations in intergenerational food security are above 0.2, which is approximately the magnitude found by Halliday, Mazumder, and Wong (2018) for self-reported health.

The last set of results in Table 3 focus on relative food spending per needs. Any measure of food insecurity may have limitations, thus comparisons across different measures offer a chance to validate estimates of transmission effects. For self-reported food insecurity, one may be concerned that responses are subjective, reported with error, or influenced by stigma. On the other hand, food spending per family needs may not accurately reflect levels of deprivation and may be more closely related to correlations in income. The results in columns (5)-(6), however, seem to be consistent with those of continuous latent food security measures. Even when controlling for income and wealth, families experience more persistence in food spending per TFP than to

responses to the 18-question USDA instrument. These estimates corroborate that persistence in food insecurity, generally defined, is not a mechanical effect of low incomes or subjective survey responses.

If measurement error is expected to be problematic for an indicator of food insecurity, then a three-to-four-year average of latent food security in childhood may offer the most reliable results in terms of how food insecurity persists across generations. At the same time, the results for intergenerational transmission of food insecurity conditional on earnings and wealth are relatively consistent with respect to the proportion of years reporting marginal food security or insecurity in panel A, column (2), and the continuous measures reported in panel B. The intergenerational correlation of food security is approximately 0.1. The estimate of 0.109 for marginal, low, or very low food security has a clear interpretation of 11 percentage points less likely to be highly food secure as an adult. In comparison, the estimate for the latent food security scale is 0.116, which would be an approximately 12 percent increase at the mean scale value of 0.956.[14]

The intergenerational estimates of food security may be sensitive to some of the measurement issues mentioned in Section II, or the impact on early adulthood could depend on whether or not children are present in the second generation. We explore these considerations in sensitivity analyses with supplemental results shown in the appendix. First, we repeat the estimates for aggregated adulthood outcomes in Table 3 by showing results for individuals by repeated adult-year observations in Appendix Table A1. All of the main results are consistent, and if anything, Table A1 strengthens the case for intergenerational transmission of food insecurity conditional on earnings and wealth. Marginal security or insecurity in childhood corresponds to 12.2 percentage

[14] Further, in results not shown here, we find that intergenerational estimates for the binary outcome of food spending below TFP corresponds very closely to the results for percentile ranks of relative food spending. The unconditional correlation of low food spending is 0.241 (0.035), and conditionally the transmission estimate falls to 0.129 (0.035).

points higher chance of adulthood insecurity, and low or very low food security in childhood corresponds to about 7 percentage points higher insecurity (with a p-value of 0.116). The magnitudes are generally larger, and the multiple observations lead to higher precision in estimation.

Next, we repeat the results from Table A1 for the subsample of adults who have children present in the family unit, which we show in Table A2. In this early adulthood sample with children, first-generation exposure to food insecurity implies that the children in the next generation will be 14 percentage points more likely to experience food insecurity. For estimates with children present, there is no difference in the magnitude of transmission (or statistical significance at the 5-percent level) depending on whether the food security status includes marginal security or only those with low or very low food security when conditioning on childhood family earnings and wealth. The conditional correlation for latent food security scale is 0.188 and the rank-rank slope is 0.133.

There are multiple ways to measure food security status over childhood and adulthood, so we conduct a broad range of sensitivity estimates in Appendix Figure A5 comparing how each choice matters. We compare estimates considering the difference between aggregating status indicators using a *mean* exposure (proportion of years exposed) versus constructing another indicator for *any* exposure for a given food security status, which we show separately by combination for childhood and adulthood outcomes. Further, we consider differences between childhood experience with food insecurity at the family level versus food-insecure children as determined by the child-focused questionnaire items 11-18.[15] In summary, there is little or no

[15] Note that in comparison to estimates in Table 3, estimates in Figure A5 only use childhood measure related to food insecurity at the family level (low or very low food secure) or food-insecure children. In Table 3, the measures in each generation correspond directly, yet that is only the case in Figure A5 panel B for family-level insecurity.

difference between measuring insecurity at the family level or child-specific insecurity, and family-level estimates are more precise. This could suggest that there is little protective help on average for parents attempting to shield children from the harm of insufficient food. In general, measuring the proportion of years for childhood exposure implies larger correlations across generations than using any childhood exposure; however, the differences are smaller after conditioning on covariates including family earnings and wealth. When aggregating adulthood measures, using any insecurity leads to higher intergenerational correlations than when using means. To bring these points together, the proportion of years exposed to food insecurity in childhood is most strongly associated with whether one experiences any insecurity in adulthood, and family-level insecurity in childhood is just as relevant as child-specific measures.

6. Childhood Food Insecurity and Adult Earnings

If childhood food insecurity were only persistent in adulthood because of correlated earning ability, then we might not expect to see larger magnitudes and statistical significance of intergenerational estimates conditional on both childhood family earnings and wealth. One mechanism that could explain an independent role for childhood insecurity and adult insecurity would be adverse effects of insufficient nutrition. While food insecurity measures do not provide direct measures of nutritional intake or child hunger, children in food-insecure homes are more likely to experience such hardships that in turn could hinder developmental progress or attention span in school. Thus, childhood food security could also directly influence adult earnings in addition to the positive correlations observed in family earnings across generations. Therefore, to explore the role of childhood food security on adult earnings more closely, we re-estimate equation (1) changing the outcome variable to represent earnings measures instead of the corresponding food security measures in childhood.

Table 4 shows the estimates for two adult-earnings-based dependent variables: the percentile rank of earnings-to-needs ratio and an indicator for earnings below the poverty threshold. The independent variables of interest here include an indicator for food insecurity (low or very low security at the family level) and food-insecure children (based on the child-focused questionnaire items 11-18). Unconditionally, childhood food insecurity is associated with 26 percentile ranks lower earnings-to-needs ratio, yet after conditioning on covariates, the penalty falls to 4.4 percentile ranks lower adult earnings, which is not statistically significant at conventional levels with a p-value of 0.131. Childhood earnings and other controls explain the majority of the unconditional correlation between childhood food insecurity and adulthood earnings. Food insecurity among children, conditional on other covariates, corresponds to a penalty of 6.4 percentile ranks in adult earnings, with a p-value of 0.102.

