

Household Financial, Time, and Environmental Constraints and Low Food Security among Children

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Research Objectives

To better understand the circumstances of families experiencing **low** and **very low food security** among children:

1. How do **food prices** affect low and very low food security among children?
2. What is the importance of **local food environment** for children's food insecurity?
3. Which **demographic** and **socioeconomic** characteristics exacerbate or alleviate food insecurity?

Measurement and Motivation

Food security: consistent access to adequate food for active healthy living

Measurement: children's food security status is determined via responses by adult proxy to **8 child-specific questions** in 18-item Household Food Security Survey Module in FSS of CPS

Four categories: (1) high/marginal, (2) marginal, (3) low, and (4) very low—food security among children

Public policy interest: food insecurity has been linked to negative outcomes in children's physical, intellectual, and social development (NRC, 2006; Gundersen et al., 2011)

Contribution

Conceptualize food security as a “**commodity**” produced by the household

Develop an economic model of food insecurity, based on the conventional **household production framework** (Becker, 1965; Pollak and Wachter, 1975)

Assemble a large dataset of households with children, by **matching data** across several large-scale, national surveys

Estimate empirical model of food insecurity for all households; *in addition*, perform a more focused analysis of **very low food security**

Economic Model: Notation

- Household production setting
 - Inputs: market goods and time
 - Outputs: commodities, including children's food security
- Notation:
 - $m \geq 1$ different commodities: $Z = (z_1, \dots, z_m)'$
 - z_1 : children's food security; $\tilde{z}_1 = -z_1$: children's food insecurity
 - $l \geq 1$ different market goods: $Y = (y_1, \dots, y_l)'$
 - $k \geq 1$ different time-use activities: $T = (t_1, \dots, t_k)'$
 - Demographic and socioeconomic characteristics H
 - Location-specific attributes L

Economic Model: Setup

Decision-maker in household i maximizes utility:

$$\max_{Z_i, Y_i, T_i} U(Z_i; H_i)$$

Subject to:

Production technology constraint: $F(Z_i, Y_i, T_i; H_i, L_i) = 0$

Time endowment constraint: $Q(T_i; H_i) = 0$

Budget constraint: $B(Y_i, T_i; H_i, L_i) = 0$

Non-negativity: $Z_i, Y_i, T_i \geq 0$

Eq. for food insecurity among children comes from the problem's solution:

$$\tilde{z}_{1,i} = \tilde{z}_1(H_i, L_i)$$

Research Hypotheses

- Group A: **food prices**
 - Higher prices of food at home and fast food \Rightarrow more food insecurity among children
- Group B: **local food environment**
 - Higher density of supermarkets and other food stores, and higher density of full-service restaurants and limited-service eating places \Rightarrow less food insecurity among children
- Group C: **demographic and socioeconomic characteristics**
 - More income \Rightarrow less food insecurity
 - Higher educational attainment \Rightarrow less food insecurity
 - Larger household \Rightarrow more food insecurity
 - Younger children have smaller impact on food insecurity than older children

Data

- Households with children pooled across multiple years
 - Food Security Supplement (**FSS**) of **CPS**, December 2002–2010
 - Analytical sample size: 68,381 households
- Food price and local food environment data
 - Quarterly Food-at-Home Price Database (**QFAHPD**, *source*: ERS)
 - **ACCRA** database (*source*: Council for Community and Economic Research, C2ER)
 - Small Area Income and Poverty Estimates (SAIPE) program database; American FactFinder database (*source*: Census Bureau)
 - County Business Patterns data (**CBP**, *source*: Census Bureau)

Selected Sample Characteristics

Distribution of households by children's food security status:

Food Security Category	Count	Weighted Fraction, %
(1) High/marginal food security	57,175	83.03
(2) Marginal food security	5,391	8.06
(3) Low food security	5,293	8.12
(4) Very low food security	522	0.79
Total households	68,381	100.00

Selected demographic and socioeconomic characteristics:

Variable	Mean	Std. Dev.
Married-couple household	0.675	0.468
Female-headed household	0.248	0.432
Income, real \$\$ (thousands)	29.52	20.36
Below 185% of poverty line	0.343	0.475
Age, years	40.87	10.64
Black	0.147	0.355
Hispanic	0.191	0.393
No high school degree	0.108	0.311
High school degree	0.243	0.429
Some college	0.295	0.456
Bachelor's degree	0.214	0.410
Graduate degree	0.140	0.347

Food Establishments

Data source: County Business Patterns (**CBP**) database

Businesses are classified using 6-digit **NAICS** code

We create density measures for **5 groups** of establishments:

- **Supermarkets** and other general line grocery stores
- **Convenience stores**
- **Specialty food stores**
 - Meat markets; fish and seafood markets; fruit and vegetable markets; baked goods stores; confectionery and nut stores; all other specialty food stores; retail bakeries
- **Full-service restaurants**
- **Limited-service eating places**

Econometric Model

We use **ordered categorical** data for children's food insecurity (dependent var.) \Rightarrow adopt **ordered probit model**

Latent food insecurity:

$$\tilde{z}_{1,i}^* = X_i' \cdot \beta + \epsilon_i$$

Explanatory variables:

$$X_i = (H_i', L_i')'$$

H_i : demographics, etc.; L_i : location attributes

Error term:

$$\epsilon_i | X_i \sim i.i.d. N(0,1)$$

Observable food insecurity outcome:

$$\tilde{z}_{1,i} = k \text{ if and only if } \mu_k < \tilde{z}_{1,i}^* \leq \mu_{k+1}$$

Selected Estimation Results: Part 1

Food Security Outcome	(1) High	(2) Marginal	(3) Low	(4) Very Low
Explanatory Variable	<i>(Marginal effects)</i>			
Married-couple household	0.0174***	-0.0063***	-0.0095***	-0.0016***
Female-headed household	-0.0370***	0.0133***	0.0202***	0.0035***
Number of children, age 0–4	-0.0082***	0.0029***	0.0045***	0.0008***
Number of children, age 5–12	-0.0245***	0.0088***	0.0134***	0.0023***
Number of children, age 13–17	-0.0311***	0.0112***	0.0170***	0.0029***
Number of adults, age 18–64	-0.0048***	0.0017***	0.0026***	0.0005***
Real family income	0.0050***	-0.0018***	-0.0027***	-0.0005***
Missing income	0.1379***	-0.0496***	-0.0754***	-0.0129***
Below 185% of poverty line	-0.0529***	0.0190***	0.0289***	0.0050***
Black	-0.0289***	0.0104***	0.0158***	0.0027***
Other race	-0.0136***	0.0049***	0.0074***	0.0013***
Hispanic	-0.0188***	0.0068***	0.0103***	0.0018***
High school degree	0.0205***	-0.0074***	-0.0112***	-0.0019***
Some college	0.0239***	-0.0086***	-0.0131***	-0.0022***
Bachelor's degree	0.0756***	-0.0272***	-0.0413***	-0.0071***
Graduate degree	0.1021***	-0.0367***	-0.0558***	-0.0096***
Year 2005	0.0090*	-0.0032*	-0.0049*	-0.0008*
Year 2006	0.0111**	-0.0040**	-0.0061**	-0.0010**
Year 2007	0.0121**	-0.0044**	-0.0066**	-0.0011**
Year 2008	-0.0141**	0.0051**	0.0077**	0.0013**
Year 2009	-0.0139**	0.0050**	0.0076**	0.0013**

Selected Estimation Results: Part 2

Food Security Outcome	(1) High	(2) Marginal	(3) Low	(4) Very Low
Explanatory Variable	<i>(Marginal effects)</i>			
Metropolitan area	-0.0180***	0.0065***	0.0098***	0.0017***
Midwest region	0.0103*	-0.0037*	-0.0056*	-0.0010*
South region	0.0175***	-0.0063***	-0.0096***	-0.0016***
West region	0.0023	-0.0008	-0.0013	-0.0002
Local poverty rate	0.0007	-0.0003	-0.0004	-0.0001
Food at home price index (QFAHPD)	0.0028	-0.0010	-0.0015	-0.0003
Fast food price index (ACCRA)	-0.0086	0.0031	0.0047	0.0008
# of supermarkets per 10,000 residents	-0.0016	0.0006	0.0009	0.0001
# of convenience stores per 10,000 residents	0.0004	-0.0001	-0.0002	-0.0000
# of specialty food stores per 10,000 residents	0.0251***	-0.0090***	-0.0137***	-0.0024***
# of full-service restaurants per 10,000 residents	-0.0007	0.0003	0.0004	0.0001
# of limited-service eating places per 10,000 residents	-0.0008	0.0003	0.0004	0.0001
Fraction of households	0.8303	0.0806	0.0812	0.0079

Future Research Steps

- Investigate in more detail food prices:
 - Consider alternative food price indices: e.g., Gregory and Coleman-Jensen's (2013) TFP-based price index
 - Consider food-group price indices (fruit and vegetables, dairy, etc.)
- Investigate land area-specific densities of food establishments (e.g., # of supermarkets per 100 sq. miles)
- Investigate incorporating **food preparation time** as an outcome, by merging FSS with data from the **American Time Use Survey (ATUS)**

Thank you!

Questions?