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Social Science & Medicine 263 (2020) 113275

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: http://www.elsevier.com/locate/socscimed

Food insecurity in households with young children: A test of contextual congruence

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ARTICLE INFO

Keywords:
Food insecurity
Socioeconomic status
Race/ethnicity
Neighborhoods

ABSTRACT

Household food insecurity, an inability to provide adequate nutrition for a healthy, active lifestyle, affects nearly 1 in 7 households with children in the United States. Though rates of food insecurity declined to pre-recession levels just prior to the COVID-19 pandemic, they are now once again increasing. As a result, in one of the wealthiest countries in the world, millions of young children continue to grow up in households that struggle daily with a problem that is often associated with the developing world. The result is both immediate and long-term health and development deficits for children. We propose that the degree of demographic and socioeconomic congruence between the households of young children and their neighborhood of residence lends unique insights to food insecurity. We examine this using the ECLS-K 2010–2011 for children in families with incomes below 400 percent of the federal poverty line (N = 8600). Results show that congruence between household and neighborhood education and race/ethnicity associates with the likelihood of experiencing food insecurity. For example, households with non-Hispanic black children living in neighborhoods with high proportions of non-Hispanic blacks have significantly lower probabilities of food insecurity than similar households living in neighborhoods with smaller black populations. Similarly, more highly educated families experience lower probability of food insecurity in high education neighborhoods than when they reside in low education neighborhoods. Focusing on neighborhood risk factors as absolute and independent contributors limits our understanding of how families experience food insecurity as well as any policy efforts to address it.

Food insecurity, a household's inability to consistently provide enough food for an active and healthy lifestyle, affects nearly 1 in 7 households with children in the United States (Coleman-Jensen et al., 2019). Though rates of food insecurity declined to pre-recession (2007) levels (Coleman-Jensen et al., 2019) just prior to the COVID-19 pandemic, the current crisis is resulting in never before seen levels of food insecurity (Bauer, 2020). The impacts of food insecurity for children, especially during important developmental periods, can have immediate and long term consequences (Gundersen and Ziliak, 2015; Kirkpatrick et al., 2010). These include physical and mental health ailments, declines in academic performance, higher rates of absenteeism, repeated grades, behavioral and attention problems, and more mental health counseling (Alaimo et al., 2002, 2001; Jyoti, Fro ngillo, & Jones, 2005; Kleinman et al., 1998; Murphy et al., 1998; Whitaker et al., 2006). Given these consequences, a growing literature aims to identify the risk and protective factors associated with food insecurity among young children (Gundersen and Ziliak, 2018).

Although research on food insecurity has focused on the characteristics of individual families and children (Gundersen and Ziliak, 2018), an established literature shows the importance of residential location for shaping child health and development (Leventhal and Brooks-Gunn, 2000). Residential context can impact food insecurity through the physical and socioeconomic characteristics and resources available (or not) in communities (Brisson, 2012; Denney et al., 2018; Jackson et al., 2019; King, 2017). Extant research, however, has paid insufficient attention to the neighborhood conditions that increase or decrease vulnerability to food insecurity. This oversight is important to address if household food insecurity is rooted in family and community-based factors (Denney et al., 2018; Jackson et al., 2019; King, 2017).

To fill this research gap, we use a nationally representative sample of households with young children linked with contextual data to investigate the importance of neighborhoods for household food insecurity,

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https://doi.org/10.1016/j.socscimed.2020.113275
Received in revised form 3 July 2020; Accepted 30 July 2020
Available online 7 August 2020

and suggest, as have others (Sharkey and Faber, 2014), that an investigation of neighborhood effects is incomplete without considering characteristics of households and residential neighborhoods in tandem. Rather than treat neighborhood conditions as having a uniform impact on every resident, a key contribution of our study is examining whether neighborhood conditions impact residents differently depending on their individual or family characteristics. Are poor households, for example, more likely to be food insecure in lower-income or higher-income neighborhoods? And are households that are not below the poverty line more likely to be food insecure in lower-income or higher-income neighborhoods? In the current study, we investigate the role of congruence – the degree to which individual (or household) and neighborhood conditions align or diverge – across poverty, education and race/ethnicity in relation to household food insecurity. In doing so, our study allows policymakers to better identify where food insecurity occurs and for which households.

1. Food insecurity

Numerous individual and household determinants of food insecurity have been identified. Food insecurity is closely tied to a household's financial status (Coleman-Jensen et al., 2019), such that the prevalence and severity of food insecurity is higher among lower-income and asset poor households compared to the national average (Chang et al., 2014; Gundersen and Ziliak, 2014). Non-financial risk factors include but are not limited to single-parent households and those with grandchildren (Ziliak and Gundersen, 2016), households with an adult smoker (Cutler-Triggs et al., 2008), poor caregiver mental and physical health (Balistreri, 2012; Kaushal et al., 2013), lack of nonresident father involvement (Nepomnyaschy et al., 2014), immigrant households (Brewer et al., 2019; Cook, 2013), and low maternal education (Kimbro et al., 2012). Though informative, these factors do not fully account for the onset or severity of food insecurity among U.S. households. Recent studies from the neighborhood effects literature suggest the importance of residential context for predicting household food insecurity.

2. Neighborhoods and food insecurity

Research concerned with whether residential context influences wellbeing emerged within a framework focused on absolute differences: Put simply, are residential characteristics linked with life chances, regardless of individual and household characteristics (Robert, 1998)? From here, researchers have sought to understand how social, cultural, economic, and physical characteristics of individuals' neighborhoods influence wellbeing (Frohlich et al., 2001; Kawachi and Berkman, 2003; Singh et al., 2010). To summarize, researchers document disparities in social and developmental wellbeing for children in disadvantaged communities because the resources, infrastructure and related services that promote wellbeing are inaccessible, ineffective, or unavailable in these communities (Chetty et al., 2016; Jencks and Mayer, 1990).

