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Food Security and Policy Effects by Family Size

How Does Quality of Well-Being Depend on Quantity of Children?

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Abstract

We investigate the intersection of family size, food security, and the efficacy of public benefits, especially with respect to the Supplemental Nutrition Assistance Program (SNAP). Food security literature pays scant attention to the role of number of children in a household – an important dimension for understanding family resource and food assistance adequacy in the context of child well-being. We exploit longitudinal food security data within the Panel Study of Income Dynamics to explore how food security status and family resources change when families change in size, particularly with the addition of children. Gundersen et al. (2018) flagged large families as a group for consideration in any future SNAP reform, which motivates the need for evidence on the dynamics of family size, program benefits, and child food security. We focus on the subsample of SNAP recipients to address the question of how well program benefits meet the needs of families of varying sizes, as defined by a geographically price-adjusted Thrifty Food Plan, as well as how an additional family member, or child, affects the probability of being food insecure and how family size intersects with the likelihood of being extramarginal (no food spending beyond SNAP assistance), the size of the average food resource gap between spending and needs, and the adequacy of SNAP benefits in meeting food needs. Our findings provide key insight on the responsiveness of food assistance programs to changes in family composition and needs. Importantly, this study supports future research and policy design with respect to child well-being in larger families.

Executive Summary

We investigate the intersection of family size, food security, and the efficacy of public benefits, especially with respect to the Supplemental Nutrition Assistance Program (SNAP). Food security literature pays scant attention to the role of number of children in a household – an important dimension for understanding family resource and food assistance adequacy in the context of child well-being.

To understand the efficacy of food assistance policy by children’s family size, this analysis centers on two key research questions:

- (1) How do economic circumstances and food insecurity in families with children change with increases in family size?
- (2) How is food insecurity in families of different sizes mitigated by food assistance programs for families with children, and has this changed over time?

We exploit longitudinal food security data within the Panel Study of Income Dynamics to explore how food security status and family resources change when families change in size, particularly with the addition of children. Gundersen et al. (2018) flagged large families as a group for consideration in any future SNAP reform, which motivates the need for evidence on the dynamics of family size, program benefits, and child food security. We focus on the subsample of SNAP recipients to address the question of how well program benefits meet the needs of families of varying sizes, as defined by a geographically price-adjusted Thrifty Food Plan, as well as how an additional family member, or child, affects the probability of being food insecure and how family size intersects with the likelihood of being extramarginal (no food spending beyond SNAP assistance), the size of the average food resource gap between spending and needs, and the adequacy of SNAP benefits in meeting food needs.

We confirm larger family size as a prevalent family form for children and one that is associated with a high risk of income poverty. We also note that the proportion of children in larger families has increased over the last two decades – in particular, the proportion of children in families with four or more children in the home. As such, family size is an important indicator for inclusion in child and family research moving forward and is a characteristic worthy of increased attention to in the food security literature. Regardless of SNAP receipt, food insecurity is more prevalent among children in larger families than among children in small families and, among children in larger families, it appears to be more persistent.

We do not necessarily find a causal relationship between family size and/or number of children and low/very low food security. Results indicate some association, however, between family size and marginal food security among the whole child population – a point that warrants further future investigation. Neither did we find a clear relationship between the number of children and food insecurity among SNAP recipients. But this does not mean that food insecurity is not a concern among children in larger families receiving SNAP – indeed, our subsequent results reveal that it is. What the findings may suggest that the process of adding children to the family is not in and of itself the causal link between larger family size and food insecurity. Future work

on this topic might also compare the heterogeneity of family size effects by key economic circumstances in the households (e.g. parental employment, income shocks, or benefits receipt). Within the SNAP recipient population, a partial explanation may also lie in SNAP's benefit design: each additional household member results in additional SNAP benefits. This stands in contrast to other key income support programs that cap benefits based on number of children (e.g. the Earned Income Tax Credit), exclude new family members from receipt (e.g. Temporary Assistance for Needy Families in states where family caps remain in place), or have earnings requirements in place that require larger families to have higher levels of income than smaller families to access maximum benefit amounts (e.g. the Child Tax Credit, prior to the temporary American Rescue Plan Act expansions for 2021) – all of which serve to more specifically penalize children with larger family sizes. (Curran 2021).

In looking at SNAP specifically, we demonstrate family size to be a relevant characteristic of the SNAP-recipient population. Over the past two decades, close to 60 percent of the children receiving SNAP are those in families with 3 or more children – for this reason alone, the identification by Gundersen et al. (2018) of large families as a group for consideration in any future SNAP reform is warranted. More information about this under-acknowledged population is needed to develop this evidence base – particularly as we find the economic situation of children in larger families overall, and the children in larger families in receipt of SNAP especially, remains much worse off than their small family counterparts.

Johnson et al. (2018) and Hoynes et al. (2015) point out that extramarginal status for larger families is likely product of budget constraint rather than preference; given the differences in income poverty among SNAP-recipient children across family sizes, this holds. Somewhat unexpectedly, we found the proportion of children in larger families experiencing extramarginal status has declined over time (in contrast to the proportion of children in smaller families, which has fairly steady). Within the profile of children who are extramarginal, though, larger family size remains a common characteristic and are a group who would benefit from further inquiry.

With respect to broader questions of SNAP efficacy and adequacy, we find: (1) SNAP is more effective for smaller families in reducing the proportion of children with a food spending gap than it is for larger families; and (2) SNAP plays more of an equalizing role in reducing the depth of the food spending gap – i.e. how far children's family food spending remains below their Thrifty Food Plan level – across family sizes. Nevertheless, this gap remains a deeper one for children in larger families, indicating that – even after SNAP – a greater portion of their food needs remain unmet. An analysis of the individual USDA indicator responses by children's family size provides further confirmation – and concerning trends in recent years, whereby children in larger SNAP-recipient families who report food insecurity at the household level appear to be more directly impacted by this insecurity (e.g. not having enough to eat) themselves. Given the sharp increases in food insecurity amidst the COVID-19 pandemic (Bitler, Hoynes, and Schanzenbach 2020; Bauer, Pitts, Ruffini, and Schanzenbach 2020; Ziliak 2020), this is an area for research and policy attention. The prospect of food insecurity in larger households implies that many children could be affected by its impact. Understanding more about the nature of the food security risk posed by family size, including the broader family economic security changes that accompany increases in family size, is vital for informing the design of public policy to mitigate this risk.

Introduction

Households with children experience food insecurity at a rate 55% higher than childless households (Coleman-Jensen et al., 2019). ‘Households with children’, though, is far from a homogenous group. Differences in food insecurity by family composition are often explored with respect to race/ethnicity, immigration status, geographic region, disability, and parental marital status (Coleman-Jensen et al., 2019; Gundersen and Ziliak, 2018; Tiehan et al., 2019). Less consistently examined in food security studies is the issue and impact of family size – specifically, the number of children in the home – on the risk, severity, and persistence of food insecurity and not enough is known about the current intersection of family size, food insecurity, and the efficacy of food assistance programs and cash transfers for families with children.

Food insecurity is often episodic (Coleman-Jensen et al., 2019) and linked to changes in family income (Gundersen et al., 2011; Wight et al., 2014). An increase in a family’s number of children represents a meaningful change to their economic circumstances and needs (Kennedy et al., 2013). Curran (2019) shows that almost one-fifth of U.S. children, by the time they reach early adolescence, live in households with at least four co-resident siblings, and these larger families are associated with lower levels of parental employment and higher risk of child poverty. Large family size was identified in recent research from the United Kingdom (O’Connell et al., 2019) as the family type at highest risk of food insecurity – on par with the risk experienced by single-parent families – but detailed food security analysis by family size is less evidenced in the United States. Hofferth (2004) identified the number of children as a risk factor for families’ entry into food insecurity, but the study encompasses a narrow time period (using 1997 and 1999 PSID survey data) that would not reflect the impact of adding multiple children over time or changes in the policy environment. Other studies have focused on additional children only in women-headed urban households receiving cash assistance (Heflin and Butler, 2004; London and Scott, 2005). Family size is often absent from the contemporary set of ‘key predictors’ of food insecurity (Tiehan et al., 2019) and analyses of food insecurity trends do not regularly identify differences by number of children (Coleman-Jensen et al., 2019). Gundersen et al. (2018) flagged large families as a group for consideration in any future SNAP reform, which motivates the need for evidence on the dynamics of family size, program benefits, and child food insecurity.