[Table 4 here]

The results for whether adult earnings fell below the poverty threshold followed similar patterns to the results for earnings percentile ranks, though the magnitudes of effects are somewhat larger. The conditional effects of food insecurity in childhood imply a 5.6 percentage point increase in the probability of earnings below needs in adulthood, with a p-value of 0.217, yet the child-specific food insecurity effect is again more relevant for future earnings with an implied 11.6 percentage point increase in the likelihood of earnings below poverty and a p-value of 0.041. While family-based food insecurity is little different from child-based food insecurity in predicting insecurity in adulthood, the exposure to child-specific food insecurity is more strongly related with lower adult earnings. This evidence is suggestive that future research on the mechanisms of persistent food insecurity across generations should focus on differences between earnings ability

and other potential pathways such as food acquisition, preparation, and consumption practices established during childhood.

7. Discussion and Policy Implications

Intergenerational correlations in food insecurity are around 0.1 to 0.2 among young adults aged 18 to 34, and the persistence of food insecurity decreases with its severity. These are the first point estimates of persistent food insecurity across generations, and therefore an important benchmark for studies of intergenerational transmission of poverty and deprivation. Our evidence suggests that the transmission mechanism is not a spurious correlation driven by family earning ability or wealth endowments. An important related question is how much intergenerational associations between food insecurity and earnings are interrelated. If the causal mechanism for persistent food insecurity is related to human capital development, then one might expect childhood food insecurity to lead to lower earnings as an adult. Our evidence suggests that childhood food insecurity is predictive of adult earnings below poverty, which is clearest when considering the prevalence of child-based food insecurity rather than family-based measures. The intergenerational role of childhood food insecurity on earnings is complementary to the findings of Hoynes, Schanzenbach, and Almond (2016) that food assistance—via the rollout of the SNAP program—promotes economic self-sufficiency in adulthood.

While there has been debate about the relevance of different poverty measures, substantial rates of food insecurity, particularly among children, indicate that families in the U.S. do face challenges meeting essential needs, especially following the Great Recession as well as during the COVID-19 pandemic. If childhood exposure to food insecurity has longer-term implications for family outcomes, then children of the next generation may face similar cycles of food and economic insufficiency. Academics and advocates alike have agreed that food assistance policy in

the U.S. could improve responsiveness to family need (for example, see Ziliak, 2016). The latest expansions to SNAP benefits through the modernized Thrifty Food Plan should improve food security among lower-income families, still the ongoing need of those on assistance is considerable. In evidence shown in Appendix Figure A1, about 44 percent of children receiving SNAP have some degree of food insecurity, many with very low food security. One in five children with means-tested disability assistance are in very low food secure families. Despite evidence that program participation improves food sufficiency in households with children (see McKernan, Ratcliffe, and Braga, 2021), the gap between adequate food for children by family income status requires further consideration. Children in families receiving no public assistance are highly food secure at a rate of 90 percent with only 4 percent low or very low food secure combined, which should signify a benchmark that assistance programs aim to replicate.

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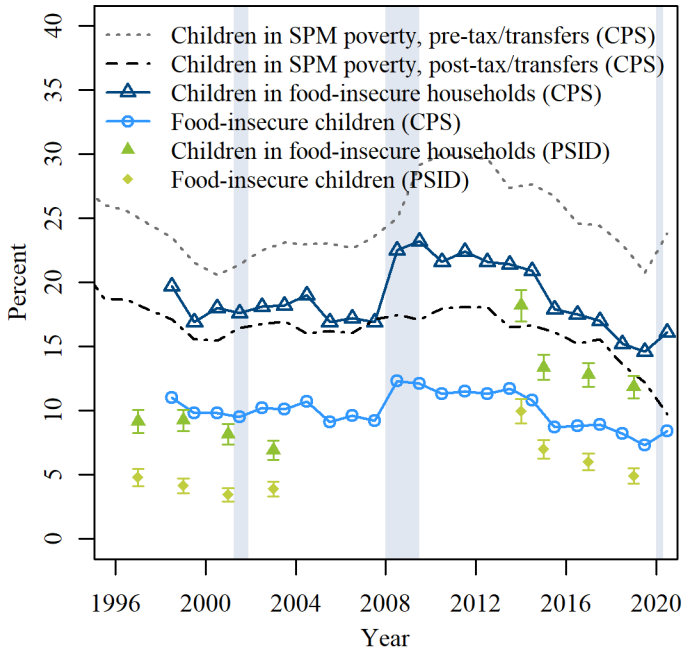
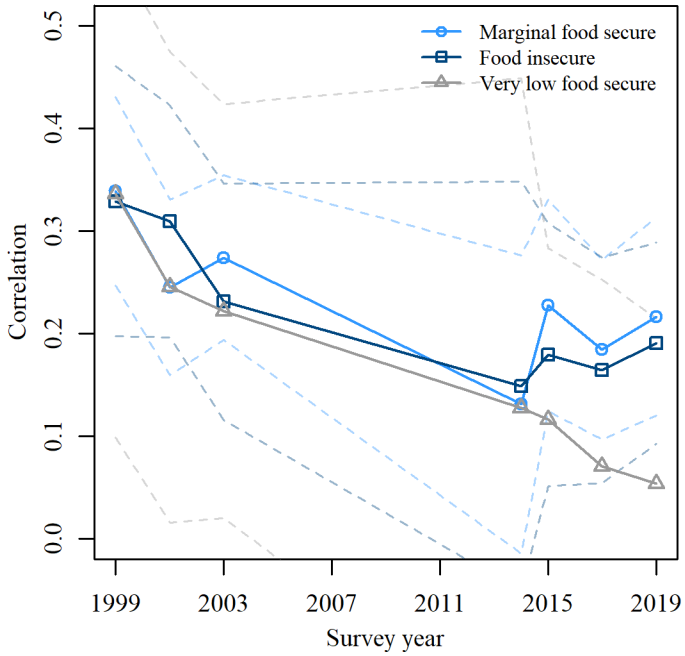
Figure 1. Percent of Children by Food Security and Poverty Status