As such, there are many reasons to believe social and economic indicators of neighborhoods might reveal important insights into the risk of experiencing food insecurity. Neighborhood scholars reason that the health benefits of socioeconomic status (SES) are not limited to individual status—high-income and highly educated places should benefit individuals through improved infrastructure and more highly resourced social networks, regardless of their individual or household SES (Sampson, 2003). Neighborhoods with more wealth can attract more institutional resources, such as large chain grocery stores (Walker et al., 2010). Further, some more advantaged neighborhoods may be characterized by a greater density of other institutional resources like schools, libraries, and community organizations, the lack of which may contribute to the impact of neighborhood disadvantage on residents' wellbeing (Wilson, 1996), including food security status. Community organizations, for example, are important both for enrolling families in formal governmental food assistance programs, but also for creating and maintaining the informal channels that connect families to each other and encourage strategies to overcome food shortages (King, 2017). Neighborhoods with higher levels of perceived social cohesion might experience greater levels of trust and resource sharing between residents, which promotes food security (Denney et al., 2017; King, 2017).

Still, evidence for neighborhood SES contributing independently to the risk of household food insecurity is sparse. A descriptive study showed significantly greater proportions of food insecure households in neighborhoods with higher poverty rates and higher less than high school educated populations (Kimbro et al., 2012). A more recent study, however, using neighborhood concentrated disadvantage as a marker of SES found no direct adjusted association (Denney et al., 2018). Focusing on individual, household, and even neighborhood risk factors as absolute and independent contributors may limit our understanding of how families experience food insecurity. What if, for example, the infrastructural resources and sociodemographic characteristics of communities, which promote or hinder health, matter for food insecurity in different ways for different residents (Sharkey and Faber, 2014)?

2.1. Contextual congruence and food insecurity

In the current study, using a framework of contextual congruence, we investigate the importance of neighborhoods for household food insecurity, and suggest, as others have (Sharkey and Faber, 2014), that an investigation of neighborhood effects is incomplete without considering the dynamic nature of households and residential neighborhood characteristics in tandem. That is, we move beyond the inquiry that if context matters for food insecurity it will matter equally for all households regardless of their demographic and socioeconomic differences. Instead, we examine whether congruence across poverty, education, and race/ethnicity at the individual and neighborhood-level associates with household food insecurity risk. These indicators have specific relevance to food insecurity. At the household-level, poverty, for example, indicates material well-being, which is strongly linked to a family's ability to secure enough food (Coleman-Jensen et al., 2019). Parental education also indicates material well-being, as well as human capital and other skills, such as financial management, tied to a household's food security status (Gundersen and Ziliak, 2014). At the neighborhood-level, rates of food insecurity, as well as health risks, are unequally distributed across place according to the socioeconomic and racial-ethnic composition of residents (Gundersen et al., 2014; Lichter and Qian, 2018).

Theoretically speaking, congruence between household and neighborhood conditions may reduce risk of household food insecurity. Households that feel connected to those around them, perhaps by sharing a similar demographic or socioeconomic profile, are likely to pool resources and share information and strategies to acquire adequate food supplies (Ahluwalia et al., 1998; Stack, 1974). In contrast, neighborhoods where distrust pervades the community are places where social resources have difficulty taking hold, and neighbors may consequently keep to themselves (Rankin and Quane, 2000). Lending some support for this theory, Jackson and colleagues' recent study (2019) finds that families experiencing low social capital in their neighborhood, especially in combination with violence and perceived danger, are significantly more likely to experience food insecurity after accounting for household SES. Additionally, Denney et al. (2018) find that neighborhood socioeconomic disadvantage is linked with greater risk of food insecurity among higher-SES families but lower risk among low-SES families. The authors speculate that lower SES families in disadvantaged communities engage in more information and resource sharing which mitigates food insecurity risk. In other words, social relationships and social support which improve health (Berkman and Glass, 2000) and lower food insecurity risk (Denney et al., 2017; King, 2017) may be greater in places where congruency is higher regardless of absolute neighborhood characteristics.

To date, although not focused on food insecurity, research exists that illustrates some health benefits of living in neighborhoods where

residents share a similar demographic profile or socioeconomic status. Looking at racial and ethnic status, Pickett and Wilkinson (2008) review evidence of a race/ethnic group density effect on health and wellbeing and find that several studies have linked better mental and physical health for racial/ethnic minorities who live in places with higher percentages of their same racial/ethnic identity. Such examinations turn attention away from absolute differences to a discussion on how congruence between household and community characteristics can impact wellbeing. One study found, for example, that middle-income blacks in the New York metropolitan area chose to live in predominantly black, socioeconomically disadvantaged, communities so that they might have greater access to cultural resources and limited exposure to everyday acts of discrimination (Mullings and Wali, 2001). Similar bodies of work have documented wellbeing disadvantages for whites in predominantly non-white communities compared to whites in predominantly white communities (Pickett and Wilkinson, 2008).

These group density effects are not isolated to racial and ethnic identity. Halpern (1993) and others (Pickett and Wilkinson, 2008) discuss the relevance of other community and individual characteristics, such as social class and religion, which, when aligned, provide benefits for psychological wellbeing. In all, there is theoretical and empirical evidence that supports the idea that individuals embedded into communities with congruent characteristics may have more ready access to health promoting resources than when individuals are in communities that are different from their circumstances. Importantly, this all suggests, for example, that both poor families in more advantaged places and non-poor families in more disadvantaged places would experience deficits as both experience contextual incongruence.

