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A Cross-Sectional Exploration of Food Security, Depression, and CHAOS in Low-Income Households with Children

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Introduction

The absence of access to adequate food by all people, at all times, in order to support an active and healthy life is a phenomenon referred to as food insecurity.[1] The economic recessions of the early 21st century have led to increases in the number of reported food insecure households in the United States.[2] Households with children experience food insecurity at increased rates, with 9.4% of households with children reported food insecure compared to the overall 14.0% of households in 2014.[1] Research has revealed that child food insecurity is related to multiple adverse health and developmental outcomes among children (e.g., hospitalizations, lower math and reading achievement, and poorer psychosocial functioning).[3–7]

Food insecurity is posited to impact *all* members of a household, through a variety of ways. Depression has been linked to food insecurity, particularly among low-income women.[8–10] Perhaps low-income mothers, oftentimes single female heads of household, are responding to stressors in the environment associated with the experience of food insecurity.[11] Leung and colleagues found a dose-response relationship between depression and food insecurity among both men and women, with higher prevalence of depressive symptoms reported corresponding with increasing rates of food insecurity.[12]

Recently, it has been demonstrated that children report experiencing aspects of food insecurity—cognitively, emotionally, and physically—despite parents attempts to buffer their experience.[13] Beyond food insecurity, low-income children and youth face an array of suboptimal, chaotic living conditions, such as residing in more crowded, noisier, and poorer-quality housing and experiencing less structure, routine, and predictability in their daily home life.[14–16] This experience of "chaos" and its relationship to parenting and child development outcomes was the impetus for the development of the Confusion, Hubbub, and Order Scale (CHAOS).[17] In subsequent utilization of the CHAOS instrument, it has been documented that low-income adolescents' parents report higher levels of chaos than their more affluent counterparts, and this experience of chaos has adverse effects on socioemotional adjustment, longitudinally.[18] Furthermore, CHAOS and low socioeconomic status at the household level have been suggested to be independent sources of shared environmental influences that may negatively impact a child's development.[19] One particular study confirmed the links between household chaos and parenting and indicated that household chaos is predictive of children's problem behavior(s), over and above other factors such as parenting.[20] The scale has been tested among low-income parents, and household chaos was found to be associated with multiple

detrimental correlates among parents (e.g., elevated levels of harsh or inconsistent discipline of parents toward their children) and children (e.g., elevated levels of behavior problems and reduced social abilities).[21]

Although linkages between food insecurity and depression have been demonstrated, as well as a general characterization of how CHAOS relates to the home environment and child development, no studies have explored the relationship between CHAOS, depression, and food insecurity among a very low-income population. The purpose of this paper was to evaluate the cross-sectional relationship between depression, CHAOS, and sociodemographics/family characteristics on levels of food insecurity among low-income households with children, ages 0-18 years.

Methods

Surveys were developed and collected as part of a baseline evaluation of a community-based initiative to address hunger and food insecurity in a medium-sized midwestern city. Participants were recruited from various community venues in areas where low-income families live and spend time (e.g., public libraries, food pantries). Eligible participants were 19 years of age and older, a parent or primary caregiver to at least one child living in the same household 50% of the time or more, and English- or Spanish- speaking. Survey items included nutrition assistance program participation, food security, depression, CHAOS, and sociodemographics/family characteristics.

Measures

Sociodemographics and family characteristics. The variables assessed included race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic/Latino, American Indian, and all other races/ethnicities), age (18-29; 30-39; 40-44; 45-49; 50-64; 65 and older), sex (male or female), education (no formal education; grade school; high school or equivalent; vocational, business, or trade school; 2-year junior or community college; 4-year college or university; graduate or professional school), income (none; $5,000 or less; $5,000-$10,000; $10,001-$15,000; $15,001-$20,000; $20,001-$25,000; $25,001-$30,000; $30,001-$35,000; $35,001-$50,000), and Supplemental Nutrition Assistance Program participation (yes or no).

Depression. A modified version of the Short Depression-Happiness Scale (SDHS)[22] was used to measure depression. The SDHS is a 5-item scale that is a dual measurement of depression and happiness as opposite ends of a single continuum. Participants rate how often they experience negative and positive feelings. Responses were self-reported

Likert scales and scored from 0 ("strongly disagree") to 4 ("strongly agree"). Raw scores were the mean of responses. Participants were grouped into "low," "medium," and "high" classifications based on raw score tertiles.