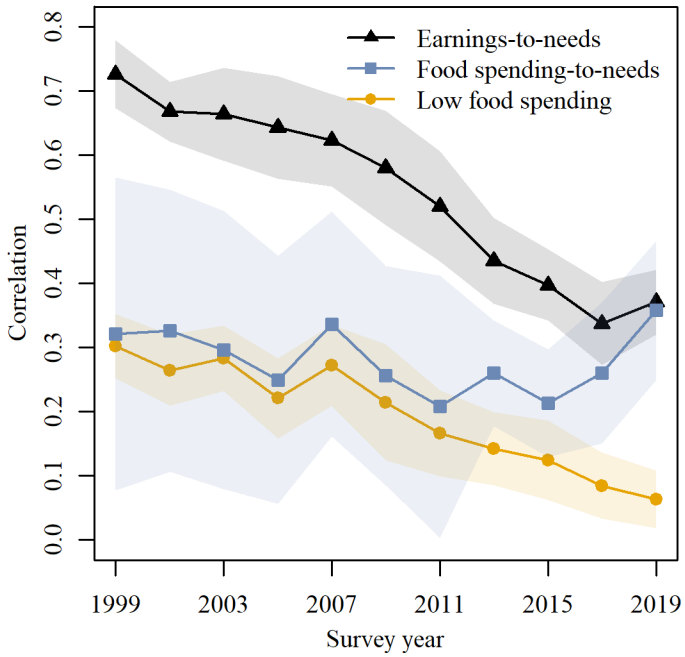
Notes: Shaded regions indicate recessions according to the National Bureau of Economic Research. SPM poverty denotes the percent of children in families with economic resources (before or after taxes/transfers) below the Supplemental Poverty Measure threshold.

Figure 2. Within-Family Persistence in Food Security Status Relative to the 1997 Survey Year



Notes: Conditional estimates, using PSID core longitudinal sample weights, are shown with 95-percent point-wise confidence intervals with state-level clustering.

Figure 3. Within-Family Persistence in Family Income and Food Spending Relative to Survey Year Means over 1995–1997



Notes: Conditional estimates, using PSID core longitudinal sample weights, are shown along with 95-percent point-wise confidence intervals based on state-level clustering. Food spending denotes total food expenditure and Supplemental Nutrition Assistance Program benefits relative to the USDA Thrifty Food Plan adjusted for state price differences. The initial period represents a three-year average for individuals observed as children.

Table 1. Descriptive Statistics by Generational Life Stage

	Childhood, ages 0–17	Early adulthood, ages 18–34	Early adulthood with children present
Survey years:	1997-2003	2014-2019	2014-2019
Family income (thousands)	70.188	54.000	56.019
	(73.562)	(61.299)	(60.267)
Family earnings (thousands)	58.227	46.917	47.983
	(73.120)	(56.952)	(57.852)
Food expenditure (thousands)	9.121	7.800	8.701
	(5.793)	(5.720)	(5.760)
Food stamps/SNAP value (thousands)	3.470	2.559	3.728
[conditional on receipt]	(3.409)	(3.364)	(3.268)
Receives food stamps/SNAP?	0.136	0.179	0.297
	(0.343)	(0.383)	(0.457)
Food spending per Thrifty Food Plan	1.366	1.911	1.415
	(0.695)	(1.387)	(0.874)
Food spending below Thrifty Food Plan?	0.296	0.234	0.335
	(0.457)	(0.424)	(0.472)
Food secure?	0.816	0.692	0.644
	(0.387)	(0.462)	(0.479)
Marginal food secure?	0.087	0.130	0.149
	(0.282)	(0.336)	(0.356)
Low food secure?	0.073	0.106	0.147
	(0.260)	(0.309)	(0.354)
Very low food secure?	0.024	0.072	0.060
	(0.153)	(0.258)	(0.238)
Food-insecure children?	0.048	0.040	0.088
	(0.213)	(0.197)	(0.283)
Poverty status?	0.129	0.123	0.160
	(0.335)	(0.328)	(0.367)
Most education high school or less?	0.392	0.279	0.359
	(0.488)	(0.449)	(0.480)
Age of head of family	40.151	29.752	31.398
	(8.940)	(7.087)	(8.377)
Married couple in family?	0.797	0.452	0.611
	(0.402)	(0.498)	(0.488)
Number of children in family	2.243	0.763	1.686
	(0.996)	(1.080)	(1.011)
Black, non-Hispanic?	0.188	0.201	0.261
	(0.391)	(0.400)	(0.439)
White, non-Hispanic?	0.725	0.713	0.640
	(0.447)	(0.453)	(0.480)
Other, non-Hispanic?	0.020	0.019	0.026
	(0.139)	(0.136)	(0.161)
Hispanic?	0.067	0.068	0.072
	(0.251)	(0.251)	(0.259)
Number of individuals	2109	2109	1047
Observations	7493	5449	2699

Notes: Sample means (medians for dollar amounts) are shown with standard errors (interquartile ranges for dollar amounts) in parentheses. Estimates are weighted using individuals' core longitudinal sample weights.

Table 2. Transition Probabilities Conditional on Childhood Food Security and Age Adjustments

	Adult food security status			
	Food secure	Marginal food secure	Low food secure	Very low food secure
Childhood food security status				
Food secure	76.4%	10.4%	8.5%	4.7%
Marginal food secure	57.0%	17.2%	14.9%	10.9%
Low food secure	49.0%	22.1%	15.2%	13.7%
Very low food secure	54.8%	15.1%	14.9%	15.2%

Notes: The transition probabilities represent the expected adult food security status given each childhood status conditional on a quadratic in both the individual's current age in adulthood and the parent's average age during childhood.