On the other hand, differences among residents may promote wellbeing, the sharing of information and strategies, and thus result in lower food insecurity. In a classic urban ethnography, Jane Jacobs (1961) suggested that economic heterogeneity leads to more informal contact between residents and enhanced social cohesion. More recent research on spatial stigma reveals that disadvantages associated with residential context can accumulate with household disadvantages (Keene and Padilla, 2018). This would suggest that disadvantaged families might benefit most from locating in less disadvantaged places. Spatial stigma, however, can be embodied and carried by these families from one location to the next, thereby limiting the possible benefits that disadvantaged families in more advantaged places may experience (Keene and Padilla, 2010). In contrast, other research shows that disadvantaged families from disadvantaged and stigmatized neighborhoods can generate strong social networks, durable social ties, and enhanced social cohesion in spite of and in response to their stigmatization (August, 2014; Thomas, 2016).

3. Hypotheses

We aim to understand if household characteristics within residential context is important for household food insecurity. Thus, we address three primary hypotheses:

H1. The odds of household food insecurity will be lower with congruence between household and neighborhood poverty statuses.

H2. The odds of household food insecurity will be lower with congruence between household and neighborhood educational statuses.

H3. The odds of household food insecurity will be lower with congruence between household and neighborhood race/ethnic statuses.

Support for congruence would show that the closer aligned household characteristics are with neighborhood characteristics, the lower the odds of food insecurity. Support as it relates to race and ethnicity, for example, would show that households have lower food insecurity when they reside in neighborhoods with more co-ethnic residents than when they reside in neighborhoods with fewer residents of a similar race or ethnic status. We test these hypotheses against their alternatives; namely, household food insecurity will be lower with *incongruence* between household and neighborhood poverty, education, and race/ethnicity. Support for this alternative as it relates to poverty, for example, would show that households living in poverty have lower food insecurity when they reside in lower poverty neighborhoods than when they reside in higher poverty neighborhoods.

Finally, we lack appropriate data in the current study to properly test for issues related to how households select into or move within or between neighborhoods with more or less consistent demographic and socioeconomic characteristics to their own. However, we examine congruence across related but distinct indicators of demographic and socioeconomic characteristics and, importantly, do so for a sample of children in households with lower income levels (less than 400% of the federal poverty line [FPL]).

4. Data and method

We use restricted, geo-coded data on children and their families from the Early Childhood Longitudinal Study-Kindergarten Class of 2010–2011 (ECLS-K), linked to residential census tract estimates from the American Community Survey (ACS), 2007–2011.

The ECLS-K sample includes 17,800 children (in accordance with our restricted data agreement we round all sample sizes to the nearest 50) with valid geocodes at the spring kindergarten wave. About 29% of this sample is missing a parent interview at the spring wave, when food insecurity was collected, limiting our sample size to 12,800 children. We further restrict our sample to those with incomes below 400 percent of the FPL in 2011. This leaves a final sample of 8,600 children who live in 2,951 Census tracts. Roughly 9% of the sample represents the sole observation in their census tract and the average number of children per census tract is 2.7; as described below, we estimated single- and multilevel regression models and find no evidence this creates estimation problems (Bell et al., 2008).

4.1. Variables

Household food insecurity, a binary measure created from the USDA's 18-item food insecurity scale (Bickel et al., 2000), serves as our outcome measure. ECLS families are asked questions regarding food supplies and household resources to purchase food over the last 12 month period. We follow convention (Bickel et al., 2000) and code households where parents answered affirmatively to three or more of the 18 items as food insecure.

To isolate any associations between contextual congruence and household food insecurity, we control for relevant measures of children and their families. These include the gender of the child, age of child in months, age of mother in years, child's race/ethnicity, the family living arrangement, the number of siblings in the household, number of years lived at the current address, whether the child attends school in an urban area, parent's perception of whether their neighborhood is safe for their child to play outside, and an abbreviated version of the Center for Epidemiological Studies of Depression Scale (CES-D) indicating whether the primary caretaker is likely depressed (Radloff, 1977). Finally, we include household income in categories of less than 100% FPL (the referent), 100–199% FPL, 200–299% FPL, and 300–399% FPL.

At the neighborhood-level, we account for median monthly rent and residential stability, measured as the proportion of the neighborhood who lived in the same home one year ago. In sensitivity tests, we also accounted for the proportion of the neighborhood's residents which were children, as well as the density of food retail establishments and food pantries (using U.S. Census Bureau Business Pattern data), which did not substantively alter the findings.

To capture the association between contextual congruence and food insecurity, we take two measurement and assessment approaches. First we generate congruence measures that represent the proportion of neighborhood children who share the household's poverty status (we

replicated results with the proportion of adults in poverty and the results are nearly identical), the proportion of residents who share the level of parental education, and the proportion of residents who share the child's race/ethnicity. These measures are constructed specific to each household so that, for example, a value at or above 50 for the relative poverty measure would indicate that the majority of children in the neighborhood share the household's status (below poverty or not). The relative measures are standardized in the regression results (in Table 2) so that associations can be interpreted in standard deviation units. For example, an odds ratio less than 1.0 for co-education would mean that the odds of household food insecurity are lower for a one standard deviation increase in congruence between the child's parental education status and the neighborhood education level (measured as bachelor's degree or higher or less than a bachelor's degree). Such an approach is useful in that it allows us to assess if household food insecurity is associated with congruence between household and residential contexts. It is limited in that it does not make clear for whom the association is important.

Thus, our second strategy uses neighborhood measures of poverty, educational attainment, and race/ethnic composition and interacts them with household level measures. For poverty, we construct a dichotomous measure indicating greater than or equal to 20% of children in the neighborhood are below the poverty line (Bishaw, 2011). For educational attainment, we created empirical terciles to represent neighborhoods with low, medium, and high proportions of residents with a bachelor's degree or more. For race/ethnic composition, we capture race/ethnicity-specific terciles of co-race/ethnic composition of the neighborhood, and dichotomize the results into low (the lowest tercile) and medium/high co-race/ethnicity.