CHAOS. A short version of the CHAOS scale was used. Using 6 items, the inventory assesses the level of routine, noise, and general environmental confusion. Responses were self-reported Likert scales and scored from 0 ("strongly disagree") to 4 ("strongly agree"). Raw scores were the mean of responses. Participants were grouped into "low," "medium," and "high" classifications based on raw score tertiles. Initial testing of the CHAOS survey included 15 items,[17] although others have used the 6-item version.[19] Matheny and colleagues provided preliminary evidence for the validity and reliability of the 15-item scale in terms of correlations with observational measures of home disorganization and parenting, internal consistency (Cronbach's α = 0.79), and 12-month stability (r = 0.74).[17] Using the 6-item scale, Hart and colleagues demonstrated moderate inter-rater reliability (r = 0.77).[19]

Household Food Security. The United States Department of Agriculture (USDA) 6-item Household Food Security Module[23] was used to assess food security status at the household level. Questions are ordered by severity and attribute-related experiences or behaviors to insufficient resources to buy food over the past 12 months. A raw score was created by summing the affirmative responses to the 6 questions, with a higher score reflecting higher levels of food insecurity (or very low food security). Categories were then assigned on the basis of guidelines from the USDA,[23] with the following scores reflecting varying levels of food security: 0 = "high food security"; 1 = "marginal food security"; 2-4 = "low food security"; and 5-6 = "very low food security." These categories were collapsed and operationalized as a binary outcome (high/marginal vs. low/very low food security).

Analysis
Percentages and mean ± standard deviations were used to describe sociodemographics and family characteristics among all participants. Alpha level for statistical significance was set at 0.05. The primary independent variables were depression and CHAOS (both split into tertiles). Other variables were collapsed for analyses: age (ages 18-39 or 40 years and older), education (high school or less vs. greater than high school), race and ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other), income (0-$10,000 vs. $10,001 and above), and marital status (married or living with partner vs. divorced, widowed,

single). Descriptives and chi-square tests were conducted for all variables. Potential covariates were assessed (e.g., age, income, education, race/ethnicity, sex, SNAP participation, number of children and adults in the household, and marital status) and included in the final logistic regression model through backward elimination. All statistics were conducted using SAS (version 9.2, SAS Institute Inc., Cary, NC).

Results

Sociodemographics and Family Characteristics

Table 1 shows the sociodemographic and family characteristics of the sample population, with a large percentage of very low-income participants (e.g., 71% earning less than $20,000 a year; 2015 federal poverty line for a family of four = $24,250).[24] In addition, 59% of respondents reported that they currently receive SNAP benefits. Table 1 also shows that respondents were 75% female and that about half of the respondents were aged 18-39 (52%). The majority of respondents were African American (42%) or white (31%), with fewer Hispanic respondents (12%). Most of the respondents had a high school or equivalent level of education (56%). Finally, the mean number of children in households was 2.33 (SD = 1.58; this data point is not shown in the table).

[TABLE 1]

Table 2 describes univariate relationships between study variables and varying household food security levels. Those in the "high" and "medium" groups for depression and CHAOS were both more likely than the "low" groups to experience low or very low food security. Income and education were also related to food security, with low levels of education and low income being associated with low or very low food security. Age, sex, race/ethnicity, and marital status were not associated with food security status.

[TABLE 2]

In Table 3, the unadjusted and adjusted odds ratios for being "low or very low" food secure (e.g., food insecure) were assessed using depression and CHAOS as predictor variables. In unadjusted analyses of depression and CHAOS, these variables accounted for 4% and 7% of the variance, respectively (depression: OR = 0.33, CI = 0.16-0.67; $p < 0.01$; CHAOS: OR = 0.21, CI = 0.10-0.45; $p < 0.001$). In the adjusted models that controlled for relevant covariates (i.e., age, income, education, and sex),

effects were similar. The adjusted model with depression as the predictor variable explained 10% of the variance in food security level, with those reporting the lowest tertile of depression being significantly less likely to report low and very low levels of food security when compared to the highest level of depression (OR = 0.31, CI = 0.15-0.65; p < 0.01). In the adjusted model for CHAOS, 14% of the variance in food security level was accounted for, and those reporting the lowest tertile of CHAOS were significantly less likely to report low and very low levels of food security when compared to the highest level of CHAOS (OR = 0.20, CI = 0.09-0.43; p < 0.01). Lastly, in a model with CHAOS and depression included simultaneously, as well as controlling for covariates, the effect of depression was attenuated and not significant while CHAOS remained statistically significant (OR = 0.25, CI = 0.11-0.56; p < 0.01).

[TABLE 3]

Discussion

This study demonstrated that CHAOS and depression may be important correlates to explore further in relation to food insecurity. Families who reported higher levels of either CHAOS or depression were more likely to also report lower levels of household food security. CHAOS and depression may have some overlap and play similar roles in food insecure households with children, as CHAOS demonstrated a stronger relationship with food security than depression when controlling for sociodemographics. CHAOS is a scale that has not been tested widely among food-insecure populations and might help explain some of the stress experienced by low-income and food-insecure families. In addition, these variables should be explored further and compared across more varied population (e.g., socioeconomic status).

Potential negative outcomes have been demonstrated for the variables included in the current study, often separately. There has been a relationship demonstrated between parental depression and child psychoemotional impairment.[25,26] The impact of food insecurity on child academic achievement, cognitive performance, and physical development has been shown.[27,28] Perhaps the relationship between child outcomes of food insecurity are mediated through the child internalizing challenges experienced at home. A less studied variable is CHAOS, which has been described as having an impact on child development and other related variables.[14–16] This study begins to draw relationships between these 3 variables, as they often occur in an overlapping manner among low-income populations.