Recent literature (Johnson et al., 2018; Hoynes et al., 2015) indicates that within the population of Supplemental Nutrition Assistance Program (SNAP) recipients, a significant amount of families are intramarginal, in that they spend more on food than they receive in food assistance benefits (e.g. SNAP), and these families represent the bulk of the research focus on SNAP benefit level efficacy. Larger families are more likely to be extramarginal consumers—their food spending is less than or equal to the amount of SNAP benefits received—and are an understudied population group in food security studies in recent decades.

Extramarginal status can result from preference or from budget constraint, but Johnson et al. (2018) and Hoynes et al. (2015) observe that for larger families, it is likely the product of the latter. Hoynes et al. (2015:19) find that SNAP program estimates of family food needs increase faster by family size than do food expenditures, and they point to two possible suggestions for this discrepancy: “differences in resources across family sizes, or [...] actual economies of scale in the production and consumption of food are larger than is assumed by the [SNAP] program.”

To explore these two points further and understand more about food security in larger families in the context of their extramarginal consumer status for the purposes of informing policy, more investigation of larger family resources and the specific impact of SNAP on families of larger size is needed.

Building on the recent work of Johnson et al. (2018), Hoynes et al. (2015), and Gundersen et al. (2018), our study addresses this gap. This study explores not only how family food insecurity changes with family size, but also traces out corresponding changes in families' broader economic circumstances (e.g. parental employment, income shocks, or benefits receipt). If family size matters for the risk of food insecurity, family size also matters for effective policy responses. This study adds to our understanding of how families of different sizes experience food resource gaps and are supported by key food assistance programs – in particular, SNAP.

Research Questions

To understand the efficacy of food assistance policy by children's family size, this analysis centers on two key research questions:

- (1) How do economic circumstances and food insecurity in families with children change with increases in family size?
- (2) How is food insecurity in families of different sizes mitigated by food assistance programs for families with children, and has this changed over time?

Research Methods

Conceptual Foundations

This analysis examines family size from the children's perspective – here, the number of co-resident children in the home. This follows the approach set out by Curran (2021), informed by Preston's (1976) discussion of the differences between measuring family size from an adult perspective (e.g. women's fertility) and a child perspective (e.g. sibling size – either biological siblings or co-resident children). Preston (1976) notes that the former approach, as a matter of group averages, often undercounts the prevalence of large family size among children. The latter child-centered measure offers a better way to see larger family size as a common family feature for children (Curran 2021) and to understand the number of children in the household among which family resources (e.g. parental attention, material items, family income, and more) must be spread.

The impact of family size on family resources is often understood in terms of a resource dilution model: that increases in family size, particularly through the addition of children, might introduce strains on family resources. Becker (1964, 1981) and Becker and Tomes (1979, 1986) established an economic framework for considering family decision-making in the context of a 'quantity versus quality' tradeoff for children investments and human capital development. Blake (1981), among others, considers the hypothesized link between large families and education outcomes, or intelligence, as a measure of quality. More recently, Gibbs et al. (2016) propose a

conditional resource model that identifies public supports for investments in children as a potential offset to the effects of traditional resource dilution on children. While the resource dilution approach features prominently in child development literature, quality outcomes tend to be the focus rather than the process in its own right, such as the link between family resources and child food security (or, nutritional intake).

Building on recent research by Curran (2019, 2021) on family size and income poverty among children, this study focuses directly on the resource dilution process, with a particular examination of the effect of family size on children’s food security while also accounting for the broader social and policy contexts in which children live. We adapt the Gibbs et al. (2016) conditional resource approach to look at the potential offset from food assistance by family size and examine the impact of public policy on family food security as family size changes over time. The findings provide crucial evidence on family food and economic security and the efficacy of food assistance by family size.

Methods of Analysis

Food security is measured by the level of difficulty households have meeting their basic food needs – a concept assessed and tracked by the US Department of Agriculture (USDA) using questionnaires included in the Food Security Supplement to the Current Population Survey (CPS), also featured in select years of the Panel Study of Income Dynamics (PSID). The eighteen-question assessment asks questions about the level of food need in the household as a whole and among adults and children individually. We use these responses to re-construct the USDA household food security scale (Coleman-Jensen et al. 2018) according to which ‘food secure’ households report zero to two insecure conditions (we break this out in further detail with a ‘marginal food secure’ category of one to two insecure conditions) and ‘food insecure’ households report three or more insecure conditions. Of households deemed ‘food insecure’, those with ‘low food security’ are those with three to five conditions versus those with ‘very low food security’ are those with six conditions or more (‘very low food security’ households with children are those with eight conditions or more) (Coleman-Jensen et al. 2018).

Our analysis first presents descriptive trends in the risk of food insecurity of the whole child population by family size conditional on other family characteristics. Given families’ repeated observations, we also estimate persistence in food insecurity status by children’s family size. In order to identify the impact of additional children on food security, we use a panel model approach as well as using instrumental variables to estimate family size effects on food insecurity. We look first at the whole child population and then repeat our model within the sample of SNAP recipients; the latter approach seeks to avoid confounding biases of unobserved differences in SNAP-recipient families from the rest of the population. The fixed-effect approach is motivated by the need to account for a family’s endogenous decision-making concerning family growth, and we generally follow others in the literature, such as Black et al. (2005). That is, given a family’s observed food insecurity over time, we can identify how changes in family size are directly related to current child food security. Specifically, for family f in state s and year t , we would estimate $FOODSEC_{fst} = \theta(FAMSIZE)_{ft} + \beta'x_{fst} + \alpha_f + \mu_s + \kappa_t + \varepsilon_{fst}$, where the outcome $FOODSEC_{fst}$ represents a measure of family food security. The independent variables include a measure of family size as well as controls for time-varying

family and state-level characteristics, x_{fst} , a family fixed effect, α_f , state effect, μ_s , year effect, κ_t , and a family's idiosyncratic error term, ε_{fst} . In order to clearly present sources of identification and potential bias, we first estimate the model assuming $\alpha_f = 0$, without and then with control variables, as a comparison of how much correlation is explained by unobserved characteristics.

Controlling for family fixed effects addresses permanent unobserved heterogeneity between families, yet some fertility choices may be correlated with time-varying outcomes. The literature has typically instrumented for family size by considering exogenous variation related to the sex of firstborn children, or the occurrence of multiple births (see Angrist and Evans, 1998; Black et al., 2005). A child's sex at birth is like a random assignment to the parent, yet this outcome can influence future fertility decisions. Alternatively, the birth of twins, for example, would be a plausibly exogenous shock to family size beyond the fertility initial choice. Therefore, we define instruments for whether the firstborn child was female, separate indicators for whether two firstborn children are same-sex male or female, and an indicator for multiple births, or more commonly, twins.

The second half of our analysis focuses specifically on SNAP-recipient families to examine the impact of food assistance policy (specifically: SNAP) on food insecurity across family sizes using a set of additional measures. We construct descriptive tables showing the profile of children in receipt of SNAP by family size, estimates of food security among SNAP recipients, as well as the percent of SNAP recipient families who are extramarginal and how this differs by family size over time. To identify families with extramarginal status, we draw on the definition employed by Johnson et al. (2018) (e.g. their F17 variable) that identifies whether or not a household spends any additional money on food used at home on top of what is purchased with SNAP benefits.

To further understand the adequacy of SNAP benefits by family size, we then examine SNAP benefits as a percent of food needs for different family sizes and trends in the degree to which SNAP benefits reduce the average food spending gap among children who receive it. The average food spending gap is defined as the difference between food expenditure and needs according to the Thrifty Food Plan. Gundersen et al. (2018) discuss the food resource gap using CPS data on the additional income households need in order to become food secure, so our constructed measure of the food spending gap provides a new data comparison with PSID evidence over multiple years and by family size. Further, we elaborate on this gap by incorporating regional variation in food purchasing power (Basu, Wimer, and Seligman, 2016; Bronchetti, Christensen, and Hoynes, 2018; Ziliak and Gundersen, 2016). Using this information, we construct a measure of real benefit adequacy defined as the percent of price-adjusted food needs met by SNAP benefits in addition to a price-adjusted food spending gap and comment specifically on SNAP adequacy for smaller versus larger families. We then return to the issue of food insecurity rates – and the ways in which food insecurity manifests itself – across family sizes within the SNAP-recipient population.

We conclude with a discussion of the implications of our findings for food security and child well-being research, as well as the implications for understanding the impact of current food

assistance policy, future potential SNAP reforms, and the treatment of family size within the broader social safety net.