4.2. Estimation

Approximately 21% of children remaining in our analytic sample were missing data on one or more household or child level characteristics of interest, with the majority (90%) only missing on the number of years the child had lived at the current residence (because it was only collected in the fall kindergarten wave). We employ the latest techniques for multiple imputation of missing data and generate five sets of probable values for each missing value using a diverse set of predictors and Stata 14 software (Royston, 2005). Regression models on the un-imputed sample provide substantively similar results and are available upon request.

We estimated two sets of logistic regression models on the imputed data, adjusting the standard errors for clustering of children by neighborhood. We also estimated multilevel logistic models but results were substantively similar (available upon request) so we present the one-level logistic models here. In Table 2, we predict food insecurity with a robust set of control measures, and then test each contextual congruence measure (co-poverty, co-education, and co-race/ethnicity). In Table 3, we test interactions between our household and categorical neighborhood characteristics of interest to better understand associations between contextual congruence and household food insecurity. We present odds ratios (OR) for all regression results in the tables. Finally, we generate fully adjusted predicted probabilities with pairwise comparisons to illuminate the interaction results and present those in Figs. 1–3.

5. Results

Table 1 provides weighted proportions and means for household food insecurity and for the individual/family and neighborhood characteristics for the full sample and separately for children in food secure and insecure households. Table 1 shows that food insecurity for households with young children varies considerably by child and family characteristics consistent with large bodies of work in these areas (Gundersen and Ziliak, 2018). Thus, we focus our discussion here on Panel B.

Table 1
Means and proportions, ECLS-K: 2010–2011, families below 400% FPL.

	Panel A. Individual and Family Characteristics n = 8600		
	Full Sample	**Food secure**	**Food insecure**[a]
Food insecure	.16		
Household Income			
Less than 100% FPL	0.34	0.29	0.59***
100–199% FPL	0.28	0.27	0.29+
200–299% FPL	0.20	0.22	0.08***
300–399% FPL	0.19	0.22	0.04
Child is male	0.52	0.52	0.53
Child's age in months	74.41	74.69	74.79
Foreign-born parent	0.28	0.25	0.40***
Child Race/Ethnicity			
Non-Hispanic white	0.53	0.56	0.38***
Non-Hispanic black	0.15	0.14	0.17**
Hispanic	0.32	0.29	0.45***
Mother's age in years	33.49	33.55	33.20+
Family Structure			
Two-parent family	0.65	0.66	0.57***
Single mother family	0.25	0.23	0.33***
Other family type	0.10	0.10	0.10
Parent has a college degree	0.29	0.32	0.13***
Number of siblings in household	1.54	1.50	1.76***
Years lived in home	3.91	3.97	3.64***
Primary caregiver likely depressed	0.10	0.07	0.24***
Neighborhood is safe for child to play outside	0.66	0.70	0.46***
Child's school in urban area	0.75	0.73	0.81***
	Panel B. Neighborhood Characteristics n = 2951		
	Full Sample	**Food secure**	**Food insecure**[a]
Neighborhood Congruence Measures			
% co-poor	64.6	67.5	50.0***
% co-education	65.9	64.4	73.8***
% co-race/ethnic	64.1	65.2	58.4***
Median rent (in dollars)	923.57	927.69	902.30*
Residential stability	84.97	85.28	83.35***
Neighborhood Census Measures, Categories			
High child poverty (>20%)	0.43	0.41	0.55***
Education terciles			
Lowest tercile (0–15% with a BA)	0.39	0.37	0.47***
Middle tercile (15–30%)	0.37	0.37	0.36
High (30%+)	0.25	0.26	0.17***
Low co-race/ethnicity (lowest tercile, child specific)	0.19	0.18	0.20

***p < 0.001 **p < 0.01 * p< 0.05 +p < 0.10.
Source: ECLS-K: 2010–2011 (N = 8600 in 2951 neighborhoods); 2007–2010 ACS data at the tract level
[a] p-value for a bivariate logistic regression predicting food insecurity; by column (i.e. food secure vs. food insecure).

Panel B of Table 1 provides information on the neighborhood characteristics for children in food secure and insecure households. Turning first to the neighborhood congruence measures, which for ease of interpretation are presented here as the percentage of residents in the neighborhood who share the characteristic, we see that on average, children live in neighborhoods where 64% of residents share household and neighborhood poverty status, measured simply as poor or not poor. Food insecure children, however, on average live in neighborhoods where 50% of residents share their poverty status, while food secure children on average live in neighborhoods with much higher congruence (67.5%). The high poverty measure further shows that 55% of the food insecure sample resides in the poorest neighborhoods while 41% of the food secure households reside in high poverty neighborhoods. The relative education measure shows a different story. That is, food insecure children live in neighborhoods where, on average, 73.8% of residents share their parents' highest educational attainment, while food

secure children live in neighborhoods with greater educational heterogeneity (64.4% congruence). But in terms of absolute differences, food insecurity by neighborhood education is distributed similarly to neighborhood poverty; a smaller proportion of children in food insecure households live in neighborhoods with a high proportion of residents with a bachelor's degree or more. For race/ethnicity, on average, the children live in neighborhoods where 64.1% of residents share their own race/ethnicity. This proportion is lower for food insecure children (58.4%) than for food secure children (65.2%). When categorized as "low co-race/ethnicity," however, we do not see significant differences by food security.

