Household Food Insecurity and Young Immigrant Children's Health and Development Outcomes *

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1. Background and Motivation

In United States, 17.5 million households experienced food insecurity, including 15.8 million children (Coleman-Jensen, Nord, and Andrew 2014:10). Children of immigrants, the fastest growing segment of population growth in America (Hernandez, Denton, and Macartney 2008), are particularly vulnerable to food insecurity (Quandt 2006). While a growing body of literature has documented the negative effects of food insecurity on children's wellbeing, little is known about how children of immigrants, particularly those of very young age, are faring in terms of their health and development in comparison to children of native born parents in the context of food insecurity.

It is well documented that the experience of food insecurity has a wide range of deleterious effects on children's physical and mental health, and it poses numerous risks to behavioral outcomes and cognitive development (e.g. Connell et al. 2005; Cook et al. 2013). But the majority of studies to date have not taken the nativity status of parents into account. It is plausible that the epidemiology and adverse outcomes associated with food insecurity is particularly more profound for children of immigrants than their counterparts with native-born parent(s), given that immigrant families face additional constraints and disadvantages (e.g., limited English proficiency and low family income) that could place their children at greater risk of developmental disadvantage. Identifying the developmental consequences of a particular material hardship—food insecurity—of children from immigrant families will advance our understanding of the role family socioeconomic resources plays on child development among immigrant families.

In this project, we will address the gap in existing research by focusing on household food insecurity and its association with children's development and health outcome at the age of 48-month. We plan to investigate whether and how household food insecurity experiences are associated with differential development outcomes at early childhood for both groups of children by looking at three domains of child development, including cognitive development (reading and math skills, physical (parent-reported child health status), and socio-emotional/behavioral outcomes (positive behavior index).

2. Theoretical Framework

- **Direct pathway**

Early childhood is a critical developmental time and the rapid physical growth and brain development demand high and sufficient nutritional intake; as a result, nutritional deficiencies can be particularly detrimental during this period. Casey and colleagues (2005) and Cook et al. (2004) examined the health consequences of food insecurity for infants and toddlers. Both studies found that for infants and toddlers (i.e., 0-36 months old) the exposure to food insecurity was linked to higher odds of fair/poor health status and of hospitalizations in comparison to those without the exposure.

In regards to development outcomes, evidence suggests that early nutritional deprivation can permanently hamper cognitive development (e.g., McCann and Ames 2007), and increases risks for behavioral and emotional problems (Lozoff et al. 2000; Georgieff 2007). Since biological processes of nutritional deficiency are assumed to work similarly for immigrants and non-immigrant children, we expect that food insecurity is directly associated with reported health status and less desired cognitive and behavioral outcomes, and the association is similar between children of immigrants and children of natives.

- **Indirect pathways**

Previous research had raised the possibility that the link between food security and children's development may be mediated by other variables, particularly family socioeconomic status and maternal characteristics. We expect that the indirect pathways can operate differently for children from immigrant and non-immigrant families. First, conventional socioeconomic indicators such as educational level and occupational skills may not have the same meaning for immigrant families as they do for American-born families for various reasons (e.g., immigration policy, social and cultural capital accumulation process). As a result, the implications of these indicators may differ for immigrant children and their development in the context of food insecurity in comparison to non-immigrant children. Second, strong evidence suggests that mothers in food insecure households have elevated depressive symptoms which has been found to be associated with multiple aspects of mother-child interactions which, in turn, influence children's cognitive and behavioral outcomes. However, it is necessary to consider the maternal depression pathway in light of nativity status and the psychological consequences attached to it. Immigrant families have made a transition to a new society that requires extensive adaptation and they face a myriad of challenges during this process (Fuligni 1998; Hernandez & Charney 1998). Less acculturated immigrant parents—those who have limited English proficiency, noncitizens, or have more recently arrived in the United States—can face additional disadvantages and constraints in work and welfare benefits. These disadvantages and challenges, in turn, could raise the risk of food insecurity and depression, which in turn, exacerbate the negative effects on children's wellbeing. Therefore, we hypothesize that food insecurity is negatively and indirectly associated with child health, cognitive and behavioral outcomes during early childhood. Specifically, these associations will operate in part through socioeconomic characteristics and maternal depression. We further hypothesize that the indirect negative effect is stronger for children of immigrants than children of natives; focusing on children of immigrants alone, the indirect negative association will be stronger for children born to less acculturated parents than children born to more established immigrant parents.

3. Data and Methods

- **Data**

Data from the Early Childhood Longitudinal Study-Birth Cohort (ECSL-B) are used to carry out the study. The ECLS-B is appropriate for this project because it not only has rich information about children, family's characteristics, and parental nativity status, it also assesses children's multiple developmental domains, such as cognitive, behavioral, and physical development. This longitudinal dataset is collected at five points of time: 9-month after birth, 24-month, 48-month, entrance to kindergarten, and the first grade. Specific to this project, we used data from the base year (9-month wave, as children was approximately 9 months of age at the time of assessment) and the third wave (48-month wave when children were approximately 4 years old at the time of assessment). Most covariate variables, food insecurity and outcome measurements are from the 48-month wave. The focus on the outcomes at 48-months is based on two considerations. First, 48-month wave is the first time that ECLS-B conducted reading and math assessments with Item Response Theory (IRT) score. Second, 48-month is a period before children transitioning into formal schooling. Given the critical role that school readiness and early learning capacity play in creating long-term educational disparities in later years (Entwisle, Alexander,

and Olson 2005), understanding the disparities in development of this age group as a consequence of food insecurity is significant as it provides insights that a very early disadvantage among children of immigrants may posit them at a lagged start as they move through the formal educational system.