Data

This study exploits the availability of longitudinal food security data in the PSID, including the Child Development Supplement, for survey years 1997-2003 and 2014-2019, over the course of which key public programs for families with children saw expansions. The outcome variable of interest is child food insecurity for the sample of families with at least one child. Further, using the full 18-item USDA questionnaire, we estimate a latent measure of child food insecurity. Key independent variables include family size (number of children in the family unit) as well as control variables for age, age squared, gender, race, parental education, parental marital status, parental work, and income poverty status.

Family size

The analysis specifically defines children's family size as the number of co-resident children under the 18 in the home. The delineation between 'larger' family and 'smaller' family size is set at three co-resident children. A family with one or two children under 18 in the home is identified as a smaller family and a family with three or more children under 18 in the home is identified as a larger one. This follows the approach of Curran (2021), where it is noted that it remains an open question in the contemporary literature as to what constitutes a 'large' family today, but a three-child family is above the US mean family size for children. Where relevant, the analysis breaks out 'larger' family results to distinguish between families with three children only and those with four children or more to identify any underlying trends. Tables 1 and 2 identify the sample size used in the analysis, as well as basic socio-economic descriptive characteristics, across years and children's family size.

Table 1. Distribution of children across family sizes and PSID survey years

Year	Smaller families (1 to 2 children)		Larger families (3 or more children)		Families with 3 children		Families with 4 or more children	
	N	%	N	%	N	%	N	%
1997*	3,482	64.5	2,295	35.5	1,452	27.8	843	10.6
1999	3,498	66.1	2,194	33.9	1,374	26.1	820	10.5
2001	3,655	68.1	2,101	31.9	1,383	25.4	718	8.7
2003	3,670	68.6	2,077	31.4	1,335	24.6	742	9.0
2014*	3,749	58.0	3,207	42.0	1,701	28.7	1,506	18.7
2015	3,514	60.2	2,613	39.8	1,494	28.5	1,119	15.8
2017	3,494	58.6	2,751	41.4	1,560	29.6	1,191	16.8
2019	3,394	57.8	2,740	42.2	1,566	31.2	1,174	16.0

Notes: Survey years marked with an asterisk correspond to the Child Development Supplement. N represents the observation count for number of children by family type, and the percentage represents the distribution of children by family size estimated with PSID sample weights.

Table 2. Characteristics of children (percent) by family size and survey years

	Smaller families (1 to 2 children)		Larger families (3 or more children)	
	1997–2003	2014–2019	1997–2003	2014–2019
Family structure				
Single parent	24.7	28.1	25.1	23.9
Married/cohabiting	75.3	71.9	74.9	76.1
Race/ethnicity				
Black	15.1	15.6	22.5	18.5
Hispanic	5.5	5.6	7.7	8.5
Other	2.2	3.9	1.6	3.7
White	77.3	75.0	68.2	69.4
Maternal education				
Less than 12 years	8.7	4.6	12.8	9.3
12 to 15 years	65.7	49.2	63.2	51.9
16 years or more	25.6	46.2	23.9	38.8
Family head employed	89.7	88.4	84.6	87.3
Income poverty status				
Below 100% FPL	8.0	8.8	19.2	16.7
Below 130% FPL	11.8	12.7	25.0	24.5
Family food security status				
Food secure	84.9	77.9	78.6	70.8
Low food security	5.0	8.1	9.4	11.5
Very low food security	2.2	3.7	2.2	6.4
Food security among children				
Food secure	96.5	94.5	95.0	91.4
Low food security	3.2	5.2	4.8	8.0
Very low food security	0.3	0.3	0.2	0.6
Program participation				
Food stamps/SNAP	8.0	15.9	19.2	27.2
School Breakfast Program	15.4	27.0	27.4	41.2
School Lunch Program	20.5	30.7	35.5	44.7

Notes: Percent of children under age 18 are shown for each family characteristic with estimates produced using PSID sample weights.

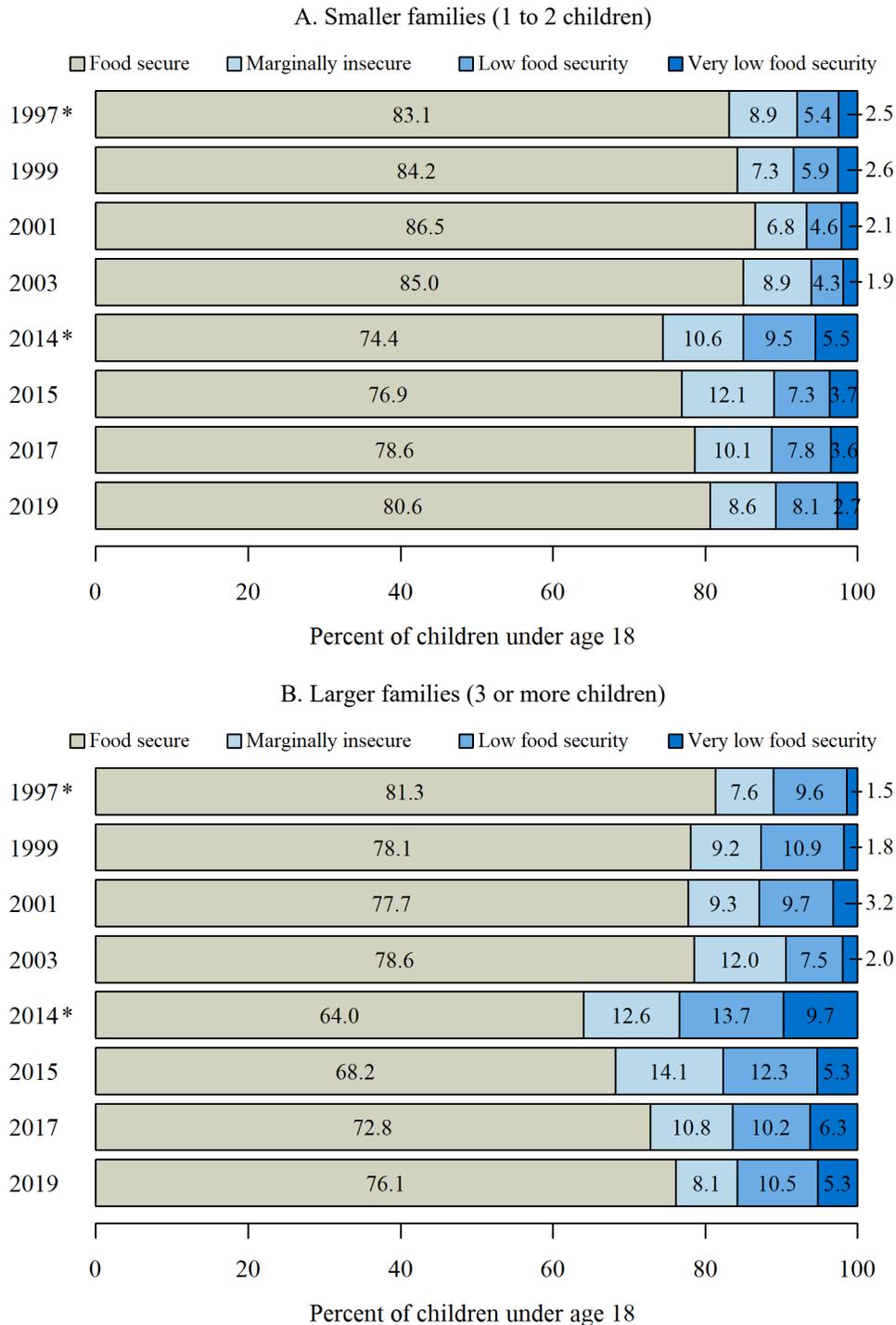
Table 1 shows the prevalence of larger family size among children in the US. At any given point over the last two decades, more than one-third of children lived in families with at least three co-resident children under the age of 18, with the proportion ticking further upward in recent years. Most of the children in larger families are those living in families with three children, but the proportion of children living in families with four or more children increased notably in the last decade. As of 2019, 16 percent of children lived in families with at least four children at home. Table 2 indicates that children in larger families are often in two-parent households and are a more diverse population across racial and ethnic groups than smaller families. While children in both larger and smaller families have similar proportions of their heads of household in work, children in larger families experience much higher poverty rates (more than twice the level of those experienced by children in smaller families) and higher rates of food assistance receipt, making an examination of the efficacy of SNAP policy, in particular, across family sizes a relevant and timely point of investigation.

Results

Levels and Trends in Food Security by Children's Family Size

Using our constructed USDA measure of food security, Figure 1 reveals children in larger families to be consistently more food insecure than children in smaller families over time. Children in large families also experience deeper food insecurity – in all years, greater proportions lived in ‘low’ and (from 2001) ‘very low’ food insecure households compared to children in smaller families.