Table 2 provides odds ratios from logistic regressions with clustered standard errors predicting household food insecurity using the co-poverty, co-education, and co-race/ethnicity standardized measures. Model 1 includes the household and child-level characteristics. Among this <400% FPL sample, the adjusted odds of household food insecurity are lower the further away the household is from the FPL.

The control measures in Model 1 of Table 2 associate with food security in well-established ways (see Gundersen and Ziliak, 2018). Model 2 shows that the association of living in a neighborhood that shares household and neighborhood poverty status is below 1.0 ($p \leq 0.10$). Model 3 suggests that, when household and neighborhood educational attainment align, the odds of household food insecurity are, again, lower ($p \leq 0.10$). Finally, Model 4 shows the odds ratio for co-race/ethnicity is also below 1.0, but the adjusted association is not statistically significant. These models begin to assess the adjusted association between contextual congruence and food insecurity, but they cannot reveal for whom congruence may matter most.

Table 3 takes a different approach by considering whether the association between contextual congruence and food insecurity differs for higher and lower-SES families, and by race/ethnicity. For parsimony, we present just the main effects and interactions for our variables of interest, but the results are net of all control variables included in Table 2. First, Panel A displays results for household and high neighborhood poverty. Model 1a shows that among this lower to moderate income sample, after adjusting for relevant household and child-level covariates, living in a high poverty neighborhood is not associated with the odds of household food insecurity. Model 1b, however, investigates not if neighborhood poverty is related to food insecurity but for whom it is most relevant. The interaction results in Model 1b suggest, relative to families living below poverty, the odds of food insecurity for children in households that are 200–299% FPL are impacted to a greater degree ($p \leq 0.05$) by living in high poverty neighborhoods; neighborhoods that are largely incongruent with their household poverty status.

In Fig. 1, we plot the predicted probabilities generated from the estimates in Table 3, Model 1b. In all, Fig. 1 shows little support for an association between contextual congruence and food insecurity in terms of poverty. The likelihood of food insecurity is much higher for children in families living below and near poverty than for children in families further away from the poverty line. But looking within family types who live in low and high poverty neighborhoods, however, shows no significant differences. The predicted probability of food insecurity for children in families 200–299% of the FPL and living in high poverty neighborhoods (0.097) is marginally higher than similar children living in low poverty neighborhoods (0.073) but that difference does not reach significance. Similarly, the predicted probability for children living below poverty is higher when their household is located in a low poverty (0.26) versus a high poverty (0.23) neighborhood but the difference does not reach significance.

Returning to Table 3, Model 2a of Panel B shows that the adjusted association between neighborhood education and household food insecurity does not reach statistical significance. Model 2b, once again, aims to examine for whom neighborhood educational attainment might matter most. The interaction terms, along with the direct effects, suggest that the associations of neighborhood education are dependent upon parental education in the household. The significant interaction shows that the protective association of living in a high education neighborhood is shaped by whether children live in families where at least one parent has a college education.

Fig. 2 shows that food insecurity is less likely for children in more highly educated households when they live in more highly educated neighborhoods compared to when they live in less highly educated neighborhoods. Specifically, for children with at least one parent with a bachelor's degree, their lowest likelihood of food insecurity (0.11) is in high education neighborhoods and their highest likelihood of food insecurity (0.16) is in low education neighborhoods. Further, in high education neighborhoods, the difference between children in families with (0.11) and without (0.18) a college educated parent is significant.

Next we turn to Panel C in Table 3, which presents results testing whether the influence of living in a low co-race/ethnicity neighborhood on food insecurity varies by race/ethnicity. In Model 3a, the low co-race/ethnicity variable is positive (OR = 1.12) but does not reach statistical significance. In Model 3b, however, we again see some evidence that contextual congruence matters for predicting food insecurity, specifically for non-Hispanic blacks. The interaction for non-Hispanic blacks suggests that living in a neighborhood with fewer residents identifying as black is associated with disproportionately higher odds of food insecurity (OR = 2.00, $p \leq 0.01$). There is no significant interaction for Hispanics, meaning the odds of food insecurity for Hispanics is not different whether there are small or large proportions of Hispanics living in the neighborhood. These results are depicted in Fig. 3. The likelihood of food insecurity for whites and Hispanics are not statistically significantly different when they live in low co-ethnic or mid to high co-ethnic neighborhoods. But the probability of food insecurity for blacks in low co-ethnic neighborhoods (0.20) is significantly higher than the probability of food insecurity when blacks live in mid to high co-ethnic neighborhoods (0.13).

Table 2
Logistic regressions predicting food insecurity among families below 400% of the FPL (odds ratios), ECLS-K: 2010-2011 (N = 8600).

	Model 1	Model 2	Model 3	Model 4
Household Income				
Less than 100% FPL (ref)	1.00	1.00	1.00	1.00
100–199% FPL	0.63***	0.62***	0.62***	0.63***
200–299% FPL	0.26***	0.26***	0.26***	0.26***
300–399% FPL	0.15***	0.15***	0.15***	0.15***
Child is male	1.04	1.04	1.04	1.04
Child's age in months	1.01	1.01	1.01	1.01
Foreign-born parent	1.30**	1.30**	1.30**	1.31**
Child Race/Ethnicity				
Non-Hispanic white (ref)	1.00	1.00	1.00	1.00
Non-Hispanic black	0.75**	0.75**	0.76**	0.76**
Hispanic	0.86+	0.85+	0.88	0.87
Mother's age in years	1.02***	1.02***	1.02***	1.02***
Family Structure				
Two-parent family (ref)	1.00	1.00	1.00	1.00
Single mother family	1.09	1.09	1.09	1.10
Other family type	0.76*	0.75*	0.76*	0.76*
Parent has a college degree	0.72**	0.72**	0.71***	0.72**
Number of siblings in household	1.09**	1.09***	1.09***	1.09**
Years lived in home	0.96*	0.96*	0.97*	0.97*
Primary caregiver likely depressed	3.08***	3.08***	3.08***	3.08***
Neighborhood is safe for child to play outside	0.58***	0.58***	0.58***	0.58***
Child's school in urban area	1.07	1.08	1.07	1.07
Neighborhood Controls				
Median monthly rent (in dollars)	1.00	1.00	1.00	1.00
Residential stability	0.99*	0.99*	0.99*	0.99+
Neighborhood Congruence Measures				
% co-poor		0.95+		
% co-education			0.93+	
% co-race/ethnic				0.96
Constant	0.19**	0.19**	0.19**	0.18**