Table 3. Estimates of Intergenerational Food Security Correlations by Aggregated Adult Observations

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Indicators for food security status					
	Marginal, low, or very low food security		Low or very low food security		Very low food security	
Childhood food security	0.380	0.109	0.243	0.048	0.145	0.019
	(0.037)	(0.036)	(0.043)	(0.043)	(0.090)	(0.087)
Conditional	No	Yes	No	Yes	No	Yes
Observations	2109	2109	2109	2109	2109	2109
	Decomposition of unconditional intergenerational effects explained by covariates					
Age profiles		0.032		0.012		-0.008
		(0.013)		(0.013)		(0.010)
Control variables		0.081		0.048		0.030
		(0.023)		(0.021)		(0.024)
Childhood family earnings		0.067		0.032		0.033
		(0.024)		(0.022)		(0.015)
Childhood family wealth		0.091		0.103		0.071
		(0.026)		(0.024)		(0.024)
	B. Continuous measures of food security or spending per Thrifty Food Plan (TFP)					
	Latent food security scale		Percentile rank of food security		Percentile rank of food spending per TFP	
Childhood food security	0.343	0.116	0.238	0.085	0.274	0.148
	(0.047)	(0.049)	(0.024)	(0.026)	(0.028)	(0.029)
Conditional	No	Yes	No	Yes	No	Yes
Observations	2109	2109	2109	2109	2109	2109
	Decomposition of unconditional intergenerational effects explained by covariates					
Age profiles		0.015		0.018		0.012
		(0.013)		(0.008)		(0.007)
Control variables		0.048		0.036		0.052
		(0.022)		(0.014)		(0.014)
Childhood family earnings		0.051		0.037		0.047
		(0.025)		(0.015)		(0.016)
Childhood family wealth		0.114		0.061		0.015
		(0.028)		(0.017)		(0.009)

Notes: The intergenerational measures for childhood correspond to the same adulthood measures as indicated by the column headers. Robust standard errors with state-level clustering are shown in parentheses, and PSID core longitudinal weights are used in estimation. Both the childhood and adulthood measures represent the mean over the observed years, or proportion of years for the indicator measures.

Table 4. Intergenerational Estimates of Childhood Food Security Correlations with Earnings in Adulthood

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	Earnings-to-needs percentile rank				Earnings below poverty threshold			
	Low or very low food security		Food-insecure child(ren)		Low or very low food security		Food-insecure child(ren)	
Childhood food security	-0.260	-0.044	-0.337	-0.064	0.308	0.056	0.435	0.116
	(0.027)	(0.029)	(0.041)	(0.038)	(0.048)	(0.045)	(0.067)	(0.056)
Conditional	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2109	2109	2109	2109	2109	2109	2109	2109
	Decomposition of unconditional intergenerational effects explained by covariates							
Age profiles		-0.018		-0.019		0.026		0.030
		(0.008)		(0.012)		(0.012)		(0.017)
Control variables		-0.072		-0.104		0.084		0.120
		(0.018)		(0.027)		(0.021)		(0.030)
Childhood family earnings		-0.105		-0.126		0.120		0.146
		(0.016)		(0.019)		(0.023)		(0.025)
Childhood family wealth		-0.021		-0.024		0.021		0.023
		(0.011)		(0.011)		(0.017)		(0.018)

Notes: The intergenerational measures for childhood correspond to the same adulthood measures as indicated by the column headers. Robust standard errors with state-level clustering are shown in parentheses, and PSID core longitudinal weights are used in estimation. Both the childhood and adulthood measures represent the mean over the observed years, or proportion of years for the indicator measures.

APPENDIX

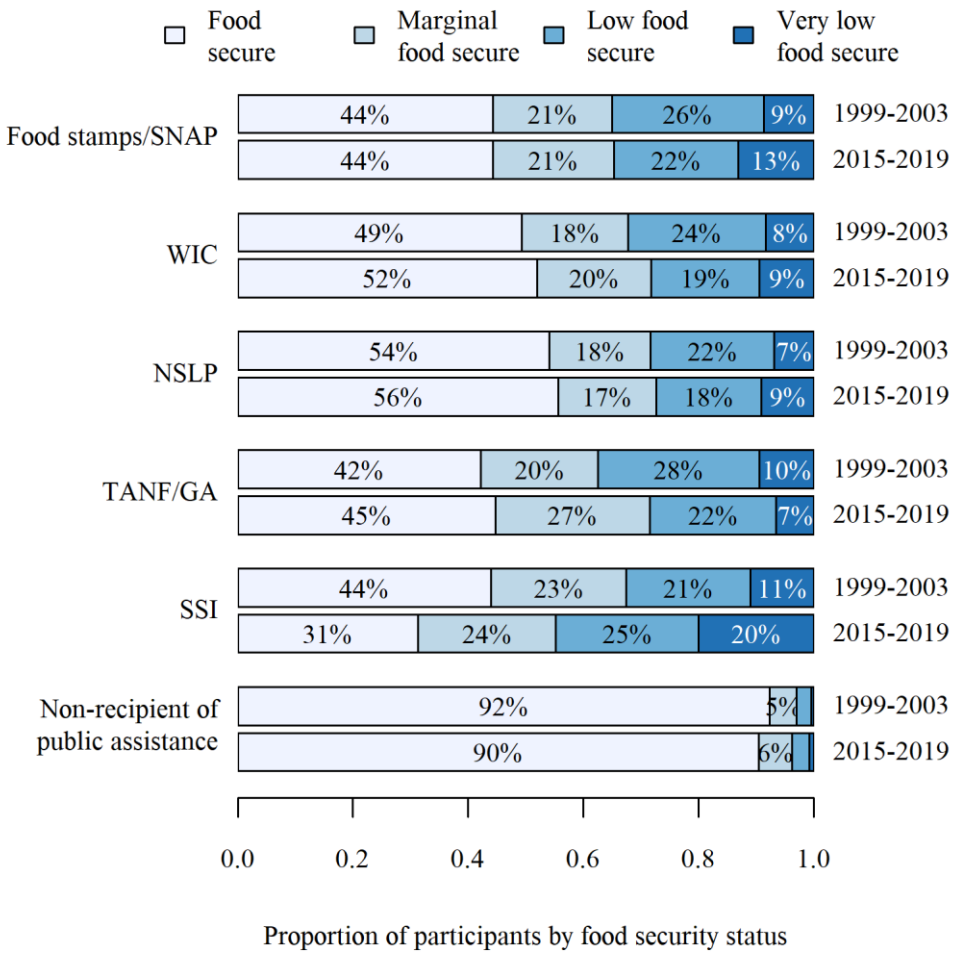
Questionnaire used to assess food security (Coleman-Jensen et al., 2020):