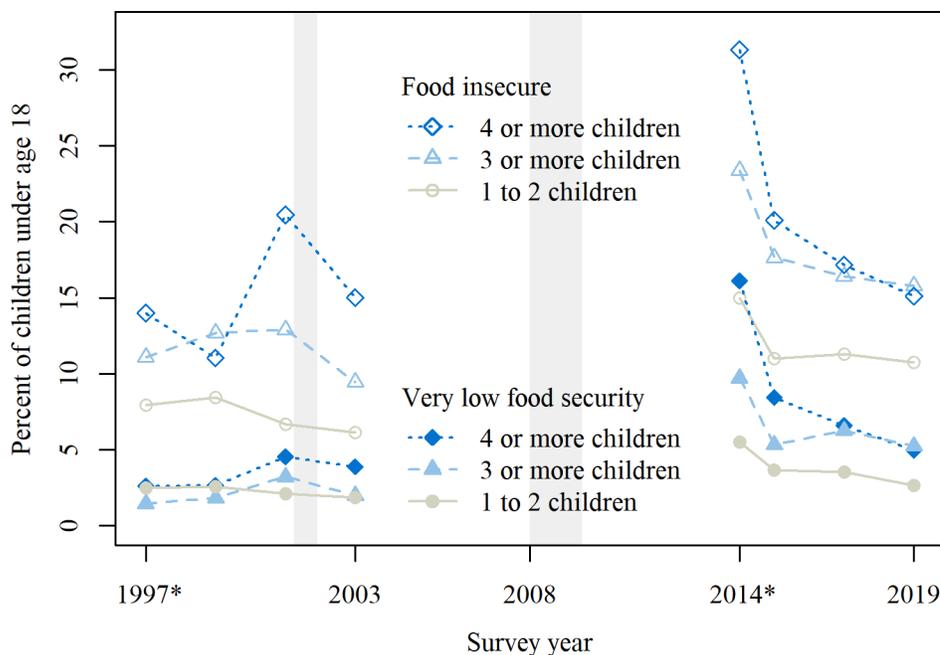
Figure 1. Distribution of children by food security status of the family, family size, and survey year



Notes: The distribution of children are shown by family food security status, estimated using PSID sample weights. Food secure is defined here as zero food-insecure conditions in response to the 18-item questionnaire whereas marginally insecure corresponds to 1-2 conditions, low security 3-7, or very low 8 or more. The asterisks by 1997 and 2014 indicate that data from these years correspond to the Child Development Supplement.

Figure 2 charts trends in overall food insecurity, with a particular look also at the ‘very low’ food security category, in the years where the USDA food security questions are available in the PSID. The ‘1 to 2 children’ lines represent smaller families. The ‘3 or more children’ lines represent larger families, but an additional ‘4 or more children’ group is also included to understand trends among families with more children. As seen in Figure 1, children in larger (3 or more child) families report higher levels of overall food insecurity over time than smaller families, though the trend lines between family sizes are similar over time. Children in large (4 or more child) families, however, experience the sharpest changes – with their rate of food insecurity doubling in the years prior to the 2001 recession (1999-2001) and almost one-third who are food insecure in the years after the Great Recession before dropping down sharply to mirror rates of ‘3 or more child’ families in recent years. With respect to very low food security, children across family sizes had a similar baseline in 1997, though a family size gap opened up shortly thereafter and remains in place to present day. Similar to overall food insecurity results, very low food security rates among all children were notably elevated when the PSID USDA questions resumed in the 2014 Child Development Supplement potentially indicating a slow recovery from the economic downturn with respect to family food security.

Figure 2. Food security trends for families with children, by family size

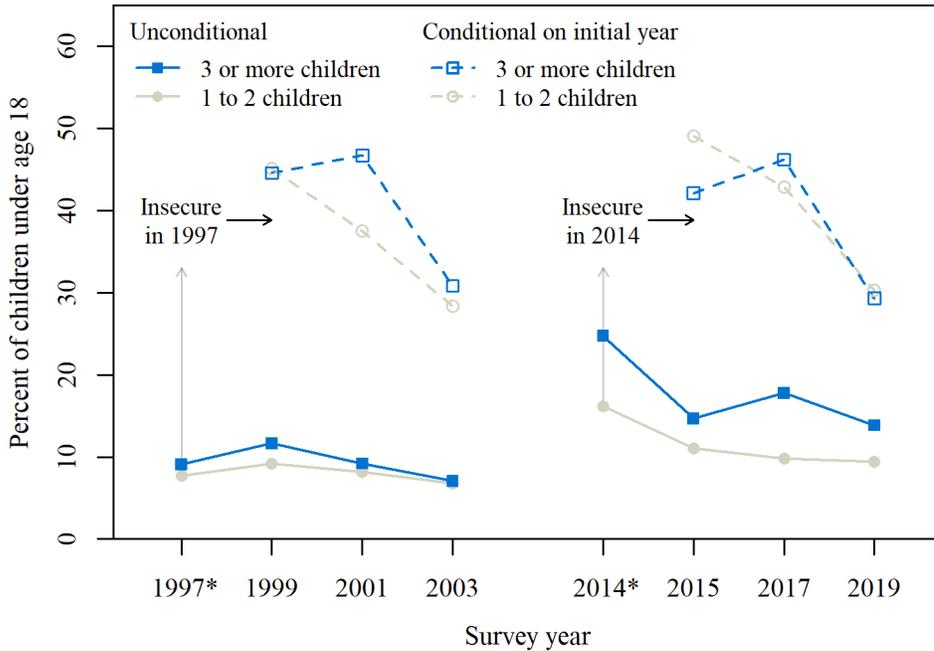


Notes: Percentages are estimated with PSID sample weights. Food insecure includes families with either low food security or very low food security. The asterisks by 1997 and 2014 indicate that data from these years correspond to the Child Development Supplement.

Figure 3 estimates persistence in food insecurity status by children’s family size. The bottom lines mirror the overall food insecurity rates by family size as seen in Figure 2. The top set of lines chart the persistence in food insecurity for children across each time period – in other words, what proportion of children who are food insecure children in 1997 and 2014

(respectively) remained food insecure over the next five years? In both instances, children in smaller families who experience food insecurity at a given point in time become less food insecure as time progresses. Food insecure children in larger families, on the other hand, tend to see their food insecurity persist (indeed rise for a period of years) prior to abating.

Figure 3. Persistent food insecurity for families with children, by family size and survey year



Notes: Percentages are estimated with PSID sample weights. Food insecurity includes families with either low food security or very low food security. Persistence is shown as food insecurity rates conditional on a child's family size and food insecurity in the initial year, either 1997 or 2014. Samples include only children who are observed under the age of 18 in a four-year range. The asterisks by 1997 and 2014 indicate that data from these years correspond to the Child Development Supplement.

Impact of Additional Children on Food Security

The next set of results report our panel model using instrumental variables to estimate family size effects on food insecurity. We look first at the whole child population and then repeat our model within the sample of SNAP recipients. Table 3 reports results from the whole child population. It suggests larger family size (3 or more children) is correlated with about 5 percentage points higher chances of marginal food insecurity (column (1)) – i.e. their family meets at least one food-insecure condition in the 18-item USDA questionnaire. Controlling for standard observed characteristics like age, race/ethnicity, state and year effects (column (2)), does little to the correlation between family size and insecurity. Interestingly, the effect goes away when controlling for family fixed effects in column (3). A family fixed effect might capture something like a control for total number of children (present and future), yet it does not address the year-to-year changes in decisions that may be closer related to a family's immediate

circumstances, such as income, resources, and food security. When we address time-varying food insecurity in column (4), larger family size again has the same magnitude of an effect on marginal food insecurity, yet estimated imprecisely given a point estimate of 0.053 and standard error (0.053). In results not shown here, we find the estimating effects by families with two children, three children, or four or more children follow a similar pattern, yet these endogenous variables are harder to instrument. The results for the single indicator for 3 or more children can be thought of as a weighted average between those for 3 children and 4 or more children. This result also suggests that a linear model using the number of children present (for an estimation sample with at least one child present) would be a reasonable fit.

