Predicting "Real-Time" Food Hardship with Retail Food Spending: A New Approach Linking Scanner Data and the Census Household Pulse Survey

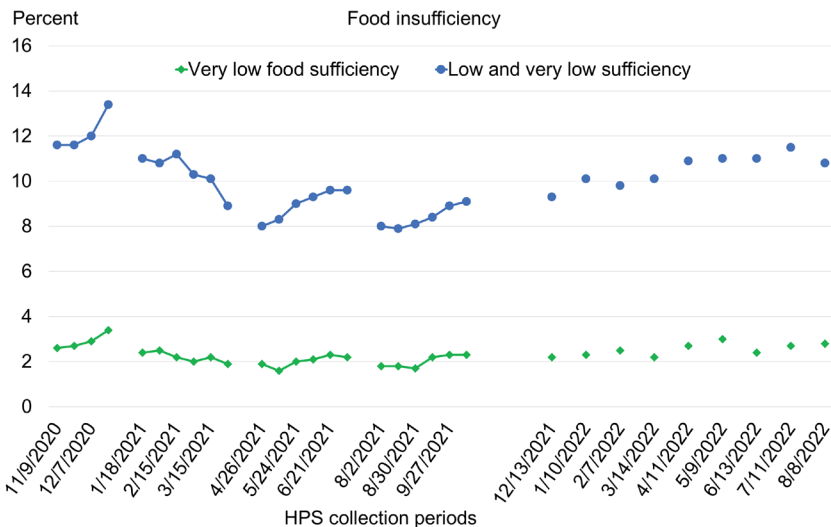Katie Fitzpatrick & Kejda Llana

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Food Hardship Rose Dramatically During Pandemic

Food insufficiency fluctuated during the Coronavirus (COVID-19) pandemic

Percent   Food insufficiency

→ Very low food sufficiency   ● Low and very low sufficiency

HPS collection periods

Notes: Food insufficiency includes low and very low food sufficiency; Household Pulse Survey (HPS) data were not collected during 12/22/2020–1/5/2021, 3/30/2021–4/13/2021, 7/6/2021–7/20/2021, 10/12/2021–11/30/2021, 2/8/2022–3/1/2022, and 5/10/2022–5/31/2022. Beginning in December 2021, HPS followed a 2-weeks on, 2-weeks off data collection and dissemination approach.
Source: USDA, Economic Research Service using data from U.S. Department of Commerce, Bureau of the Census, HPS data as of August 8, 2022.
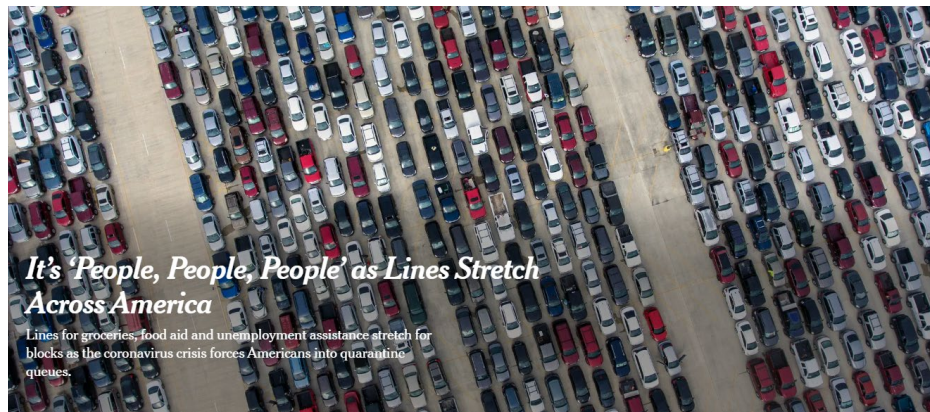
13.4% of households reported sometimes or often not having enough to eat

Spike in SNAP applications

Historic demand for food bank resources

It's 'People, People, People' as Lines Stretch Across America

Lines for groceries, food aid and unemployment assistance stretch for blocks as the coronavirus crisis forces Americans into quarantine queues.