1. We worried whether our food would run out before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?
2. The food that we bought just didn't last and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?
3. We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?
4. In the last 12 months, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food? (Yes/No)
5. (If yes to question 4) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
6. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? (Yes/No)
7. In the last 12 months, were you ever hungry, but didn't eat, because there wasn't enough money for food? (Yes/No)
8. In the last 12 months, did you lose weight because there wasn't enough money for food? (Yes/No)
9. In the last 12 months did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food? (Yes/No)
10. (If yes to question 9) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

(Questions 11-18 were asked only if the household included children age 0-17)

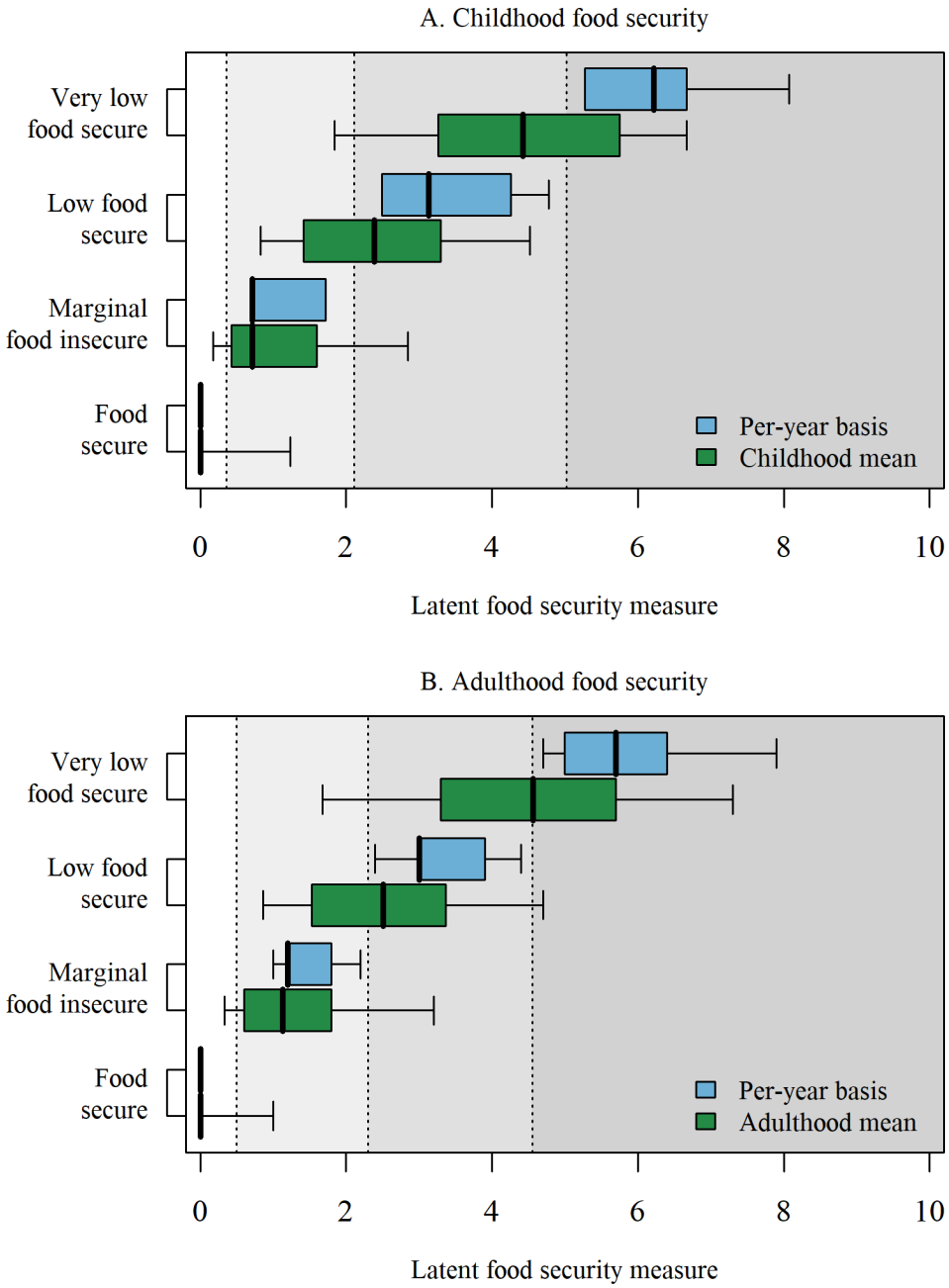
11. \We relied on only a few kinds of low-cost food to feed our children because we were running out of money to buy food." Was that often, sometimes, or never true for you in the last 12 months?
12. \We couldn't feed our children a balanced meal, because we couldn't afford that." Was that often, sometimes, or never true for you in the last 12 months?
13. \The children were not eating enough because we just couldn’t afford enough food." Was that often, sometimes, or never true for you in the last 12 months?
14. In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food? (Yes/No)
15. In the last 12 months, were the children ever hungry but you just couldn't afford more food? (Yes/No)
16. In the last 12 months, did any of the children ever skip a meal because there wasn't enough money for food? (Yes/No)
17. (If yes to question 16) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
18. In the last 12 months did any of the children ever not eat for a whole day because there wasn't enough money for food? (Yes/No)