In the remaining columns of Table 3, we show that an additional child would increase a family's chances of marginal food insecurity by about 2 percentage points. Again, the fixed effects estimates show this relationship as economically and statistically insignificant, while the IV results are statistically insignificant but economically similar to the unconditional correlations. As an exploration of the differences between fixed effects and IV, we estimated a model that included both approaches, and the results appear no different from the IV results, similar magnitude and similarly imprecise. Despite magnitudes that suggest increasing number of children raises the risk of marginal food insecurity, the results in panel B of Table 3 are more clear: family size seems causally unrelated to low or very low food security. The IV estimates in columns (4) and (8) are essentially zero. Note that in all of the IV estimates in Table 3, the Kleibergen-Paap statistics strongly reject hypotheses of weak IVs, and the tests for overidentification are likewise easily satisfied.

Table 3. Family size effects of additional children on family food security status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Marginal food insecurity (any food-insecure conditions reported)								
3 or more children	0.050 (0.012)	0.051 (0.010)	-0.016 (0.022)	0.053 (0.053)				
Number of children					0.021 (0.006)	0.024 (0.005)	-0.001 (0.013)	0.016 (0.017)
Control variables	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Fixed effects	No	No	Yes	No	No	No	Yes	No
Instrumental variables	No	No	No	Yes	No	No	No	Yes
Weak IV test statistic				24.838				26.859
p-value				0.000				0.000
Hansen J statistic				1.345				1.542
p-value				0.718				0.673
B. Food insecurity (low or very low food security)								
3 or more children	0.042 (0.009)	0.043 (0.007)	0.013 (0.013)	0.003 (0.029)				
Number of children					0.016 (0.004)	0.018 (0.003)	0.003 (0.008)	0.001 (0.009)
Control variables	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Fixed effects	No	No	Yes	No	No	No	Yes	No
Instrumental variables	No	No	No	Yes	No	No	No	Yes
Weak IV test statistic				24.838				26.859
p-value				0.000				0.000
Hansen J statistic				0.218				0.219
p-value				0.975				0.975
Number of observations	20986	20986	20986	20986	20986	20986	20986	20986

Notes: The sample is conditional on at least one child present. Robust standard errors with state clustering are shown in parentheses, and PSID sample weights are used in estimation. Control variables include quadratics in age for the head of the family unit as well as the youngest child, indicators for race/ethnicity, state-level unemployment rate, poverty rate, and real state-year-adjusted benefit levels for cash and food assistance, a state-level SNAP program access index, and state and year fixed effects. Instrumental variables include an indicator for the firstborn child's sex, indicators for whether the two firstborn siblings are same sex boys or both girls, an indicator for twins

Table 4 repeats our model within the sample of SNAP recipients. Here, it suggests larger family size (3 or more children) is correlated with about 3 percentage points higher chances of marginal food insecurity (column (1)). As above, controlling for standard observed characteristics like age, race/ethnicity, state and year effects (column (2)), also does little to the correlation and the effect goes away when controlling for family fixed effects in column (3). When addressing time-varying food insecurity in column (4), larger family size increases the magnitude of an effect on marginal food insecurity, yet is again estimated imprecisely given a point estimate of 0.036 and standard error (0.086). In the remaining columns of Table 4, we show that an additional child would also increase a SNAP-recipient family's chances of marginal food insecurity by less than 2 percentage points. Results in panel B of Table 3 move in the other direction: family size seems inversely associated with low or very low food security among SNAP recipients (to a small degree). As with all of the IV estimates in Table 3, the Kleibergen-Paap statistics in Table 4

strongly reject hypotheses of weak IVs, and the tests for overidentification are likewise easily satisfied.

Table 4. Family size effects of additional children for SNAP-recipient family food security status

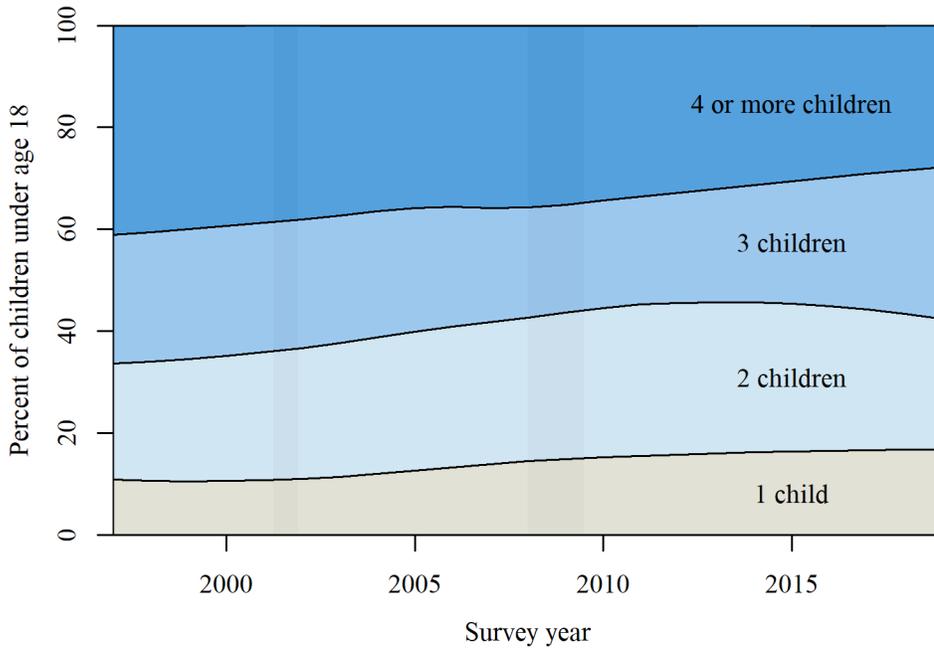
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Marginal food insecurity (any food-insecure conditions reported)								
3 or more children	0.027 (0.015)	0.029 (0.016)	-0.019 (0.044)	0.036 (0.086)				
Number of children					0.016 (0.007)	0.018 (0.008)	-0.003 (0.025)	0.012 (0.026)
Control variables	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Fixed effects	No	No	Yes	No	No	No	Yes	No
Instrumental variables	No	No	No	Yes	No	No	No	Yes
Weak IV test statistic				22.191				23.288
p-value				0.000				0.000
Hansen J statistic				2.039				1.991
p-value				0.564				0.574
B. Food insecurity (low or very low food security)								
3 or more children	0.032 (0.014)	0.035 (0.014)	0.019 (0.028)	-0.044 (0.068)				
Number of children					0.015 (0.006)	0.016 (0.005)	-0.007 (0.014)	-0.013 (0.020)
Control variables	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Fixed effects	No	No	Yes	No	No	No	Yes	No
Instrumental variables	No	No	No	Yes	No	No	No	Yes
Weak IV test statistic				22.191				23.288
p-value				0.000				0.000
Hansen J statistic				0.225				0.266
p-value				0.973				0.966
Number of observations	9252	9252	9252	9252	9252	9252	9252	9252

Notes: The sample is conditional on at least one child present for families that ever participate in SNAP during the estimation years. Robust standard errors with state clustering are shown in parentheses, and PSID sample weights are used in estimation. Control variables include quadratics in age for the head of the family unit as well as the youngest child, indicators for race/ethnicity, state-level unemployment rate, poverty rate, and real state-year-adjusted benefit levels for cash and food assistance, a state-level SNAP program access index, and state and year fixed effects. Instrumental variables include an indicator for the firstborn child's sex, indicators for whether the two firstborn siblings are same sex boys or both girls, an indicator for twins

Impact of Food Assistance, by Children's Family Size

Our final section explores the degree to which SNAP matters for children's food security across family sizes. Figure 4 reveals larger family size to be a common characteristic of SNAP-recipient children. Close to 60 percent of children receiving SNAP over the last two decades have been part of families with three or more children.

Figure 4. Prevalence of larger family size among SNAP recipient children



Notes: Percentages are estimated with PSID sample weights. The trends include data smoothing for presentation purposes.

Table 5 looks at whether the profile of children, across family sizes, who receive SNAP differs from the child population as a whole. Results indicate that all children in receipt of SNAP are more likely to be in lone parent households, but children in larger families on SNAP are more likely to live in two-parent households than their small family counterparts in later years. Levels of maternal educational attainment among children in larger families on SNAP are lower than that of children in smaller families in both time periods, but the gap in rates of heads of household in work is similar across family sizes closed in the recent time period. Most relevant to our assessment of family resources and implications for food security across family size, however, is the sharp disparity in poverty rates. The proportion of children in receipt of SNAP in families with incomes below 100 percent and 130 percent of the federal poverty line is high overall, but children in larger families on SNAP experience poverty at substantially higher rates than children in smaller families. Poverty rates for all children fell between the two time period, but even in the most recent years, children in larger families on SNAP reported a poverty rate close to 20 percent higher than that of children in smaller families on SNAP (50.1 percent versus 41.1 percent).

