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ORIGINAL PAPER

Role of Family Stressors on Rural Low-Income Children's Behaviors

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Abstract
Background Exposure to multiple stressors and lack of access to resources place rural children at high risk for adverse consequences. Family Stress Model guided this study to examine relations between two stressors- food insecurity and maternal depressive symptoms, and behavior problems among younger and older rural children.
Objective To test associations between food insecurity, maternal depressive symptoms, and behavior problems among younger and older rural low-income children.
Methods Cross-sectional data from 370 low-income rural families across 13 states was analyzed using structural equation modeling and multiple group analyses. Mothers' education level, household income, marital/partner status, and participation in SNAP served as covariates.
Results Among younger children, maternal depressive symptoms partially mediated the relation between food insecurity and child externalizing behaviors, while among older

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children, maternal depressive symptoms completely mediated the relation between food insecurity and child internalizing and externalizing behaviors.
Conclusions Stress manifested directly from, or indirectly through, maternal depressive symptoms and from food insecurity was related to behavior problems among younger and older rural children; however, the relations varied by age of children. Programs and policies that prevent or lessen both food insecurity and maternal depression may help to lessen problem behaviors among on rural children. Longitudinal studies are needed to rigorously examine causation and directionality among food insecurity, maternal depression and rural child behavior problems, while accounting for influences of child, caregiver and family characteristics.

Keywords Rural families · Child problem behaviors · Maternal depression · Food insecurity · Low-income

Introduction

Exposure to multiple stressors places children at high risk for adverse consequences (Center on the Developing Child 2007). Food insecurity and maternal depression are two stressors that are linked to compromised health, development and behavior problems among children (Cook and Frank 2008; Goodman et al. 2011). Poverty is strongly correlated with food insecurity (Coleman-Jensen et al. 2013) and maternal depression (Erwin et al. 2010), and shares many demographic characteristics including low household income and low educational attainment (Evans 2004). However, food insecurity, independent of poverty, negatively effects children's health and behaviors (Ashiabi and O'Neal 2008).

Place—where families live—affects health and long-term outcomes (Hassink 2015). Rural children are at higher risk of mental health problems than their non-rural peers (Heflinger et al. 2015), and at high risk of overweight and obesity in adulthood (Olson et al. 2007). Poverty and lack of access to resources helps to explain the high risk of substantial health and development disadvantages faced by rural families (Chartbook on Rural Health 2015), including unnoticed and untreated depression. Lack of access to affordable and healthful foods has led to some rural communities being identified as food deserts (ERS, USDA 2013), and families patching resources together to meet food needs which in turn can elevate parental depression (Jackson et al. 2000). Furthermore, ethnic, racial and socioeconomic composition of rural America has changed over the past twenty years, and services in rural communities often do not adequately address the health needs of the diverse face of rural America (Aday et al. 2001). Thus, the unique and diverse health realities facing rural families warrant further examination (Polaha et al. 2010).

Studies that have examined the relations between food insecurity, maternal mental health and child problem behaviors are predominantly based on cross sectional national or urban samples and are not generalizable to rural populations (Gamm and Hutchinson 2008). Recognition of multiple influences (i.e., place, socioeconomics) on health and well-being (Sameroff and Fiese 2000) can increase understanding of the developmental context of food insecurity and its potential effects on children. This study helps to address the call for research focused on rural health and well-being and the need to examine the combination of risk factors that are linked to problem behaviors among children across multiple rural communities in a comprehensive model.

Background

Influence of Family Stressors on Child Development and Family Functioning

Food insecurity exists when there is uncertainty about future food availability and access, insufficiency in the amount and kind of food required for a healthy lifestyle, or the need to use socially unacceptable ways to acquire food (National Research Council 2006). Food security has been categorized as *high food security*—no indications of food-access problems or limitations; *marginal food security*—anxiety over shortage of food in the house; *low food security*—reduced quality, variety, or desirability of diet; and *very low food security*—multiple indications of disrupted eating patterns and reduced food intake. Low and very low food security are combined in the category, food insecure, and high and marginal food security are combined in the category, food secure (Coleman-Jensen et al. 2016). The disruptive nature of food insecurity, and having to make choices between food, shelter, and other necessities, places families at risk for instability, multiplies the effect of poverty on children, and places children at high risk for compromised health and development (Belsky et al. 2010). For example, in a cross-sectional study of urban parents and school-age children in Pennsylvania, Kleinman, et al. (1998) found that child behavior problems were more prevalent among children who were food insecure than children who were food secure.