Figure A1. Distribution of Children's Food Security Status
by Assistance Program Participation



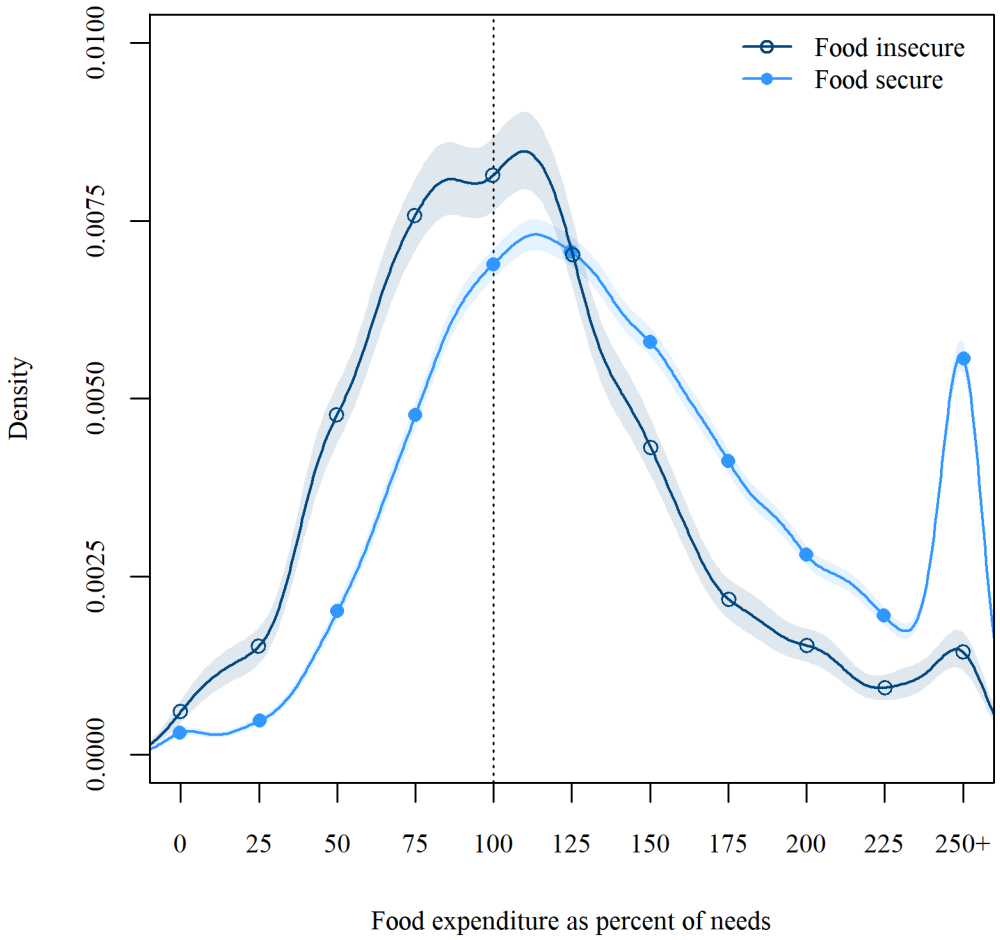
Abbreviations: Supplemental Nutrition Assistance Program (SNAP); Special Supplemental Nutrition Program for Women, Infants, and Children (WIC); National School Lunch Program (NSLP); Temporary Assistance for Needy Families (TANF); General Assistance or other welfare (GA); and, Supplemental Security Income (SSI).

Figure A2. Relationship between Latent Food Security
and Food Security Status Indicators