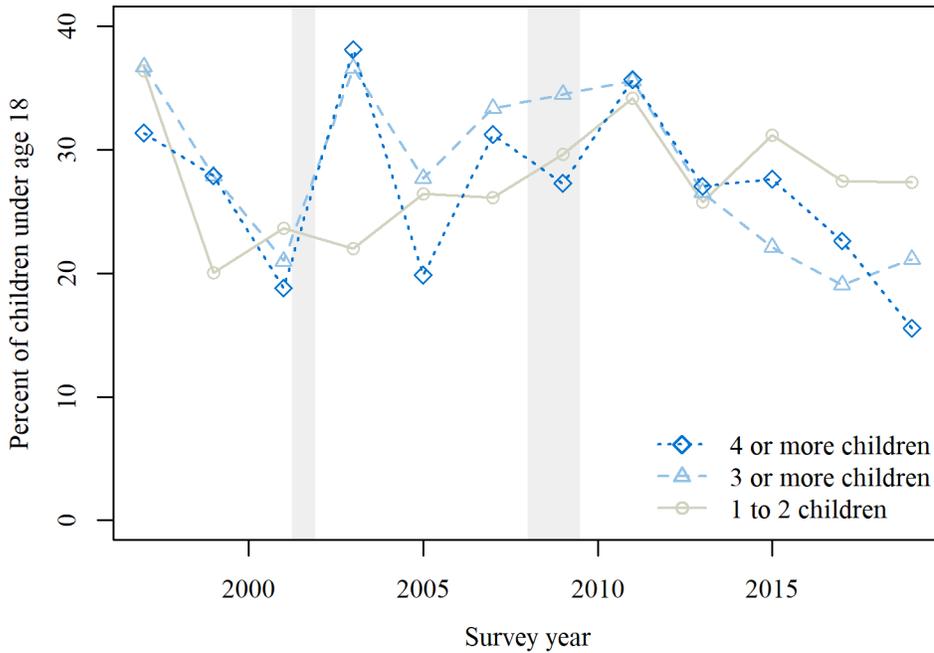
Table 5. Characteristics of SNAP-recipient children (percent) by family size and survey years

	Smaller families (1 to 2 children)		Larger families (3 or more children)	
	1997–2003	2014–2019	1997–2003	2014–2019
Family structure				
Single parent	68.1	62.3	68.0	55.3
Married/cohabiting	31.9	37.7	32.0	44.7
Race/ethnicity				
Black	41.0	37.4	56.4	39.5
Hispanic	9.1	5.9	11.1	12.4
Other	2.7	4.2	2.2	3.8
White	47.3	52.6	30.3	44.3
Maternal education				
Less than 12 years	35.3	17.1	38.8	27.4
12 to 15 years	63.9	70.7	58.9	64.8
16 years or more	0.8	12.2	2.3	7.7
Family head employed	71.7	72.6	65.2	75.8
Income poverty status				
Below 100% FPL	49.5	41.1	68.2	50.1
Below 130% FPL	65.3	54.1	79.5	68.6
Family food security status				
Food secure	48.1	41.5	50.4	42.0
Low food security	17.8	23.3	22.1	22.8
Very low food security	11.4	13.0	7.7	16.2
Food security among children				
Food secure	84.4	85.2	85.5	80.1
Low food security	13.6	13.7	13.7	17.6
Very low food security	2.0	1.2	0.8	2.3
Program participation				
SNAP is extramarginal	26.2	28.9	31.3	20.8
School Breakfast Program	70.6	77.2	77.0	86.6
School Lunch Program	84.2	84.4	90.7	89.2

Notes: Percent of children under age 18 are shown for each family characteristic with estimates produced using PSID sample weights.

Of note in Table 5 is the changing prevalence of extramarginal status among children by family size. In the earlier time period, 1997-2003, children in larger families on SNAP report extramarginal status at a greater rate than children in smaller families on SNAP (31.3% compared to 26.2%). By the latter period, 2014-2019, these dynamics shift – in large part due to a notable decrease in extramarginal status among children in larger families receiving SNAP as seen in Figure 5.

Figure 5. Percent of children in families with extramarginal SNAP participation, by family size and survey year



Notes: Percentages are estimated with PSID sample weights. Extramarginal SNAP participation is defined by families who spend no additional money on food-at-home consumption beyond the value of SNAP benefits.

Figure 5 reveals a convergence around 2011 in the rates of extramarginal status among children across family sizes. From that point on, extramarginal status among children in smaller families held relatively steady, but declined steadily among children in larger families. But larger family size remains a common characteristic among SNAP-recipient children with extramarginal status; in results not reported here, more than half of SNAP-recipient children with extramarginal status between 1997 and 2019 lived in families with three or more children in the household. Over time, this figure has been driven by a consistent share of those living in families of 4 children or more.

For children, extramarginal status means that family expenditures on food are limited to the value of their SNAP benefits; no additional spending occurs to feed members of the household. Most SNAP-recipient children (at least two-thirds in any given year), however, are intramarginal – their families spend more on food than they receive in food assistance benefits. As such, an examination of extramarginal status tells only part of the story of family food expenditure. Table 6 takes a broader look at food expenditures among SNAP-recipient children to assess the impact of SNAP across family sizes. Here, the ‘food spending gap’ is defined as household food spending below the Thrifty Food Plan adjusted for state and metro status price parities and ‘total food spending’ includes food spending away from home and food delivery. Between 1997 and 2019, for children in SNAP-recipient families, it examines three items: (1) the real 2018 dollar amounts of food spending, SNAP benefits, and food needs by family size; (2) the proportion of SNAP-recipient children who have unmet food needs and the magnitude of this gap when

accounting only for food spending at home, and (3) the degree to which these figures change when SNAP benefits are added in.

Table 6. Food spending gaps among children living in SNAP-recipient families, 1997–2019

	Smaller families (1 to 2 children)	Larger families (3 or more children)	All families
A. Real 2018 dollar amounts of spending, benefits, costs (\$)			
Food at home spending	3,259	3,544	3,409
Total food spending	4,553	4,702	4,631
Value of SNAP benefits	2,884	4,808	3,894
Food at home spending + SNAP	6,144	8,352	7,303
Total food spending + SNAP	7,437	9,510	8,525
Thrifty Food Plan cost	6,014	9,634	7,915
B. Percent of children with family spending below needs			
Food at home spending	78.5%	89.4%	84.2%
Food at home spending + SNAP	51.5%	66.1%	59.1%
Total food spending + SNAP	39.1%	51.6%	45.7%
C. Relative food spending gap as a percent of needs (sample mean)			
Food at home spending	51.2%	63.3%	57.6%
Food at home spending + SNAP	17.8%	21.6%	19.8%
Total food spending + SNAP	13.6%	16.8%	15.4%

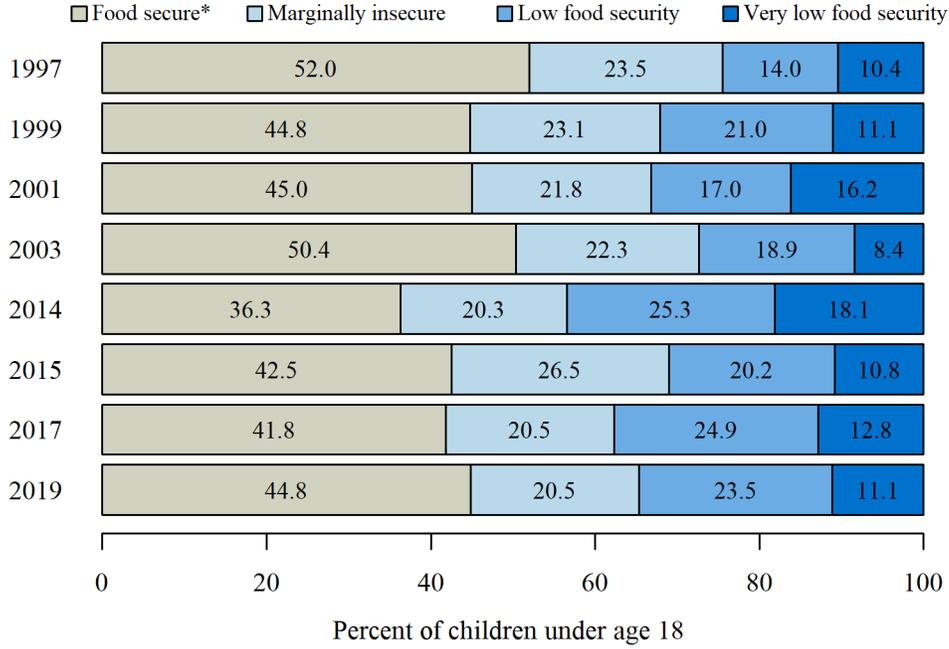
Notes: Dollar amounts and percentages are estimated using PSID sample weights. The dollar amounts are adjusted to account for inflation in food prices over time. Thrifty Food Plan costs are estimated based on USDA reports and correspond to family composition and the age and sex of each family member. The relative food spending gap is expressed as a sample mean so that the population-level food poverty is comparable across columns; the conditional food spending gap for those who are below the needs threshold is calculated by dividing the food gap as shown by the respective rate below the threshold.