Maternal depression, a multifaceted illness that describes physical and emotional changes mothers can have during pregnancy or after giving birth (Clark and Fenichel 2001), has been shown to compromise mothers' abilities to effectively parent (Kiernan and Huerta 2008), and to create stressful living environments for children (Marmorstein et al. 2004) which have been associated with child behavior problems (Goodman et al. 2011). Additionally, the majority of studies that have examined the relations between food insecurity, maternal depression (or maternal distress which is related depressive symptoms, Bronte-Tinkew et al. 2007), and child behaviors have been based on cross sectional data from national or urban samples. Weinreb et al. (2002), in their cross sectional study of urban homeless and low-income families in Massachusetts, found an independent relationship between very low food security among both pre-school and school-age children and child internalizing behavior problems after they controlled for maternal distress, housing status, and stressful life events. Whitaker et al. (2006), in a cross-sectional study of mothers of 3-year-old children in 18 large U.S. cities, found that mothers who had a mental health problem were more likely than mothers who did not have one to have children with both internalizing and externalizing behavior problems. Additionally, the likelihood of child behavior problems increased with mothers' level of food insecurity. However, Slack and Yoo (2005) and Huang et al. (2010) analyzed two time points of data from the Panel Study of Income Dynamics to examine the relations between food insecurity, maternal distress and child behaviors. Huang et al. (2010) found that parental stress mediated the effects of food insecurity on behavior problems among older children. However, Slack and Yoo (2005) in their study of families in urban and rural Illinois, found that parental characteristics (i.e., stress, warmth, depression) mediated the effects of food insecurity on externalizing behavior problems among younger children, and on internalizing behavior problems among both younger and older children. Differences in findings across these studies may be attributed to differences in sample characteristics and study designs including measures of food insecurity, mental health and problem behaviors, and ability to control for potential confounding variables. Understanding the relations among the

variables is complicated and further exploration among population groups warrant examination.

As outlined by Burton et al. (2013), the face of rural America and rural life changed dramatically and rapidly over the past two decades (Brown and Schafft 2011). Low-wage service employment largely replaced stable, family-sustainable production jobs (Smith and Tickamyer 2011). Rural communities became home to a growing number of racial and ethnic minorities, some of whom left urban centers in search of affordable living, and others who immigrated from Latin America in search of employment (Lichter 2012). Across rural America, the spatial concentration of poverty has changed (Peters 2012) and has impacted family life (e.g., family relations, stress, mental health, access to quality health care; duration of poverty) (Burton et al. 2011; Snyder and McLaughlin 2004), all of which are linked to risks and disparities to rural family well-being (Wolfe et al. 2012).

Furthermore, approximately one out of seven (15.4%) rural U.S. households are food insecure (ERS, USDA 2015) and there is high prevalence of maternal depressive symptoms (Callan and Dolan 2013) and stressful parent–child interactions (Sano et al. 2011) among rural low-income households. Examining the influences of the co-occurring stressors of food insecurity and maternal depression on both younger and older low-income children's behaviors across multiple rural communities can be helpful in further understanding potential short- and long-term consequences of low-income on rural children's development.

Theoretical Framework

The family stress model (FSM) (Conger and Elder 1994) guides this study as it helps us to think about how food insecurity and maternal depression are related to child well-being. The FSM posits that families with few economic resources may need to make difficult choices among basic needs (e.g., food, housing, energy, health care) which can lead to emotional distress (e.g., depression, anxiety) among parents (Wickrama et al. 2008). This distress increases the number of stressors family experience and interferes with caregiving practices and negatively affects children's well-being (Conger et al. 2010).

The Current Study

Although several studies have provided increasing support for the FSM in different populations and extending the model by adding new constructs (Mistry et al. 2004; Benner and Kim 2010), household food insecurity has not fully been introduced to the model. Guided by the FSM, this study examines relations between household food insecurity, maternal depressive symptomology, and internalizing and externalizing problem behaviors among both younger and older rural children into one comprehensive model. This study is based on a sample of 370 families that have household incomes at or below 185% of the Federal Poverty Level and who live in rural communities across thirteen states. We propose that household food insecurity creates pressure in families which is associated with higher levels of maternal depressive symptoms, which in turn is related to more stressful living environments that is associated with more negative behaviors among both younger and older rural children.