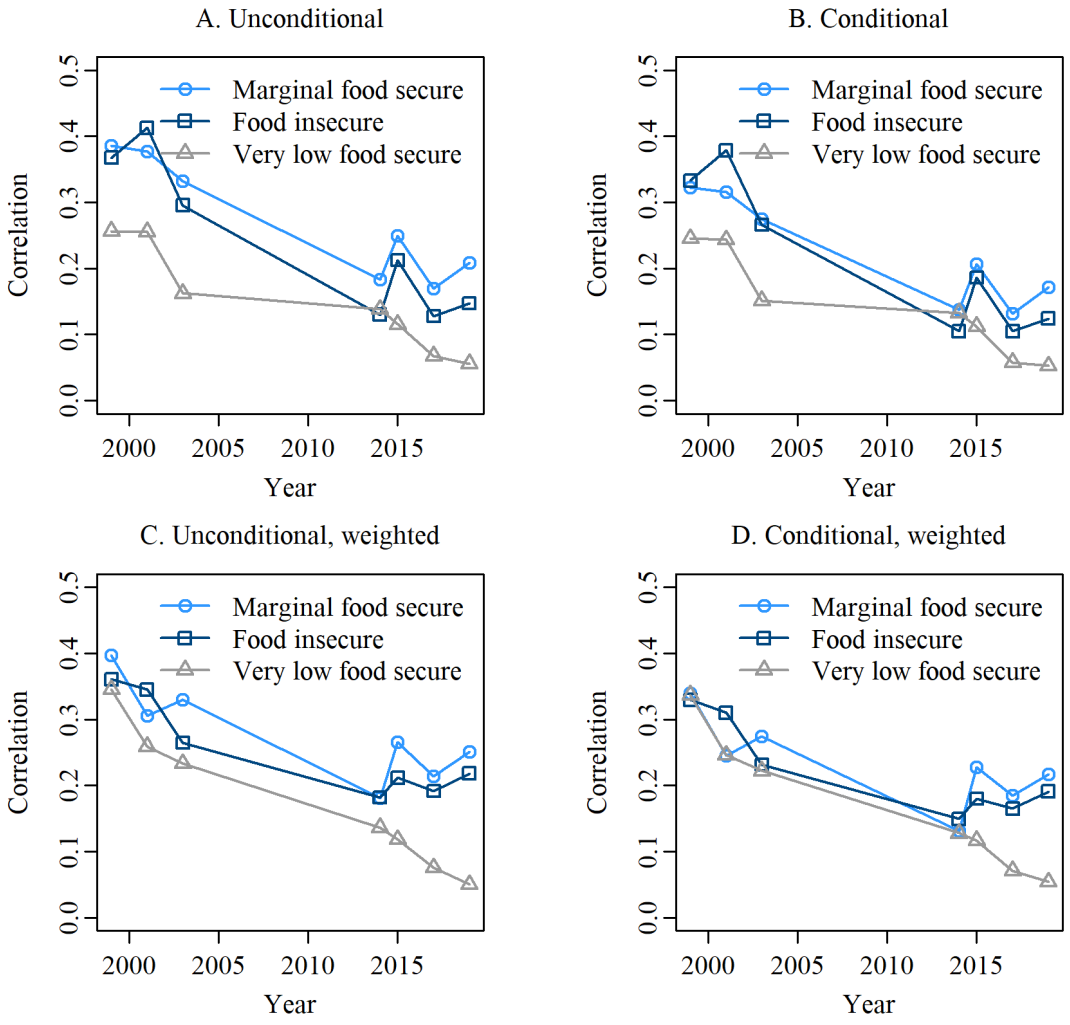
Notes: Food secure denotes no positive responses to the 18 food security questions, marginal food secure denotes at least 1 positive response to the 18 food security questions, low food secure denotes at least 3 positive responses, and very low food secure denotes at least 6 positive responses for families with no children or at least 8 positive responses for families with children. The box plots represent the median and interquartile range of the latent measure of food security, and the extreme lines show the range of values excluding outliers.

Figure A3. Distribution of Food Expenditure as a Percent of Needs
(USDA Thrifty Food Plan) by Food Security Status



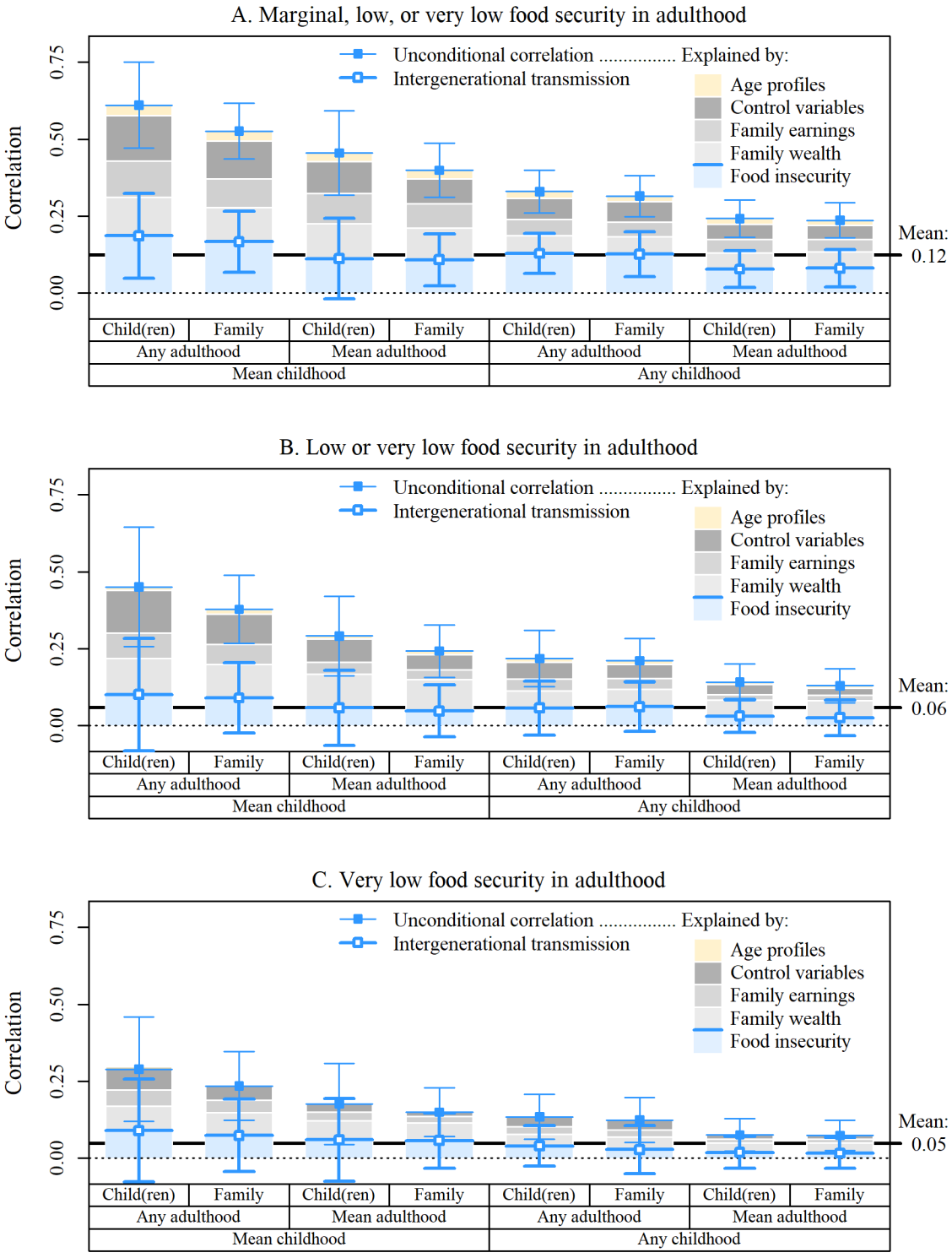
Notes: Food secure denotes no positive responses to the 18 food security questions, and low food secure denotes at least 3 positive responses. The 75-percent cutoff corresponds to the largest mean difference in low food spending probability by food secure or low food secure statuses. While the percent of needs x-axis is abbreviated for illustration purposes, the density mass of food secure individuals above the 250-percent threshold of needs is much greater than those who are low food secure.