Source: ERS, USDA
https://ers.usda.gov/covid-19/food-and-consumers

Food Insecurity: The Official Measure of Food Hardship

Food insecurity provides valuable insight for policy

Challenges for responding to food hardship quickly

- Time
  - Collected in December (CPS-FSS) and unavailable until nearly a year after collected
- National focus
  - State and local level less reliable

New tools needed to complement the CPS-FSS

Trends in the prevalence of food insecurity and very low food security in U.S. households, 2001–21

Percent of households
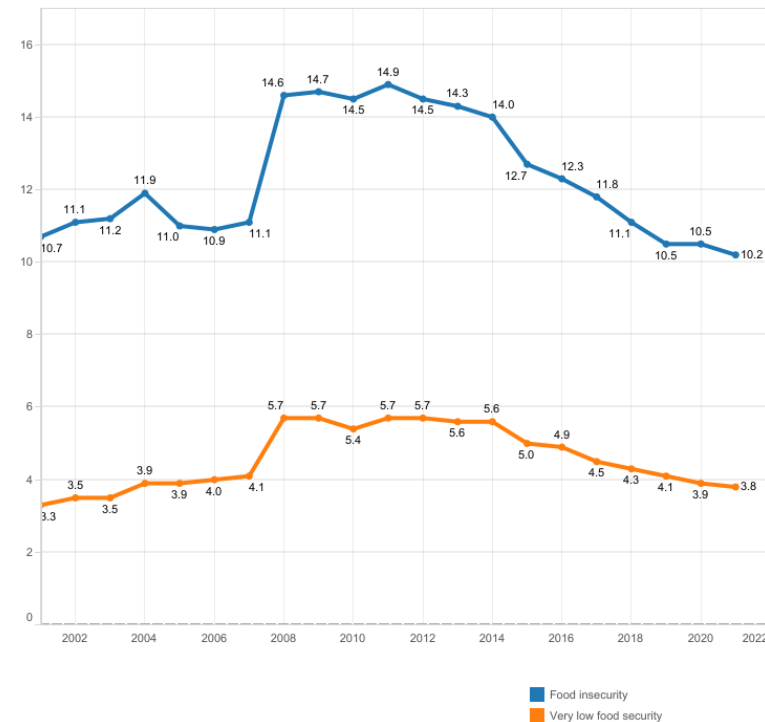
Source: Calculated by USDA, Economic Research Service, using Current Population Survey Food Security Supplement data.

Research Question: Can "Big Data" on Food Expenditures be Used to Predict Food Hardship?

USDA's Economic Research Service (ERS) has made investments in food retail scanner data collected by IRI

- National and State Weekly Time Series data on ERS website
- Household Panel available through restricted agreements

Can we use this data to create models of the relationship between food spending and food insufficiency that can be utilized by national, state, and local governments to address food hardship quickly?

Motivation: Food Hardship
During the Pandemic

The COVID-19 pandemic exacerbated food hardship

Precipitous Decline in Employment, Particularly Among Workers With Characteristics that Put them more at risk for Food insecurity

- Concentrated in Service Industry

- Concentrated among historically disadvantaged populations

- Concentrated among those with low SES

Why might Food Expenditures be useful to Predict Food Hardship?

Table 7
Weekly household food spending per person and relative to the cost of the Thrifty Food Plan (TFP) by food security status, 2021

	Number of households[1]	Median weekly food spending	
		Per person	Relative to cost of December 2021 TFP[2]
Category	1,000	Dollars	Ratio
All households	121,944	62.50	1.15
Food security status			
Food-secure households	109,226	65.00	1.15
Food-insecure households	12,592	53.33	0.99
Households with low food security	7,884	50.00	0.96
Households with very low food security	4,708	60.00	1.08

Source: Coleman-Jensen, Alisha, Matthew P. Rabbitt, Christian A. Gregory, Anita Singh, September 2022. Household Food Security in the United States in 2021, ERR-309, U.S. Department of Agriculture, Economic Research Service

Food insecure households spend less on food than food secure households

- Evidence from CPS-FSS and FoodAPS Survey (Tiehen et al. 2017)
- During early pandemic, households with individuals that lost their job spent 15% less on food and were 36% more likely to receive free food (Restrepo, Rabbitt, and Gregory 2021)

Households at-risk of food insecurity make tradeoffs about the composition of their food budget and where they shop (Griffith et al. 2015; Lewis et al. 2021)

Data Used: Food Hardship

Household Pulse Survey collects data on food insufficiency

In the last 7 days, which of these statements best describes the food eaten in your household?