This study has limitations, the first of which is the fact that the results are based on cross-sectional data, thus limiting attributions about the direction of causality between variables.[29] In addition, there may be other variables not assessed that influence and moderate relationships between CHAOS, depression, and food insecurity (e.g., psychosocial variables, parenting style). Furthermore, the sample was relatively small and from one geographic area in the midwestern US, limiting generalization of results to a national low-income and food-insecure sample. Also there may have not been differences by sex since the sample was predominantly female.

Several strengths of this study should be noted, including the real-world aspect of these data, which were collected in a community setting, and the ability to collect information on a large group of very-low food-secure families with children. The higher rates of food insecurity experienced by this typically understudied sample population allowed for exploration of factors not previously explored in relation to food insecurity, namely CHAOS and depression. Future studies seeking to assess and alleviate food insecurity should consider including and intervening on these potentially important factors (e.g., CHAOS and depression).[30]

More in-depth study of the home environment and potential mechanisms for how depression, CHAOS, and food insecurity may interact and influence a multitude of child outcomes is also warranted. Future studies may want to consider a longitudinal design following families with children over time to better understand causation and implications of CHAOS, depression, and food insecurity and best potential strategies to intervene. Concurrent observational studies may provide a richer understanding of the home environment and child development. Elucidating the psychological aspects of food insecurity, in tandem with other potentially important factors (e.g., physiological hunger, dietary patterns, and psychosocial factors), may help inform the development of tailored interventions to alleviate food insecurity among low-income households with children and ultimately improve health, achievement, and related outcomes in children.

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Table 1. Sociodemographics and Family Characteristics Among a Sample of Very Low-income Survey Respondents in Midwest United States (n = 252)

Variables	n	%
Sex		
Male	62	24.6
Female	190	75.4
Age		
18-29	50	19.8
30-39	82	32.5
40-44	28	11.1
45-49	36	14.3
50-64	52	20.6
65 and older	4	1.6
Race and Ethnicity		
Non-Hispanic white	78	31.0
Non-Hispanic black	105	41.7
Hispanic	31	12.3
Other	38	15.1
Education		
No formal education	4	1.6
Grade school	7	2.8
High school or equivalent	140	55.6
Vocational, business, or trade school	26	10.3
2-year junior or community college	34	13.5
4-year college or university	29	11.5
Graduate or professional school	12	4.8
Household Income		
None	41	16.3
$5,000 or less	47	18.7
$5,000-$10,000	31	12.3
$10,001-$15,000	26	10.3
$15,001-$20,000	34	13.5
$20,001-$25,000	26	10.3
$25,001-$30,000	23	9.1
$30,001-$35,000	13	5.2
$35,001-$50,000	11	4.4
Marital Status		
Married or living with partner	105	41.7
Divorced, widowed, single	147	58.3
Supplemental Nutrition Assistance Program Participation		
No	104	41.3
Yes	148	58.7
Food Security Status		
Marginal and high	67	26.6
Low and very low	185	73.4

Table 2. Chi-square Tests Describing Statistical Relationships Between Independent Variables and Food Security Status (n = 252)

Independent Variables	Food Security		Chi-square	P-value
	Marginal and High	Low and Very Low		
Depression				
Low	32	50[a]	10.52	0.005*
Medium	20	64[b]		
High	15	71[b]		
CHAOS				
Low	41	52[a]	23.44	0.000*
Medium	14	62[b]		
High	12	71[b]		
Sex				
Male	17	45	0.03	0.864
Female	50	140		
Age				
Between 18 and 39	40	92	1.96	0.161
40 years and older	27	93		
Race and Ethnicity				
Non-Hispanic white	20	58	0.42	0.936
Non-Hispanic black	30	75		
Hispanic	8	23		
Other	9	29		
Education				
High school or less	32	119	5.62	0.018*
Greater than high school	35	66		
Household Income				
Zero to $10,000	22	97	7.79	0.005*
$10,001 and above	45	87		
Marital Status				
Married or living with partner	25	80	0.71	0.399
Divorced, widowed, single	42	105		

*: Indicates statistical significance (p < 0.05) when two groups.
a, b: Indicate statistical significance when more than two groups.

Table 3. Adjusted and Unadjusted Odds Ratios for Experiencing Low or Very Low Household Food Security Compared to Marginal and High Food Security When Comparing the Lowest Tertile Scores for Depression and CHAOS to the Highest Tertile (n = 252)

Independent Variable ("Low and Very Low" vs. "Marginal and High" Food Security)	Unadjusted			Adjusted		
	OR	CI	P-value	OR	CI	P-value
Depression[1]	0.33	0.16-0.67	0.0023	0.31[a]	0.15-0.65	0.0018
CHAOS[2]	0.21	0.10-0.45	<0.0001	0.20[a]	0.09-0.43	<0.0001
CHAOS[3]	-	-	-	0.25[b]	0.11-0.56	0.0008
Depression[3]	-	-	-	0.51[b]	0.23-1.14	0.0988

[a]: Controlled for sex, education, income, and age.
[b]: Controlled for sex, education, income, age, CHAOS, and depression.
[1]: Only depression.
[2]: Only CHAOS.
[3]: CHAOS and depression included simultaneously.