Methods

Sample

This study was based on cross-sectional data from the *Rural Families Speak about Health* project (http://ruralfamiliesspeak.org/rfsh.html). Data were collected between 2011 and 2012 in 13 states (CA, HI, IL, IA, KY, MA, NE, NH, NC, SD, TN, TX, WA) from 444 mothers who were 18 years of age or older, had at least one child under the age of 13, and lived in households with annual incomes at or below 185% of the federal poverty level. Most of the mothers in the study lived in rural counties that were designated as having an urban influence code (UIC) ranging from 6 to 10 (Mammen and Sano 2013). Mothers who lived in Hawaii and California resided in remote areas of counties classified as having an UIC of 2. The UIC classifies U.S. counties into different categories according to population size, urbanization, and access to larger communities. Higher numbers indicate more rural areas. For example, an UIC of 6 designates a county as "noncore adjacent to small metro area and contains a town of at least 2,500 residents" and a UIC of 10 as "noncore adjacent to micro area and does not contain a town of at least 2500 residents" (ERS, USDA 2007). The sample size for this study (N = 370) was reduced due to the age limitations of the Child Behavior Checklist measure (CBCL) (1½–18 years of age).

Demographic Characteristics of the Sample

Mothers (N = 370) ranged in age from 18 to 64 (M = 32.6, *SD* = 8.54). Of the 340 mothers who reported their race, 66.5% identified as White, 7.9% as Black, 2.9% as American Indian or Alaskan Native, 1.2% as Asian, 1.2% as Pacific Islander and 10% as "Other". Ten percent (10.3%) of the mothers identified as more than one race. A quarter (24.1%) of the mothers identified their ethnicity as Latina, and were not born in the U.S. Of the 364 mothers who reported their education level, two-thirds (65.6%) had limited formal education (8.2%—8th grade or less; 16.8%—completed some high school; 40.6%—high school diploma or G.E.D.), and a third had some form of post-secondary education (29.4%—technical training or some college; 3.6%—bachelor's degree; 1.4%—graduate courses or graduate degree). Over half (61.9%) of the mothers were married or had a partner, one-third (33.5%) were single (i.e. never married, divorced, widowed), and the remainder reported "other status". Annual household income was categorized into 11 levels ranging from 1 = less than $4999 to 11 = $50,000 and over, with $5000 increments between levels. Most of the mothers (78.1%) reported an annual household income less or equal to $30,000, and few (4.5%) reported an annual household income of more than $45,000. The focal children in the study (N = 370) were on average six years of age (*SD* = 3.25) and half were female (50.3%; n = 186). Among households with younger children, as well as households with older children, almost three quarters of the households participated in the Supplemental Nutrition Assistance Program (SNAP) (Food and Nutrition Service, United States Department of Agriculture 2014) (72.1%; N = 175; 70.1%; N = 195 respectively).

Data Collection Procedures

Recruitment

Mixed purposive sampling (MPS) (Mammen and Sano 2012), a strategy for recruiting populations that may be difficult to reach, was employed to recruit participants into the study. MPS is a nonprobability sampling method that combines the strengths of both purposive sampling and chain-referral sampling. Initially, three mothers who potentially met study criteria and who were well connected to the study population were identified by family professionals and through postings in locations such as laundromats, food pantries, and WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) (Food and Nutrition Service, United State Department of Agriculture 2014) offices. Mothers were screened to ensure study eligibility, and then invited to participate in a two-hour in-person interview. Informed consent was appropriately obtained from each mother before she participated in the study. Upon completion of the interview, mothers were provided three fliers that contained information about the study and the interviewer's contact information to distribute to other mothers whom they believed met the study criteria. Mothers who received the fliers contacted the interviewer if they were interested in participating in the study. Mothers were then asked a series of questions to determine if they met the study criteria. Upon being determined to have met the study criteria, in-person interviews were scheduled. Mothers continued to be recruited into the study until the time period for data collection had ended. Institutional Review Board approval was obtained by principal investigators in each state involved in the study through their associated universities.

Interviews

The research team in each state identified a graduate student, faculty member, Cooperative Extension specialist, or community-based family-serving professional who had strong communication skills and could develop rapport with the study population to serve as an interviewer. Interviewers were trained in computer-assisted personal interviewing (CAPI), a technique used in this study that has been reported as an efficient, accurate, cost-effective and acceptable method for collecting data from individuals who have low incomes and are at risk for poor health (Dinca-Panaitescua et al. 2011). Interview questions were preprogrammed on USB drives which were inserted into laptop computers. Interviewers sat next to mothers so they could see the computer screen, read the interview questions aloud, and typed mothers' responses into the computer template. The interview protocol included demographic questions (e.g., mother's age, education level, household income), and questions from standardized instruments pertaining to the physical and mental health of the mother and a randomly selected child (referred to as the "focal child") who lived in the household at least fifty percent of the time. Interviews were conducted in mothers' homes or in a private conference room at a library or Cooperative Extension office. As recognition for their contributions to the study, mothers were offered a gift card or cash ranging in value from $30 to $50. The amount and type of compensation varied based on funding available for the study in each state, and the availability of stores in each community where gift cards could be purchased. Interviews were conducted in English or Spanish, based on mothers' preferences.