Source: ECLS-K: 2010–2011 (N = 8600 in 2951 neighborhoods); 2007–2010 ACS data at the tract level; ***p ≤ 0.001 **p ≤ 0.01 * p≤ 0.05 + p≤ 0.1

Table 3
Logistic regression interaction models predicting food insecurity among families below 400% of the FPL, ECLS-K: 2010-2011 (N = 8600).

Panel A: Child and Neighborhood Poverty			Panel B: Parental and Neighborhood Education			Panel C: Child and Neighborhood Race/Ethnicity		
	Model 1a	Model 1b		Model 2a	Model 2b		Model 3a	Model 3b
<100% FPL (ref)	1.00	1.00	Parent BA or higher	0.72**	0.94	Non-Hispanic white (ref)	1.00	1.00
100–199% FPL	0.63***	0.56***	Lowest Education tercile (neighborhood; ref)	1.00	1.00	Non-Hispanic black	0.76**	0.64**
200–299% FPL	0.26***	0.22***	Middle tercile	1.08	1.09	Hispanic	0.87	0.81*
300–399% FPL	0.15***	0.14***	Highest tercile	1.04	1.17	Low co-race/ethnicity (neighborhood)	1.12	0.92
High child poverty (neighborhood)	0.96	0.86	BA or higher X mid education		0.83	Non-Hispanic black X Low co-race/ethnicity		2.00**
100–199% FPL X high child poverty		1.21	BA or higher X high education		0.54**	Hispanic X Low co-race/ethnicity		1.23
200–299% FPL X high child poverty		1.58*						
300–399% FPL X high child poverty		1.20						

Source: ECLS-K: 2010–2011 (N = 8600 in 2951 neighborhoods); 2007–2010 ACS data at the tract level; models also include all control variables in Table 2
*** ≤ 0.001 ** ≤ 0.01 * ≤ 0.05 + ≤ 0.1.

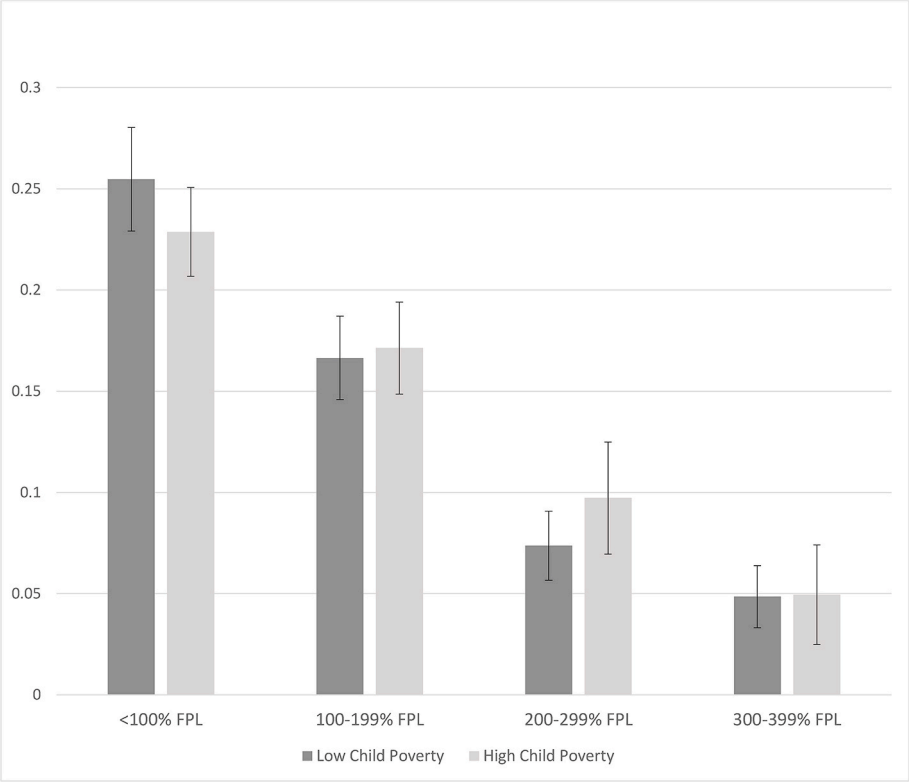

Fig. 1. Predicted probability of household food insecurity by household and residential neighborhood poverty status.

6. Discussion/conclusion

In the current study, we argue that empirical investigation into the congruence between individual and neighborhood-level characteristics provides a more holistic understanding of how neighborhood context impacts family and child well-being, specifically, the conditions that increase (or decrease) vulnerability to food insecurity. In doing so, our study establishes directions for future research on neighborhood health effects and identifies areas of prevention and intervention for addressing food insecurity among families.