Over the last two decades, a greater share of children in larger families experienced a food spending gap – both when looking just at ‘food at home’ spending on its own and ‘food at home spending + SNAP’ – than did children in smaller families. After at-home food spending and SNAP combined, two-thirds of SNAP-recipient children in larger families still experienced a food spending gap; a rate fifteen percentage points higher than their small family counterparts. SNAP reduced the proportion of all recipient children with a food gap by close to one-third (29%), but was more effective in reducing the proportion of children in smaller families with a food gap than it was for children in larger families (SNAP reduced the proportion of children in smaller families with a food spending gap by 34% and of children in larger families by 26%). With respect to the depth of the food spending gap – i.e. how far children’s family food spending remains below their Thrifty Food Plan level – SNAP plays more of an equalizing role across family sizes (SNAP reduced the depth of the food spending gap across each group by about 65%). However, even after benefit receipt – and indeed total food spending – children in larger families continue to experience higher levels of unmet food needs than their small family counterparts.

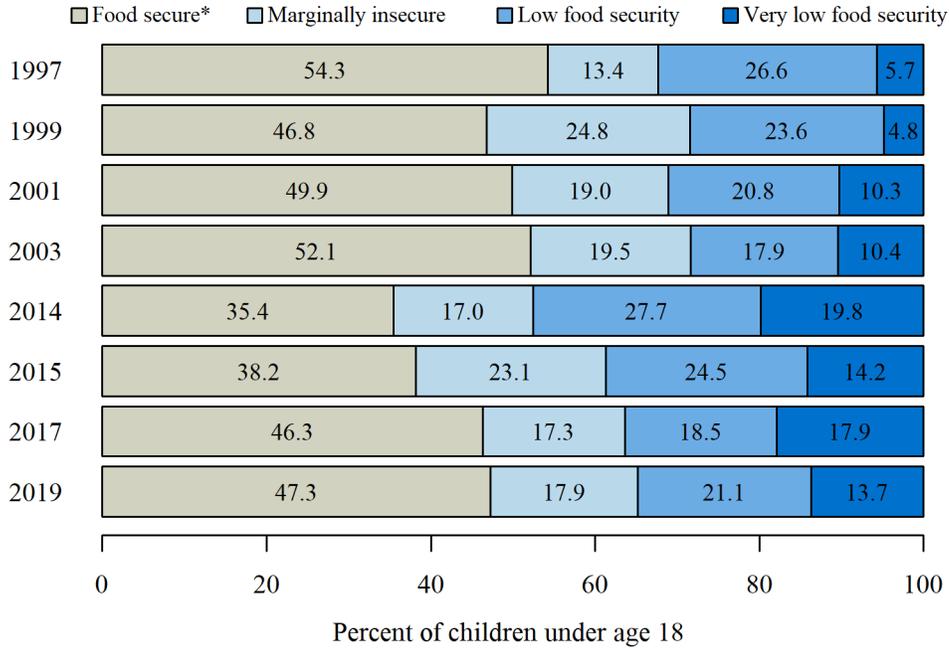
In light of these findings, it is useful to return to the issue of food security using our constructed USDA measure, as first described in Figure 1 with the whole child population. In a parallel exercise, Figure 6 plots the food security of SNAP-recipient children in the years where the USDA questionnaire appeared in the PSID. Children in larger families appear slightly more food

secure overall than their smaller family counterparts, driven by the fact that greater proportions of children in smaller families reported marginal food security over time. Up until 2017, children in larger families tended to report higher rates of low food security compared to those in smaller families, who overtook them in this category in the last two survey years. But this coincided with a switch in the prevalence of very low food security: later years saw children in larger families report consistently higher rates of very low food security than children in small families; in 2017, close to one in five SNAP-recipient children in larger families fell into this category.

Figure 6. Distribution of children in SNAP households by food security status, family size, and survey year
 A. Smaller families (1 to 2 children)



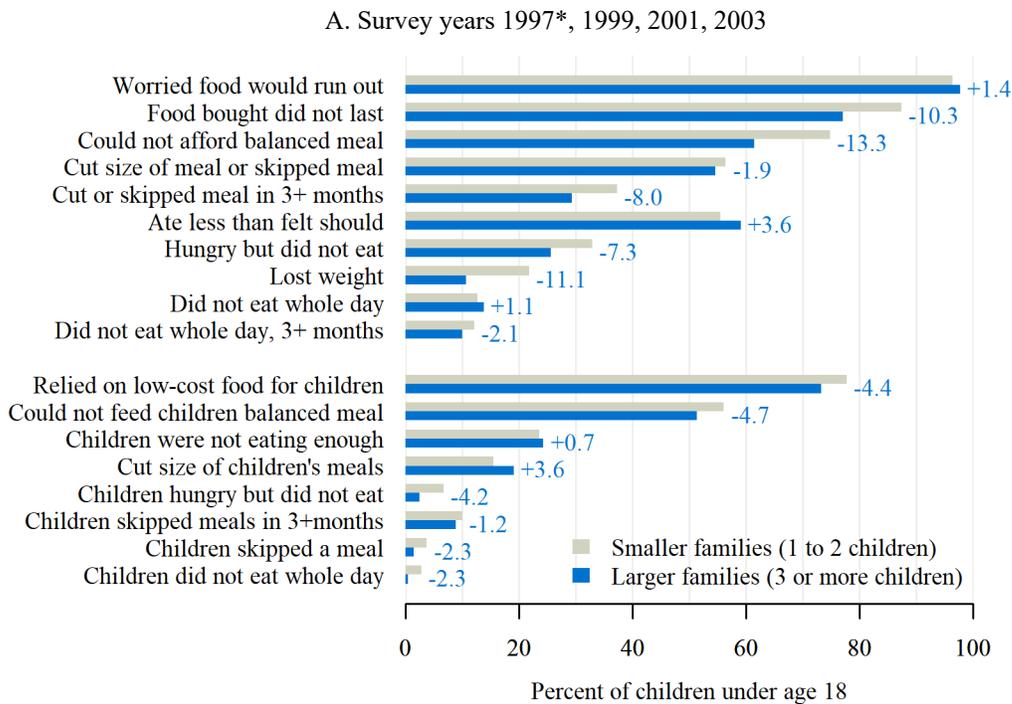
B. Larger families (3 or more children)



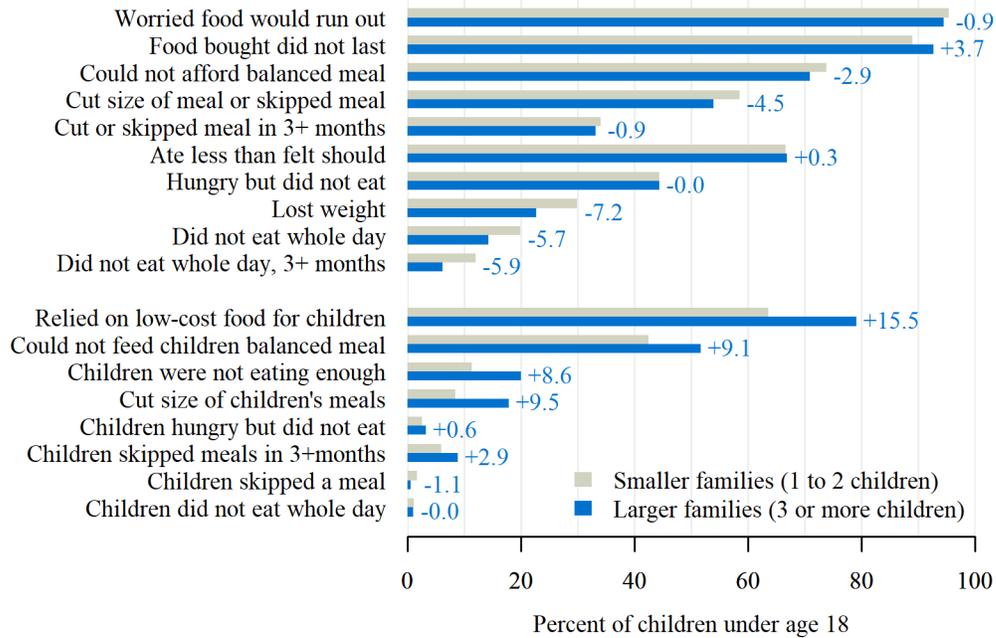
Notes: Distribution of children shown by family food security status; estimates use PSID sample weights. Food secure is defined as 0 positive responses to the 18-item questionnaire; marginally insecure corresponds to 1-2 positive responses; low security 3-7; very low 8 or more. The asterisks by 1997 & 2014 indicate data from these years correspond to Child Development Supplement.