Measures

Independent Variable

Household food insecurity was measured using the Six-Item Short Form of the USDA Household Food Security Module and the associated Six-Item Food Security Scale that have been shown to identify food insecurity among households with reasonably high specificity and sensitivity and minimal bias compared with the 18 -item U.S. Food Security Scale (Blumberg et al. 1999). A food security score was based on the number of affirmative responses to questions such as the following: (1) "In the last 12 months, the food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Response options included often true, sometimes true, never true, don't know or refused; and (2) "In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?" Response options included yes, no, and don't know. If mothers responded "yes", they were asked to respond to the question, "How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?" Response options included almost every month, some months but not every month, only 1 or 2 months, or don't know. Responses of often, sometimes, yes, almost every month, and some months but not every month, were coded as affirmative responses and received a score of 1. The sum of affirmative responses, with a potential range of 0–6, was the household's raw score on the scale. The higher the sum score, the greater prevalence of food insecurity. The Cronbach's alpha for this sample was 0.84.

Mediating Variable

Maternal depressive symptomology was measured using a short form (CES-D 10) (Andresen et al. 1994) of the original 20-item Center for Epidemiological Studies Depression Scale (CES-D). The CES-D 10 has been used as a screening instrument in both general and clinical populations, correlates well with the original 20-item version, and has been shown to be reliable ($\alpha = 0.84$–0.90) in diverse populations (Grzywacz et al. 2006). Mothers indicated how often they have felt or behaved in response to ten statements (e.g., "I was bothered by things that usually don't bother me" "I had trouble keeping my mind on what I was doing" "I felt that everything I did was an effort"). Responses options included: rarely or none of the time (less than 1 day = 0), some or a little of the time (1–2 days = 1), occasionally or a moderate amount of time (3–4 days = 2), and all of the time (5–7 days = 3). Responses were summed and total scores ranged between 0 and 30. A score of 10 or higher is considered clinically significant depressive symptomology. The Cronbach's alpha for this sample was 0.82.

Dependent Variables

Child internalizing and externalizing behaviors were measured using the norm referenced parent rating scales (*Child Behavior Checklist 1½–5 years,* CBCL 1½–5; *Child Behavior Checklist 6–18 years,* CBCL 6–18) included in the *Achenbach System of Empirically Based Assessment (ASEBA)*. The scales contain items that relate to child competencies and problems, assess for a broad range of emotional and behavioral syndromes, and evaluate children's internalizing and externalizing behaviors (Achenbach and Rescorla 2000).

Additionally, the scales were developed through factor analysis of data from the general pediatric population and have satisfactory validity and internal consistency.

In this study, a focal child was randomly selected among all the children that lived with each mother 50% or more of the time. Mothers responded to questions regarding the behavior of the focal child in the past six months and report whether each statement was "0 = not true," "1 = somewhat or sometimes true," or "2 = very true or often true". The internalizing subscale provides a rating for the extent to which the child has exhibited symptoms of anxiety, depression, or withdrawal. The externalizing subscale provides a rating of the extent to which the child has exhibited symptoms of aggression, hyperactivity, or noncompliance. Higher scores indicate more problem behaviors. The sum of item mean scores associated with each subscale yields subscale raw scores. The scores were converted to normative T-scores using the Achenbach scoring protocol, and the T-scores are normed for age and gender. T scores for each age group were used as continuous measures of internalizing and externalizing problems. Mothers who had children who were younger than 1½ years of age were excluded from the study.

Control Variables

Maternal education, household income, and marital/partner status were analyzed as control variables in order to account for their potential impact on the dependent variables (i.e., child internalizing and externalizing behaviors) and relation to each other (Goodman and Gotlib 1999). For example, commonly education level and household structure (e.g., married, single) are strongly correlated with household income, and household income is strongly correlated with participation in SNAP.

Household participation in SNAP was controlled for as it has been shown to help lessen food insecurity in low-income households (Ratcliffe et al. 2011; Schmidt et al. 2012; Shaefer and Gutierrez 2013). Maternal education had nine categories with a lower number indicating less formal education (e.g., 1.00 = 8th grade or less; 9.00 = Graduate degree). Household income was a categorical variable with higher numbers indicating higher income (e.g., 1.00 = less than $4999 to 11.00 = $50,000 and over) and $5000 increments between income categories. Marital/partner status was coded as two categories (1 = married or partnered, 0 = single, widowed, divorced). SNAP participation was coded as two categories (1 = yes, household receives SNAP, 0 = no, household does not receive SNAP).