Figure A4. Within-Family Household Food Insecurity
Correlations Relative to 1996



Notes: Estimates above are conditional on the baseline controls and use the PSID core longitudinal sample weights, and each point represents a separate estimation with 90-percent point-wise confidence intervals. Marginal food secure denotes at least 3 positive responses to the 18 food security questions, low food secure denotes at least 3 positive responses, and very low food secure denotes at least 6 positive responses for families with no children or at least 8 positive responses for families with children.

Figure A5. Intergenerational Food Security Status, by Food-insecure Child(ren) and Food-insecure Family



Notes: Childhood food insecurity represents either food insecurity at the family level or food-insecure child(ren) based on the child-focused questionnaire items; each may be measured as any exposure or mean (proportion) exposure. Adult food security outcomes are organized by family status in each panel measured as any year with that status or the mean (proportion) of years.

Table A1. Estimates of Intergenerational Food Security Correlations by Yearly Adult Observations

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Indicators for food security status					
	Marginal, low, or very low food security		Low or very low food security		Very low food security	
Childhood food security	0.367	0.122	0.239	0.070	0.124	0.018
	(0.037)	(0.035)	(0.047)	(0.045)	(0.071)	(0.069)
Conditional	No	Yes	No	Yes	No	Yes
Number of individuals	2109	2109	2109	2109	2109	2109
Observations	5449	5449	5449	5449	5449	5449
	Decomposition of unconditional intergenerational effects explained by covariates					
Age profiles		0.033		0.014		-0.005
		(0.011)		(0.011)		(0.007)
Control variables		0.080		0.044		0.024
		(0.020)		(0.019)		(0.019)
Childhood family earnings		0.058		0.029		0.020
		(0.022)		(0.022)		(0.015)
Childhood family wealth		0.075		0.082		0.067
		(0.021)		(0.020)		(0.024)
	B. Continuous measures of food security or spending per Thrifty Food Plan (TFP)					
	Latent food security scale		Percentile rank of food security		Percentile rank of food spending per TFP	
Childhood food security	0.327	0.131	0.234	0.099	0.264	0.135
	(0.046)	(0.045)	(0.024)	(0.025)	(0.030)	(0.029)
Conditional	No	Yes	No	Yes	No	Yes
Number of individuals	2109	2109	2109	2109	2109	2109
Observations	5449	5449	5449	5449	5449	5449
	Decomposition of unconditional intergenerational effects explained by covariates					
Age profiles		0.017		0.019		0.009
		(0.010)		(0.007)		(0.007)
Control variables		0.045		0.037		0.060
		(0.018)		(0.012)		(0.013)
Childhood family earnings		0.039		0.029		0.042
		(0.023)		(0.015)		(0.013)
Childhood family wealth		0.095		0.050		0.019
		(0.024)		(0.013)		(0.010)

Notes: The intergenerational measures for childhood correspond to the same adulthood measures as indicated by the column headers. Robust standard errors with state-level clustering are shown in parentheses, and PSID core longitudinal weights are used in estimation. The childhood measures represent the mean over the observed years, or proportion of years for the indicator measures.

Table A2. Estimates of Intergenerational Food Security Correlations
by Adult Observations for Families with Children

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Indicators for food security status					
	Marginal, low, or very low food security		Low or very low food security		Very low food security	
Childhood food security	0.321	0.137	0.213	0.144	0.179	0.108
	(0.057)	(0.059)	(0.064)	(0.054)	(0.098)	(0.087)
Conditional	No	Yes	No	Yes	No	Yes
Number of individuals	1047	1047	1047	1047	1047	1047
Observations	2699	2699	2699	2699	2699	2699
	Decomposition of unconditional intergenerational effects explained by covariates					
Age profiles		0.033		0.012		-0.006
		(0.016)		(0.015)		(0.008)
Control variables		0.083		0.032		0.053
		(0.034)		(0.036)		(0.030)
Childhood family earnings		0.039		-0.019		0.002
		(0.028)		(0.026)		(0.013)
Childhood family wealth		0.029		0.043		0.021
		(0.024)		(0.026)		(0.019)
	B. Continuous measures of food security or spending per Thrifty Food Plan (TFP)					
	Latent food security scale		Percentile rank of food security		Percentile rank of food spending per TFP	
Childhood food security	0.278	0.188	0.232	0.133	0.181	0.121
	(0.067)	(0.064)	(0.038)	(0.037)	(0.044)	(0.041)
Conditional	No	Yes	No	Yes	No	Yes
Number of individuals	1047	1047	1047	1047	1047	1047
Observations	2699	2699	2699	2699	2699	2699
	Decomposition of unconditional intergenerational effects explained by covariates					
Age profiles		0.009		0.020		-0.004
		(0.011)		(0.010)		(0.009)
Control variables		0.044		0.047		0.016
		(0.027)		(0.022)		(0.024)
Childhood family earnings		0.002		0.012		0.044
		(0.023)		(0.020)		(0.020)
Childhood family wealth		0.034		0.020		0.004
		(0.021)		(0.013)		(0.008)

Notes: The intergenerational measures for childhood correspond to the same adulthood measures as indicated by the column headers. Robust standard errors with state-level clustering are shown in parentheses, and PSID core longitudinal weights are used in estimation. Both the childhood and adulthood measures represent the mean over the observed years, or proportion of years for the indicator measures.