- **Measurement**

Outcome Variables*:* we used three indicators to capture child development outcomes at 48-month old, including parent-rated child health status (1=very good health; 0=good health or less), positive behavior index (range: 1-5), reading and math assessment scores (IRT scores).
Key predictors: immigration status of parent(s) and household food security status are the key predicators. Nativity status of parents is based on their place of birth (i.e., within or outside United States). Children of immigrants were defined as children with foreign-born parent(s). Household food security was measured at 48-month using the U.S. Department of Agriculture's Food Security Scale (Bickel et al. 2000). A dichotomous measure was used where food insecure (with and without hunger) equals 1 and food secure equals 0. We also constructed two dichotomous measures to capture child food security and adult food security following the standard guidelines (Bickel et al. 2000, Nord & Bickel 2002) for sensitivity analysis.
Mediator*:* Maternal depression—we use the abbreviated version of the widely used Center for Epidemiologic Studies Depression Scale (CES-D) to assess parental depressive symptoms (Radloff 1977). Family SES—it is a composite measure constructed by NCES that includes family income, occupation, and education.

- **Methods**

In this study, we use Ordinary Least Squares (OLS) regression models (linear probability for dichotomous variables) to predict four measures the four measures of child development noted. We first construct four group indicators based on nativity status of parent and household food security status, namely, a)food secure non-immigrant household (reference group), b)food secure immigrant household, c)food insecure non-immigrant household, and d)food insecure immigrant household. We then run a series of baseline models to examine the associations between household food security status and each of these outcome measures. Next, we include a series of addictive models by entering demographic controls, family SES and family structure, and acculturative indicators in a stepwise fashion. We examine whether the association between food insecurity and the outcome measures change in magnitude and significance level across four groups. Finally, we estimate the potential moderating effects of acculturation on the association between food insecurity and child development by restricting the sample to children of immigrants only. We also assess the mechanisms that link food insecurity to child development, particularly the mediating role of maternal depression.

4. Preliminary Results

Table 1 presents weighted descriptive statistics for children of immigrants and non-immigrants at 48-month by household food security status. Table 2 shows weighted developmental outcomes of children of immigrants and children of natives at 48-month wave by household food secure status. Collectively, these two tables suggest that there are large variations in food security status and child development outcomes between children of immigrants and children of natives. Specifically, results from Table 2 show that overall pattern between household food insecurity and all domains of development outcome are negative, providing suggestive evidence for the direct pathway hypothesis. Further, among food insecurity household, immigrant children are more disadvantaged in reading and very good health status relative to non-immigrant children. For example, the average percentage of reporting very good health for immigrant children in food insecure household is 20 percentage points lower than their non-immigrant counterparts. These disparities indicate that although food insecurity is negatively associated with child development outcomes, the negative influence seems more severe for children of immigrants. Table 3 provides some preliminary results from the regression models

predicting child development outcomes for four groups based on household's food security and immigration status. Results from the base models show a consistent pattern that household food insecurity is negatively associated with all domains of child development but that the magnitude of the association differs across nativity status of parent(s). For example, being in food insecure household is associated with ten percentage point decrease in the probability of reporting very good health status for non-immigrant children relative to non-immigrant children. For immigrant children the consequences are more severe—a twenty-five percentage point reduction. Turning to the full models that accounted for a wide range of socioeconomic characteristics and acculturative indicators, the picture is more mixed. Although the association between food insecurity and parent-reported health status remains negative and statistically significant for immigrant children, the association with behavioral outcome becomes positive for immigrant food insecure group (though not statistically significant). In addition, the associations between food insecurity and cognitive development (i.e., reading and math scores) for immigrants become small in magnitudes and non-significance, providing a weak evidence of the differential influence of food insecurity on cognitive development between immigrant- and non-immigrant children. These mixed results across different development domains provide a plausible support for the differential indirect pathway hypothesis mentioned above, but it seems the operation of indirect pathways is sensitive to the kind of outcome under examination. These seemingly contradictory results suggest that different processes/mechanisms may take place in the link between food insecurity and child development between children of immigrants and children of natives for different development outcomes. In all, these preliminary results provide a strong justification for further more detailed analysis.

5. Development of the Paper for PAA Conference

As far as our next steps, we plan to explicitly examine the SES and maternal depression pathways through which food insecurity influences child development outcomes, and to disentangle how these pathways differ for children of immigrants and children of natives. We are also interested in examining whether the association between food insecurity and child development differs for less and more acculturated immigrant families as measured by citizenship and time in the US. Given the growing interests in studying immigrant children's health and their social determinants, our study of the relationship between household food insecurity and child development outcome in the light of parental immigration status will contribute to the general understanding of this area, and will be of interests to a broad audience.