Though an ample body of research documents the importance of neighborhood factors for children's healthy development, researchers often treat neighborhoods as monolithic, with a uniform impact on every resident, when in reality, the same neighborhood may impact residents differently depending on their individual or family characteristics (Sharkey and Faber, 2014). Household food insecurity, an outcome that has recently received attention in neighborhood studies (Brisson, 2012; Denney et al., 2018; Jackson et al., 2019; King, 2017), is theoretically linked to the physical and social resources available or not available in communities. However, a fuller understanding of how neighborhoods matter for food insecurity may lie in our understanding of how family characteristics align or diverge from the broader community in which they reside. To address this gap in the literature on neighborhood health effects, as well as food insecurity research, we use a framework of contextual congruence to investigate the degree to which individual and neighborhood-level alignment (or divergence)

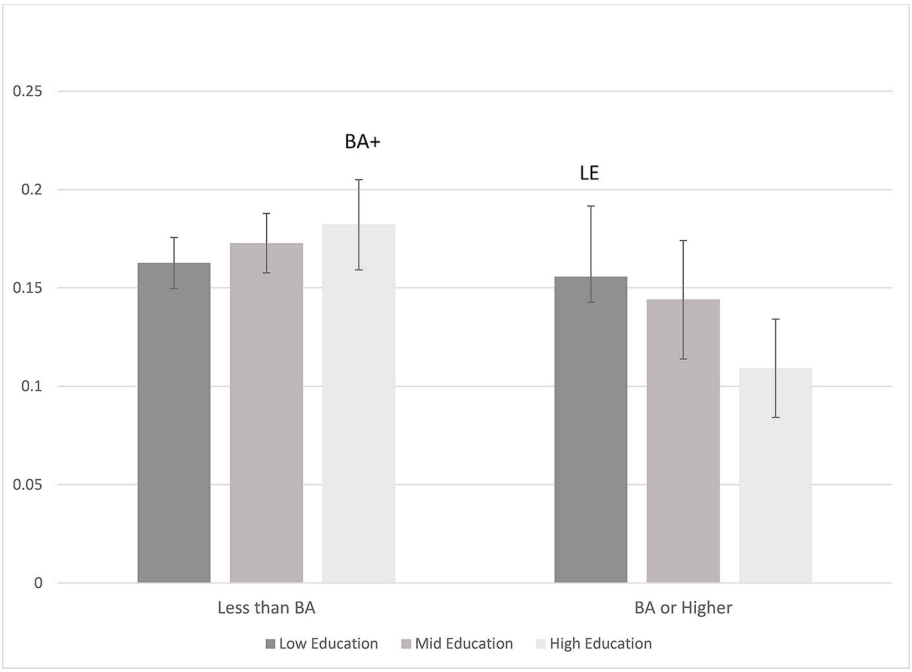

Fig. 2. Predicted Probability of Household Food Insecurity by Parental and Residential Neighborhood Educational Attainment. Notes: LE = significant difference ($p < 0.05$) for low versus high education neighborhoods for children in families with a BA or higher educated parent; BA+ = significant difference ($p < 0.05$) for less than BA and BA+ in high education neighborhoods.

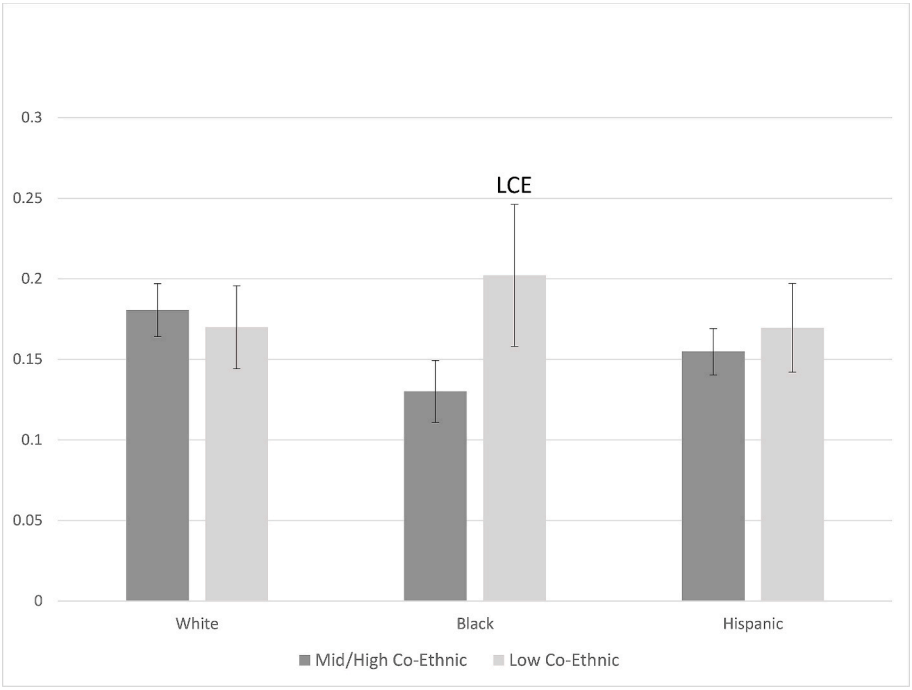

Fig. 3. Predicted Probability of Household Food Insecurity by Child's Race/Ethnicity and Residential Neighborhood's Proportion of Co-Race/Ethnicity. Notes: **LCE** = significant difference ($p \leq 0.05$) between high/mid and low co-ethnic neighborhoods for Blacks.

across poverty, education and race/ethnicity associates with household food insecurity risk.

We found evidence that contextual congruence is related to the odds a household with young children experiences food insecurity. Upon closer inspection, this was most evident in two ways. First, among this low to moderate income sample, more highly educated families experienced lowest risk of food insecurity in the most highly educated neighborhoods. At the same time, less educated families in those same neighborhoods experienced significantly higher risk of food insecurity compared to their more highly educated neighbors. The tangible benefits when the socioeconomic characteristics of families more closely align with their community— providing possibly enhanced access to social capital, social support, and social ties that can be used to avoid food insecurity—may be limited to certain kinds of families in certain kinds of places. Indeed, the probability of food insecurity between low and high educated families in other kinds of neighborhoods were not

significantly different. More troubling, this reveals that lower educated families receive little to no benefit, in terms of food security, when they reside in more advantaged communities. In other words, this suggests those who are in strongest need of assistance may not receive it.