Analysis

IBM SPSS Statistics 22 was used to compute descriptive statistics and intercorrelations for all variables in the model. Mplus Version 6.1 (Muthén and Muthén, 1998–2012) was used for the structural equation model (SEM) and multiple group analyses using maximum likelihood estimation. Our conceptual model examined relations between food insecurity, maternal depressive symptoms, and internalizing and externalizing child behaviors, while controlling for mothers' education level, household income, marital/partner status, and participation in SNAP.

First, we evaluated the fit of the conceptual model for both younger and older child groups, and a formal test for evidence of mediation was performed, with mother's depressive symptoms as a mediator. This model was also estimated as a two-group model to examine whether associations among the variables varied depending on the age group of the children. Specifically, we used the Chi square difference test for nested models to test

age group differences for each path. The change in the Chi square value between models with individual pathways constrained (e.g. the path from food insecurity to mothers' depressive symptoms was set equal for the two age groups) and a baseline model in which all pathways were unconstrained were then examined to determine which, if any, paths differed significantly between younger and older children. To test for indirect effects, 1000 bias corrected bootstrap iterations were performed. Bootstrapping procedure guards against a non-normal distribution of the mediating effect (Shrout and Bolger 2002) and the risk of spuriousness. Confidence intervals of 95% were used to determine specific indirect effects in the model.

Results

Study Variables

As detailed in Table 1, all the study variables were significantly related and all the correlations among the variables were in the expected direction. As reported in Table 2, for internalizing behaviors, the mean T score for older children was 53.37 ($SD = 9.56$) and 50.25 ($SD = 11.03$) for younger children. For externalizing behaviors, the mean T score for older children was 52.41 ($SD = 10.16$) and 51.34 ($SD = 11.54$) for younger children. The mean depressive symptoms score for mothers who had an older focal child was 9.32 ($SD = 6.34$) and 8.01 ($SD = 5.60$) for mothers who had a younger focal child. Among the older child group, the average household food insecurity score was 1.97 ($SD = 2.08$), and 1.55 ($SD = 2.04$) among the younger child group. The mean T scores for child internalizing behaviors ($t = 2.89$, $p < 0.01$) and mothers' depressive symptoms ($t = 2.08$, $p < 0.05$) were significantly different between older and younger children.

Structural Equation Model

The conceptual model in this study is a fully recursive model, which includes all possible relationships among the exogenous and endogenous variables. As a result, our model has a perfect fit for the data, $\chi^2(0) = 0.000$, $p < 0.001$; CFI = 1.000, RMSEA = 0.000. Standardized coefficients for the paths for younger children are shown in Fig. 1 and for older children are shown in Fig. 2. As shown in Fig. 1, for younger children, household food insecurity was significantly positively associated with mothers' depressive symptoms ($\beta = 0.311$) and externalizing behavior problems ($\beta = 0.236$), but not significantly associated with internalizing behavior problems. Mothers' depressive symptoms were significantly positively associated with child externalizing behavior problems ($\beta = 0.223$), but not significantly associated with internalizing behavior problems. Therefore, mothers' depressive symptoms partially mediated the association between household food insecurity and child externalizing behavior problems, where significant direct effect of household food insecurity on child externalizing behavior and indirect effects through mothers' depressive symptoms were shown. However, mothers' depressive symptoms didn't mediate the relationship between food insecurity and child internalizing behavior problems. Furthermore, our findings suggested that household food insecurity in younger children uniquely explains 5.6% of the variation in externalizing behavior and 2.1% of internalizing behavior. Mothers' depressive symptoms uniquely explains 5.0% of the variation in externalizing behavior and 1.2% of internalizing behavior.