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Table 1: Weighted Characteristics of Children of Immigrants and Children of Natives at 48-month Wave, 2005-2006, ECSLB-B Data

	Children of Natives		**Children of Immigrants**	
	Food Secure (a)	**Food Insecure (b)**	**Food Secure (c)**	**Food Insecure (d)**
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Children's age in month	52.22	52.39	53.13	53.57
	(4.05)	(3.99)	(4.36)	(4.31)
White	0.67	0.44	0.13	0.04
	(.47)	(.50)	(.34)	(.20)
Black	0.14	0.30	0.07	0.09
	(.34)	(.46)	(.25)	(.28)
Hispanic	0.14	0.17	0.65	0.82
	(.35)	(.38)	(.48)	(.38)
Asian	0.01	0.01	0.13	0.04
	(.07)	(.07)	(.34)	(.20)
Other	0.05	0.08	0.02	0.01
	(.21)	(.28)	(.15)	(.11)
Child female	0.49	0.47	0.48	0.47
	(.50)	(.50)	(.50)	(.50)
Maternal Age	32.41	29.48	32.68	31.55
	(6.84)	(6.39)	(5.96)	(6.00)
Household SES	0.10	-0.68	-0.26	-0.97
	(.77)	(.57)	(.82)	(.54)
Household Size	4.45	4.52	4.80	5.25
	(1.30)	(1.62)	(1.44)	(1.90)
Biological-Parent(s) family	0.72	0.39	0.86	0.70
	(.45)	(.49)	(.35)	(.46)
Step-parent(s) family	0.06	0.10	0.02	0.06
	(.24)	(.30)	(.14)	(.24)
Single and other family	0.22	0.51	0.12	0.24
	(.41)	(.50)	(.33)	(.43)
Home language not English	0.03	0.04	0.79	0.88
	(.18)	(.19)	(.41)	(.32)
Years Spent in U.S.	32.30	29.42	14.16	11.55
	(7.01)	(6.47)	(8.06)	(6.54)
Citizenship Status	1.00	1.00	0.29	0.14
	(.00)	(.00)	(.45)	(.34)
Food stamp receipt	0.22	0.67	0.14	0.41
	(.42)	(.47)	(.34)	(.49)
Other public assistance receipt	0.38	0.84	0.53	0.86
	(.49)	(.37)	(.50)	(.35)
Received day-care	0.83	0.73	0.75	0.65
	(.38)	(.45)	(.44)	(.48)
Maternal Depression	0.21	0.53	0.25	0.44
	(.41)	(.50)	(.43)	(.50)
N^2=	5900	800	200	250

Notes: [1] indicates statistical differences (p<.05) between the respective groups; [2] N's are rounded to the nearest 50 as required by NCES.

Table 2: Weighted Developmental Outcomes of Children of Immigrants and Children of Natives at 48-month Wave, 2005-06 ECLS-B Data

	Math Test Score			Reading Test Score			Very Good Health			Behavioral Outcomes		
	Mean	(SD)	N[1]	Mean	(SD)	N[1]	Mean	(SD)	N[1]	Mean	(SD)	N[1]
US-born												
(a) Food secure	30.04	(9.43)	5700	26.04	(10.07)	5700	0.90	(.30)	600	3.74	(.69)	5100
(b) Food insecure	24.95	(8.46)	800	21.36	(7.94)	800	0.80	(.40)	900	3.48	(.72)	700
Foreign-born												
(c) Food secure	29.08	(10.06)	1600	24.11	(10.78)	1600	0.80	(.40)	1800	3.61	(.72)	1400
(d) Food insecure	25.45	(8.89)	200	19.92	(7.15)	200	0.61	(.49)	200	3.63	(.78)	200
				a>b,c			a>c,d			a>b,c		
Difference[2]	b<c			b<c			b,c>d			b<c		

[1] N's rounded to the nearest 50 as required by NCES

[2] indicate statistical differences (p<.05) between the respective groups.

Table 3: Linear Probability Models Predicting Parent-Reported Health Status, Reading and Math Scores, and Behavioral Outcomes at 48-month Wave (2005-2006), ECLS-B Data.*

	Very Good Health		Reading		Math		Behavior	
	Base Model[1] (BM)	Full Model[2] (FM)	BM	FM	BM	FM	BM	FM
US-Born Food Insecure	-0.10*	-0.06**	-4.66**	-0.39	-5.14*	-1.09	-0.26*	-0.14*
Foreign-Born Food Secure	-0.06†	-0.01	-1.32	-0.01	-0.50	-0.18	-0.05	-0.00
Foreign-Born Food Insecure	-0.25***	-0.16*	-5.20	-0.07	-4.25	-0.34	-0.02	0.11

[1] Base Model includes basic demographic variables, including children's age and sex, and race/ethnicity (Hispanic, Asian, and White is the reference group.)

[2] Full model includes additional variables, including maternal age, household socioeconomic status, household size, household type (i.e., biological, step, or single-parent household), home language is not English, years in the United States, and citizenship status.