    A. Enough of the kinds of food (I/we) wanted to eat
    B. Enough, but not always the kinds of food (I/we) wanted to eat
    C. Sometimes not enough to eat
    D. Often not enough to eat

Aggregate responses at the national and state level to get estimates of food hardship

Data Used: Food Expenditures

Two sources:

1. ERS's Weekly Retail Food Series
   - National Data on Food Category and Food Subcategory (Dollars, Unit Sales, Volume Sales)
   - State-level Data on Food Category (Dollars, Unit Sales, Volume Sales)

2. Household Food Expenditures collected by Information Resources Inc. (IRI)
   - Product-level data and Household Characteristics

All collected based on a calendar week (Monday – Sunday)

Link Food Expenditures to Food Insufficiency

Challenge in linking HPS "weeks" to retail sales data

- HPS weeks tend to be 13 days (versus 7 days)
- HPS weeks tend to be Wed – Mon (versus Mon – Sun)
- HPS not continuous throughout the year

Solution:

- Use retail food data that overlaps most with HPS week
- Average retail food data over relevant HPS week

HPS Week	HPS Dates	Retail Food Series
18	Wed. Oct 28 – Mon. Nov. 9, 2020	Mon. Oct. 26 – Sun. Nov. 1, 2020
		Mon. Nov. 2 – Sun., Nov. 8, 2020
19	Wed. Nov. 11 – Mon. Nov. 23, 2020	Mon. Nov. 9 – Sun. Nov. 15, 2020
		Mon. Nov. 16 – Sun. Nov. 22, 2020

Methods

Two Different Models:
- National Level Data
- State Level Data

Fixed Effects Regressions
- Time Fixed Effects
  - Quarter (National Data)
  - Week (State Data)
- State Fixed Effects (State Data)

Level-Log Models
- Dependent Variable: Food Insufficiency
- Key Independent Variable:
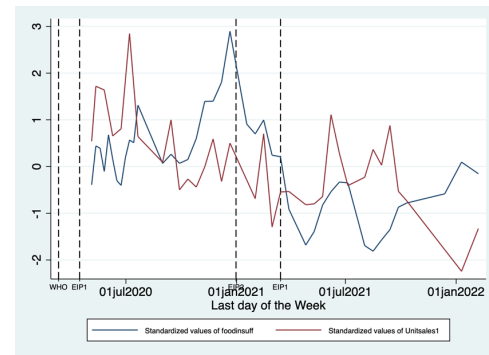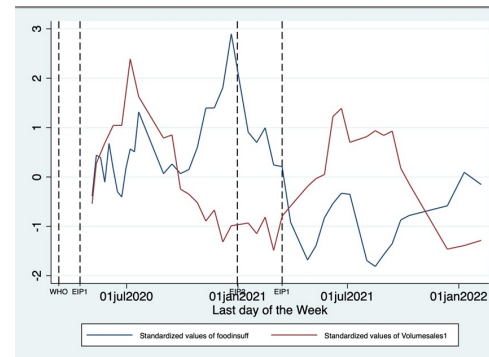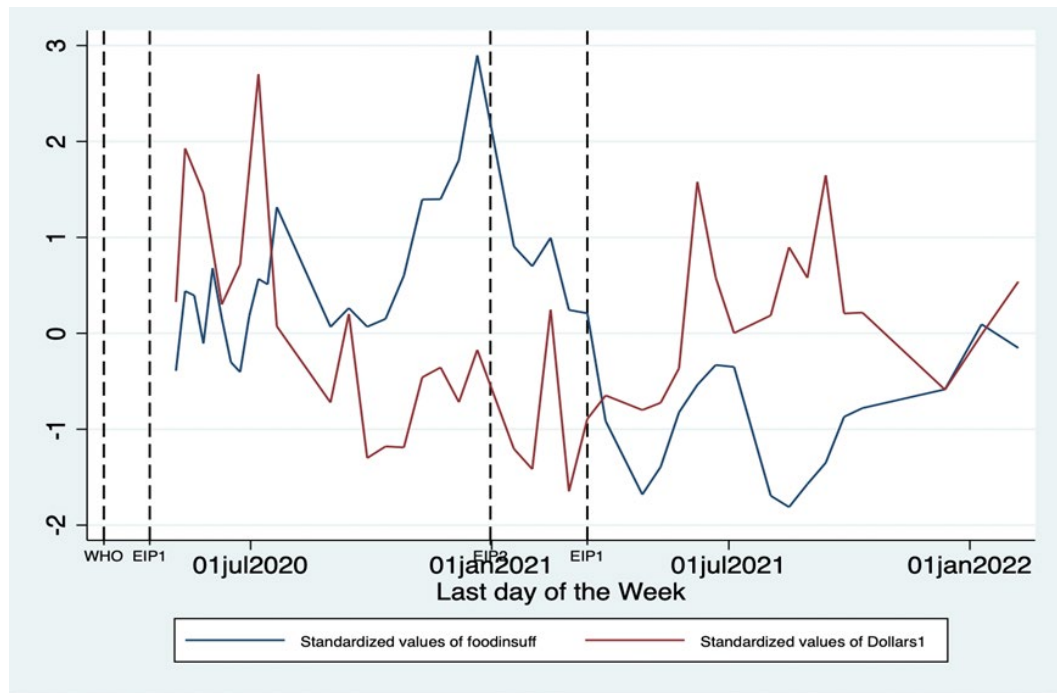$$ln(\textit{Weekly Retail Food Sales})$$