Table 1 Correlations among variables in model (N = 195 older children; N = 175 younger children)

Variable	1	2	3	4
1. Internalizing child behavior	–			
2. Externalizing child behavior	0.45*** (0.73***)	–		
3. Depressive symptoms (mother)	0.23** (0.16*)	0.20** (0.27**)	–	
4. Household food insecurity	0.20** (0.23**)	0.17* (0.35***)	0.27** (0.31***)	–

Correlations for younger children are in parenthesis

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 2 Descriptive Statistics and *T*-tests (N = 195 older children; N = 175 younger children)

Variable	Mean	Standard Deviation	Range (min–max)	*T* test Statistics	*p* value
Internalizing child behavior	53.37 (50.25)	9.56 (11.03)	33.00–85.00 (29.00–79.00)	2.89	<0.01**
Externalizing child behavior	52.41 (51.34)	10.16 (11.54)	33.00–79.00 (28.00–92.00)	0.94	>0.05
Depressive symptoms (mother)	9.32 (8.01)	6.34 (5.60)	0.00–29.00 (0.00–27.00)	2.08	<0.05*
Household food insecurity	1.97 (1.55)	2.08 (2.04)	0.00–6.00 (0.00–6.00)	1.96	>0.05

Results for younger children are in parenthesis

* $p < 0.05$; ** $p < 0.01$

For older children (see Fig. 2), household food insecurity was significantly positively associated with mothers' depressive symptoms ($\beta = 0.209$), which in turn were significantly associated with child externalizing ($\beta = 0.155$) and internalizing ($\beta = 0.228$) behaviors problems. However, the direct effects of household food insecurity on externalizing and internalizing behavior problems were not significant when mothers' depressive symptoms were introduced into the model as a mediator. Thus, mothers' depressive symptoms fully mediated the direct effects of household food insecurity on child externalizing and internalizing behavior problems. In addition, our findings suggested that household food insecurity in older children uniquely explains 0.7% of the variation in externalizing behavior and 1.3% of internalizing behavior. Mothers' depressive symptoms uniquely explains 2.4% of the variation in externalizing behavior and 5.2% of internalizing behavior.

Mediation relationships among the variables are specified in the conceptual model. Results of the analysis based on the bias-corrected bootstrap sampling procedure are as follows: For younger children, household food insecurity only had significant indirect effects on externalizing ($b = 0.069$, 95% confidence interval [CI] [0.052, 0.984]) behaviors through mothers' depressive symptoms. For older children, household food insecurity had significant indirect effects on externalizing ($b = 0.032$, 95% confidence interval [CI]

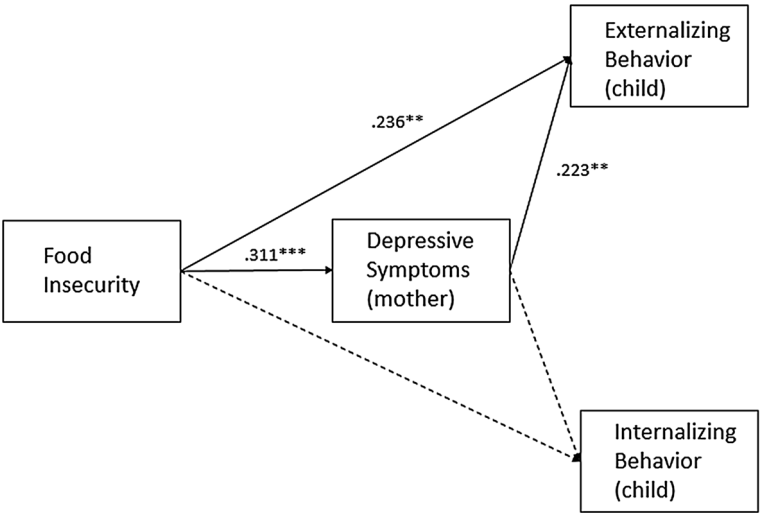

Fig. 1 Final model for younger children (1½–5 years of age). *Note* Standardized parameters are presented. *Solid lines* represent significant paths. $\chi^2(0) = 0.000$, $p < 0.001$; CFI = 1.000; RMSEA = 0.000. $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

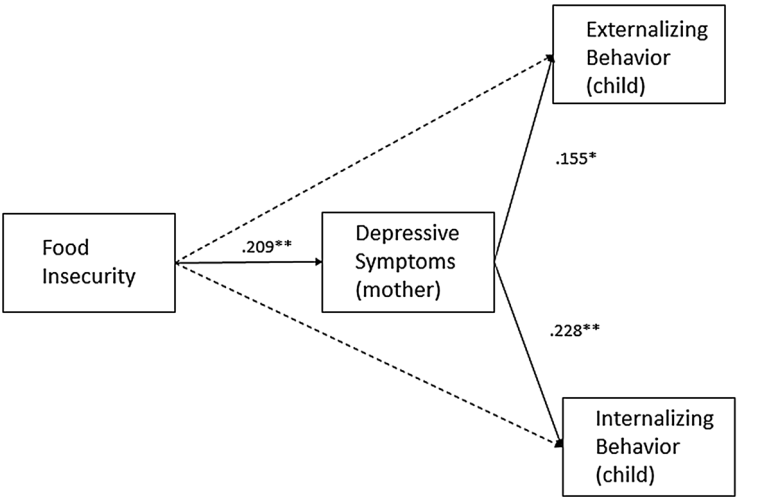

Fig. 2 Final model for older children (6–12 years of age). *Note* Standardized parameters are presented. *Solid lines* represent significant paths. $\chi^2(0) = 0.000$, $p < 0.001$; CFI = 1.000; RMSEA = 0.000. $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

[0.006, 0.469]) and internalizing ($b = 0.048$, 95% confidence interval [CI] [0.048, 0.537]) behaviors through mothers' depressive symptoms.