Our final set of results represents an attempt to draw these findings out further by using the USDA questionnaire data to understand more about the ways in which food insecurity manifests itself among SNAP-recipient families with children over time. Akin to the approach by Coleman-Jensen et al (2018) exploring the proportion of households reporting each indicator of food security by household food security status, Figure 7 examines the responses to various indicators of household food insecurity by children’s family size and compares the two time periods, 1997-2003 and 2014-2019. In the earlier period, 1997-2003, larger families indicate experiencing some of these top items at lower rates than smaller families. But by the later time period, larger SNAP-recipient families with children either caught up to or surpassed their smaller family counterparts on many indicators.

Figure 7. Percentage of children in food insecure families receiving SNAP, by family size and survey year



B. Survey years 2014*, 2015, 2017, 2019



Notes: Percentages are estimated with PSID sample weights. Data labels are shown for the differences between larger families’ responses relative to smaller families’ (larger – smaller). The asterisks by 1997 and 2014 indicate that data from these years correspond to the Child Development Supplement.

Of more interest within Figure 7, however, are the responses to USDA questions 11-18 that focus specifically on child food insecurity within the household. Here, results confirm a shift over time: SNAP-recipient children in larger families saw overall levels of responses by food insecurity indicators increase in magnitude and/or surpass the levels of children in smaller families. For example, approximately one in five SNAP-recipient children in food insecure families in the earlier time period were not eating enough and saw their meals cut due to a lack of resources. But while the rates of these indicators dropped by half for children in smaller families over time, they held steady for children in large families. Similar patterns emerged across other indicators, suggesting that children in larger families may be experiencing more direct impacts of household food security today in ways that children in smaller families are not.

Discussion

The central aim of this study is to understand the efficacy of food assistance policy by children’s family size. Two research questions guided our analysis: how do economic circumstances and food insecurity in families with children change with increases in family size? And how is food insecurity in families of different sizes mitigated by food assistance programs for families with children, and has this changed over time?

First, a note on studying family size. Larger family size is a prevalent family form for children; it is also one associated with a high risk of income poverty. Our PSID results confirm prior findings (Curran 2019, 2021; Curran and Collyer 2020) using Current Population Survey cross-

sectional data. The PSID offers the opportunity to look at trends over time; here, we note that the proportion of children in larger families continues to increase – in particular, the proportion of children in families with four or more children in the home. As such, family size is an important indicator for inclusion in child and family research moving forward. Family size is also a characteristic worthy of increased attention to in the food security literature. Regardless of SNAP receipt, food insecurity is more prevalent among children in larger families than among children in small families and has been for the last two decades. Coleman-Jensen et al. (2019) observe that food insecurity is often episodic. Among children in larger families, however, it appears to be more persistent. Adding family size to the list of family circumstances associated with food insecurity could prompt more investigation into the drivers behind this observed phenomenon.

In tracing out the impact of additional children on family food security, our models do not necessarily suggest a causal relationship between family size and/or number of children and low/very low food security. Results indicate some association, however, between family size and marginal food security among the whole child population – a point that warrants further future investigation. The application of our model to the SNAP-recipient population specifically, however, did not produce similar results. Here, there appears to be no or a slight inverse relationship between the number of children and food insecurity among SNAP recipients. This does not mean that food insecurity is not a concern among children in larger families receiving SNAP – indeed, our subsequent results reveal that it is. The findings here may suggest, however, that the process of adding children to the family is not in and of itself the causal link between larger family size and food insecurity. Future work on this topic might also compare the heterogeneity of family size effects by key economic circumstances in the households (e.g. parental employment, income shocks, or benefits receipt). But within the SNAP recipient population, a partial explanation may lie in SNAP’s benefit design: each additional household member results in additional SNAP benefits. This stands in contrast to other key income support programs that cap benefits based on number of children (e.g. the Earned Income Tax Credit), exclude new family members from receipt (e.g. Temporary Assistance for Needy Families in states where family caps remain in place), or have earnings requirements in place that require larger families to have higher levels of income than smaller families to access maximum benefit amounts (e.g. the Child Tax Credit, prior to the temporary American Rescue Plan Act expansions for 2021) – all of which serve to more specifically penalize children with larger family sizes. (Curran 2021).

In looking at SNAP specifically, we demonstrate that family size is a relevant characteristic of the SNAP-recipient population. Over the past two decades, close to 60 percent of the children receiving SNAP are those in families with 3 or more children – for this reason alone, the identification by Gundersen et al. (2018) of large families as a group for consideration in any future SNAP reform is warranted. But more information about this under-acknowledged population is useful. SNAP-recipient children in larger families are more likely to be in two-parent households than their small family counterparts. While this can offer positive benefits from a child well-being perspective (Waldfogel, Craigie, and Brooks-Gunn 2010), it is also a point of note from a resource dilution perspective – there are often more children *and* more adults in larger SNAP-recipient families across which income and other resources must be spread. This is relevant in the context of the sharp differences in income poverty rates shown in Table 5; despite poverty rates for all children declining between 1997 and 2019, the economic

situation of children in larger families overall – and the children in larger families in receipt of SNAP – remains much worse off than their small family counterparts.

Such stark differences in family resources are relevant for the area of investigation most often associated with larger family size in the literature: extramarginal status. Johnson et al. (2018) and Hoynes et al. (2015) point out that extramarginal status for larger families is likely product of budget constraint rather than preference; given the differences in income poverty among SNAP-recipient children across family sizes, this holds. Somewhat unexpectedly, we found the proportion of children in larger families experiencing extramarginal status has declined over time (in contrast to the proportion of children in smaller families, which has fairly steady). Though *within* the profile of children who are extramarginal, larger family size remains a common characteristic and would benefit from further inquiry. Results not reported here revealed that among SNAP-recipient children whose families report extramarginal status in recent years, the proportion of children in families of 4 or more children was the same as the proportion of children in families of 2 children – a point that underscores the need for more examination of the adequacy of SNAP benefits for children across family sizes.

This issue of extramarginal status prompts broader questions about SNAP efficacy and adequacy, if it is a key resource upon which recipient families are reliant. We found two things: (1) SNAP is more effective for smaller families in reducing the proportion of children with a food spending gap than it is for larger families; (2) SNAP plays more of an equalizing role in reducing the depth of the food spending gap – i.e. how far children’s family food spending remains below their Thrifty Food Plan level – across family sizes. Nevertheless, this gap remains a deeper one for children in larger families, indicating that – even after SNAP – a greater portion of their food needs remain unmet. An analysis of the individual USDA indicator responses by children’s family size provides further confirmation – and concerning trends in recent years, whereby children in larger SNAP-recipient families who report food insecurity at the household level appear to be more directly impacted by this insecurity (e.g. not having enough to eat) themselves. Given the sharp increases in food insecurity amidst the COVID-19 pandemic (Bitler, Hoynes, and Schanzenbach 2020; Bauer, Pitts, Ruffini, and Schanzenbach 2020; Ziliak 2020), this is an area for research and policy attention.

Conclusion

Family size, particularly with respect to the number of children, is a key characteristic among food insecure children that is often under-acknowledged in the literature. The prospect of food insecurity in larger households implies that many children could be affected by its impact. Understanding more about the nature of the food security risk posed by family size, including the broader family economic security changes that accompany increases in family size, is vital for informing the design of public policy to mitigate this risk. Importantly, this study identifies areas of examination to support future policy design with respect to child well-being in larger families that are more vulnerable to food insecurity. This research agenda contributes to a broader understanding of child well-being and the empirical evidence on the effectiveness and potential for food assistance and broader family income support reforms.

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