Second, we report on the association of contextual congruence with regard to race and ethnicity. Specifically, we find that, for non-Hispanic black children, the odds their household experiences food insecurity are significantly lower when the family resides in a neighborhood with high proportions of blacks compared to when the family resides in a neighborhood with lower proportions of blacks. This aligns with and adds to health research that has linked better mental and physical health for racial/ethnic minorities who live in places with higher percentages of their same racial/ethnic identity (Pickett and Wilkinson, 2008), though it is unclear why a similar relationship is not present for households with Hispanic children residing in neighborhoods with a higher proportion of Hispanic residents. Future research should expand on the underlying reasons why this ethnic density effect (Pickett and Wilkinson, 2008) for food security may be specific to non-Hispanic blacks.

On the one hand, the forms of contextual congruence we have identified may be a reflection of greater connectedness to others and integration into communities of others experiencing similar circumstances (Bourdieu, 1984; Durkheim, [1897] 1951). This results in social networks that, in the case of food security in households with young children, can be relied upon to acquire and share resources necessary to adequately feed a household. Food insecurity is a fluid condition, with families transitioning in and out of states of food security (Nord et al., 2010). If families impacted by food insecurity are surrounded by other families that can connect socially and culturally, they may have unique access to enhanced informal support and resources from the local community (Denney et al., 2017). On the other hand, these tangible benefits from shared status and identity may only reveal themselves for some families in some places.

Better understanding the conditions when contextual congruence relates to improved outcomes is important for another reason. In our study, we found that the likelihood of food insecurity for poor families is the same in high and low poverty communities. This suggests that poor families receive few benefits in terms of food security when they reside in low poverty neighborhoods. In some ways we might predict that the odds of food insecurity would be much higher for poor families in poor places. However, similar to research on spatial stigma (August, 2014; Thomas, 2016), poor residents in high poverty neighborhoods may develop strategies to deal with food insecurity similar to how they navigate other challenges. Indeed, a recent qualitative study of low-income caregivers of young children identified several innovative strategies that are used to alleviate and prevent food shortages, including reliance on social networks and information sharing (Jarrett et al., 2014).

We might also reasonably assume that the probability of food insecurity would be lower for poor families in more advantaged neighborhoods. We find no evidence of that here and it provides limited support for a by-product of spatial stigma, whereby disadvantaged families carry associated negative effects with them when they move to more advantaged places (Keene and Padilla, 2010), thereby limiting the benefits they might receive from improving neighborhood conditions. In other words, disadvantaged families may experience barriers to accessing helpful resources in higher-income neighborhoods. Examining food insecurity in the way we have highlights the important times in which congruence might matter, but also the importance of families in need not receiving benefits by living in more socioeconomically advantaged places. This further suggests that community-based efforts to combat food insecurity should not be limited to disadvantaged communities but also consider at-risk families residing in more advantaged neighborhoods.

We faced several limitations in the current study. First, we lack complete information on the residential history of families. We try to minimize the possible impact of this omission by including a measure of the duration that the child has lived at the current residence. This is a particularly important limitation with regard to understanding the best ways to address neighborhood disadvantage and the well-being of children. Indeed, Chetty et al. (2016) have reported important results from the Moving to Opportunity study that indicate positive effects for children when moving from disadvantaged to more advantaged places. These are pronounced when the move occurs when children are younger, such as the sample of children in the ECLS-K used in the current study. For our study, this also suggests that any possible benefits of contextual incongruence for household food security status, especially for disadvantaged families, might require a longer period of time than the current study considers.

Second, though a major strength of our study is identifying where food insecurity occurs and for which families, assessing the mechanisms related to congruence and food insecurity is beyond the scope of the current analysis. We hypothesize that contextual congruence reflects stronger social networks and enhanced access to various forms of social capital, which in turn, reduce food insecurity risk (Denney et al., 2017; Garasky et al., 2006; King, 2017; Martin et al., 2004). Yet, we have no measures of social cohesion, social ties, or social participation in the neighborhood of residence, with the exceptions of our measure of whether the parent believes it is safe for the child to play outside and our neighborhood residential stability measure. More research examining the potential mechanisms, such as social capital, linking congruence and food insecurity is needed to better understand why congruence impacts food insecurity risk for some families and not others. Third, our focus and analyses are centered on the neighborhood of residence and this leaves out sources of support and integration that can come from friends and family outside one's residential space. Fourth, although food insecurity is a fluid condition for many American families (Nord et al., 2010), the current study is cross-sectional and is unable to assess the relationship between contextual congruence and fluctuations in food insecurity.

The United States is one of the wealthiest nations in the world, and a nation with large disparities in child health, development, and achievement. Accurate identification of where families with young children facing food insecurity are located is, thus, imperative to generating effective solutions to combat a problem contributing to long-term deficits in health and wellbeing. Our results suggest that we must consider not just the absolute characteristics of households or neighborhoods, but rather the degree to which those characteristics align or diverge. Doing so will help us identify families in need and help us understand how residential context impacts the wellbeing of children.

Credit author statement

Denney devised the study, wrote and revised the text, managed the analysis and interpreted findings. Brewer wrote and revised the text and interpreted findings. Kimbro conducted the analysis, interpreted findings, and helped draft text.

Acknowledgment

The first author acknowledges support from the Young Scholars Program of the Foundation for Child Development (FCD) (Grant No. YSP Rice 10-2014).

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