For each pathway in the model, differences by age group of children were tested. One-by-one comparisons of the unconstrained model to the constrained model revealed some age group differences. First, an age group difference in the effects from food insecurity to externalizing behavior was found: $\Delta\chi^2(1) = 4.81, p < 0.05$. This result indicates that food

insecurity has a significant positive effect on externalizing behavior for younger children, whereas there is no significant effect between food insecurity and externalizing behavior for older children. Furthermore, an age group difference was found in the effects from mothers' depressive symptoms to internalizing behavior, $\Delta\chi^2(1) = 3.72$, $p < 0.05$: depressive symptoms in mothers with older children are positively associated with internalizing behavior, whereas depressive symptoms in mothers with younger children are not. In addition, an age group difference was found in the effects from mothers' depressive symptoms to externalizing behavior: $\Delta\chi^2(1) = 5.21$, $p < 0.05$. This result indicates that the strength of the pathway from mothers' depressive symptoms to externalizing behavior is significantly higher for younger children than it is for older children.

Discussion

This study uniquely examines the relations between two family stressors—household food insecurity and maternal depressive symptoms—and behavior problems among both younger and older children who live in low-income rural households across multiple states in the same model. We proposed that household food insecurity creates pressure in families which is associated with higher levels of maternal depressive symptoms, which in turn is related to more stressful living environments that is associated with more negative behaviors among both younger and older rural children. When we accounted for mothers' age, education level, household income and participation in SNAP, we found that relations between the variables differed by age group (younger vs. older) of children. Final models showed that food insecurity was positively associated with externalizing behavior problems among younger, but not older children, and that maternal depressive symptoms were positively associated with internalizing behavior problems among older children, but not younger children. Additionally, there were age differences in the association of mothers' depressive symptoms to externalizing behaviors that indicated that the strength of the pathway from mothers' depressive symptoms to externalizing behavior was significantly higher for younger children than it was for older children.

While Slopen et al. (2010) found that persistent food insecurity was associated with both internalizing and externalizing problems among both older and younger children, they did not account for the potential role of maternal depressive symptoms. This study builds upon Slopen et al. (2010), and is consistent with Huang et al. (2010) that suggests among older children food insecurity may operate through maternal depression to affect externalizing and internalizing problem behaviors. However, among younger children, and consistent with Slack and Yoo (2005), our study suggests that the potential effect of food insecurity on externalizing problem behaviors may be partially mediated by maternal depression. In contrast to our findings, Weinreb et al. (2002) found that maternal distress as a covariate was highly significant in models examining the effects of very low food security on child internalizing problems. However, it is important to note that our study did not distinguish between low food security and very low food security.

Potential explanations for findings in our study include, that in addition to the stress that results from experiencing unpredictable and unstable access to food, food insecure households may simultaneously experience stress associated with unaffordable or poor quality housing. Such stressors lead to a chaotic family environment that magnifies the physical and emotional stress young children who are hungry experience, which in turn elevates externalizing problem behaviors among young children (Frank et al. 2010). Young

children who are consistently hungry (or underfed) may demonstrate more behavior problems due to a general restlessness and lack of ability to self-regulate. Furthermore, it is important to note that there was a strong correlation between maternal depressive symptoms and child externalizing ($r = 0.27$; $p < 0.01$) and internalizing behaviors ($r = 0.16$; $p < 0.05$). This may be due to younger children, who are commonly fully dependent upon adults, not receiving the care and attention they need to feel secure from their mothers who are depressed.

Among older children, greater food insecurity was associated with more maternal depressive symptoms, that in turn, were associated with more externalizing and internalizing behavior problems. Maternal depressive symptoms fully mediated the relations between food insecurity and child internalizing and externalizing behaviors. A potential explanation for the finding is this study may be that older children may have a better understanding of their family's situation (i.e., little money, little food, mother who is not very responsive) which in turn could cause them to be anxious and sad (i.e., internalizing behavior) about their situations. Maternal depression can lead to harsh parenting or neglectful parenting which can result in aggressive behaviors among children. As children get older, alliance with peers and peer influence becomes stronger. When older children do not find emotional support at home, they may seek such support and a sense of belonging from peers or media (e.g., television, video games) which in some instances may not serve as positive influences.

Strengths and Limitations

Strengths

A unique contribution of this study is that it calls attention to the synergistic relation between, or accumulative effect of, two specific family stressors (i.e., food insecurity, maternal depression) and behavior problems among younger and older children across multiple rural communities in the same model (Polaha et al. 2010). This study suggests that maternal depressive symptoms may help to explain the relationship between food insecurity and negative child behaviors, and that the relationships vary by age of children (e.g., younger vs. older children). This study also highlights the unique direct and negative relationship between food insecurity and externalizing behaviors among rural younger children.

Limitations

Although the final models in this study suggest processes associated with child behaviors, causation and direction of associations cannot be determined due to the cross-sectional design of the study, and results should be interpreted with caution. It is important to note that depressed mothers may report more cases of child behavior problems (Najman et al. 2000), and *may* have more difficulty in gaining or maintaining employment and harnessing resources that are available to them, than do their mentally healthy counterparts, thus, increasing their household's risk of food insecurity. While we controlled for some household and maternal characteristics in the study, there may be characteristics or behaviors of other family members that were not measured which in turn may have influenced the relationships between the variables. Mothers were not randomly selected, and were the sole sources of data. Thus, c*aution should be taken when interpreting the findings.*

Implications for Research

Longitudinal studies that include three or more time points, and that apply transactional models, are needed to rigorously examine causation and directionality among the study variables across younger and older children. Additional potential influences of child, caregiver and family characteristics should also be considered in future studies (Lander-Potts et al. 2015). For example, the potential role of children's behaviors or the quality of the co-parent relationship in influencing maternal depression should be examined, as well as the potential role of maternal depression in influencing food insecurity. Additionally, since depressed mothers may over report child problem behaviors, and self-report data may be biased, data from outside observations of children's behaviors (e.g., teachers, child care providers) would be beneficial.

Implications for Policy and Practice

Policies, practices and programs that prevent or lessen both food insecurity and maternal depression among rural families may help to reduce negative behaviors among children. Implementing screenings for both maternal depression and food insecurity as part of existing programs or services in rural communities (e.g., school enrollment, doctor visits, food pantries, applications for subsidized housing or SNAP, home visitation programs) using reliable, valid measures that are quick and simple to administer and analyze could provide practitioners information that can use to determine when to refer families, as well as tailor their services, without subjecting a person to a battery of assessments. Mothers whose scores place them at risk for depression could be referred to mental health counselors or to family support programs that promote mental health, positive parent–child interactions, and connect families to social supports. Challenges in doing this may be the shortage of mental health professionals and services in rural America (Thomas et al. 2009), travel distance to receive services, lack of insurance coverage for services, and stigma of needing or receiving services (Sawyer et al. 2006). Initiatives such as the National Health Service Corps (NHSC) which provides loan repayment and scholarships for newly trained mental health professionals to work in a rural Health Professional Shortage Area (HPSA) (Health Resources and Services Administration, n.d.) may help to address these issues.

Food insecure households could be referred to food pantries and federally funded nutrition assistance programs (i.e., SNAP, WIC, Free and Reduced Price School Meals) that have been proven to reduce food insecurity (Ratcliffe and McKernan 2010), as well as to the Expanded Food and Nutrition Education Program (NIFA, USDA, n.d.) which helps families gain knowledge, skills and access resources to eat healthfully on a limited budget (Baral et al. 2013). Additionally, rural, low-income families commonly experience transportation barriers and live in communities where WIC clinics, larger grocery stores that have affordable foods, and food pantries may not always be available. Gas stations and convenience stores commonly serve as grocery stores for low-income families in remote rural communities (Greder 2000; Garasky et al. 2006). Public and private financing that supports mobile WIC clinics and food pantries; Electronic Benefits Transfer machines at gas stations, convenience stores, farmers markets, and small rural grocery stores; and low-cost public transportation between rural and larger communities could help increase rural families' access to food and lessen stress manifested from food insecurity.

As posited in the Family Stress Model, multiple factors influence parent and child behaviors, thus, creating a complex system of interactions. This study suggests that across

younger and older rural children, stress manifested directly from or indirectly through, maternal depressive symptoms and from food insecurity is related to child problem behaviors. However, the relations vary by age of child.

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Compliance with Ethical Standards

Conflict of interest The authors of this paper declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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