Controls:
- Macroeconomic Conditions (Initial UI Claims)
- COVID Severity (Cases and Deaths)

Summary Statistics

	National Data		State Data	
	Mean	Standard Deviation	Mean	Standard Deviation
	(1)	(2)	(3)	(4)
Household Pulse Survey				
Food Insufficiency	0.100	0.011	0.095	0.028
Weekly Retail Food Sales Data				
Total Weekly Retail Food Sales (in Hundreds of Million Dollars)	149	5.0	0.225	0.217
Unit Sales (in Hundreds of Million)	46.60	1.52	0.069	0.064
Volume Sales (in Hundreds of Million)	215.00	16.10	0.448	0.427
Observations	45		2,295	

Relationship Between Food Insufficiency and Total Weekly Retail Food Spending

Results: National Weekly Retail Food Sales, Measured in Volume, Inversely Related to Food Insufficiency
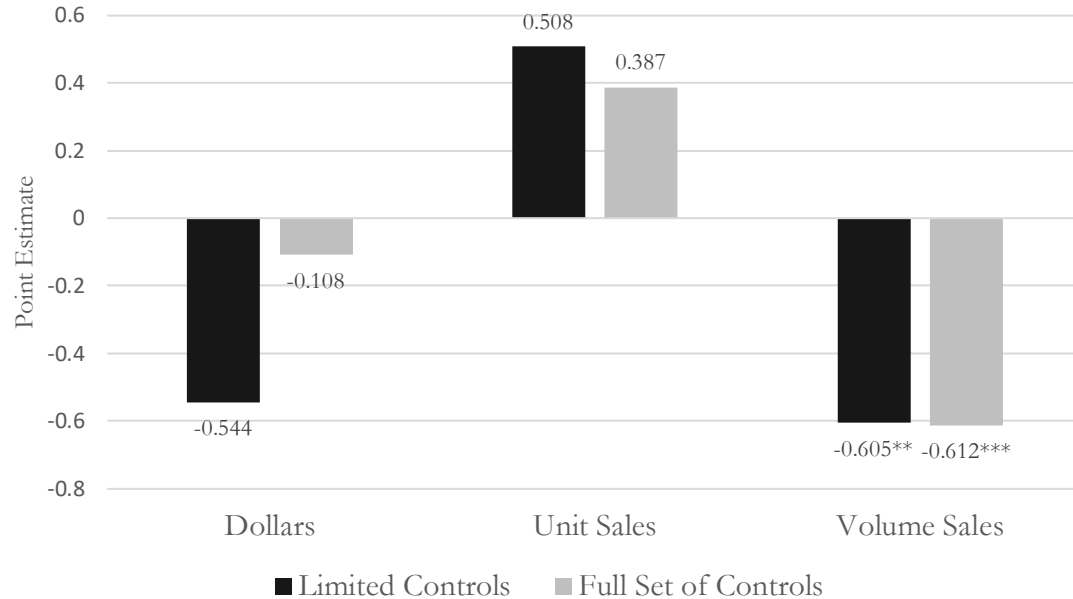
All estimates include various sets of controls. Weekly retail food sales included in natural logarithmic form.

Estimates Using National Data

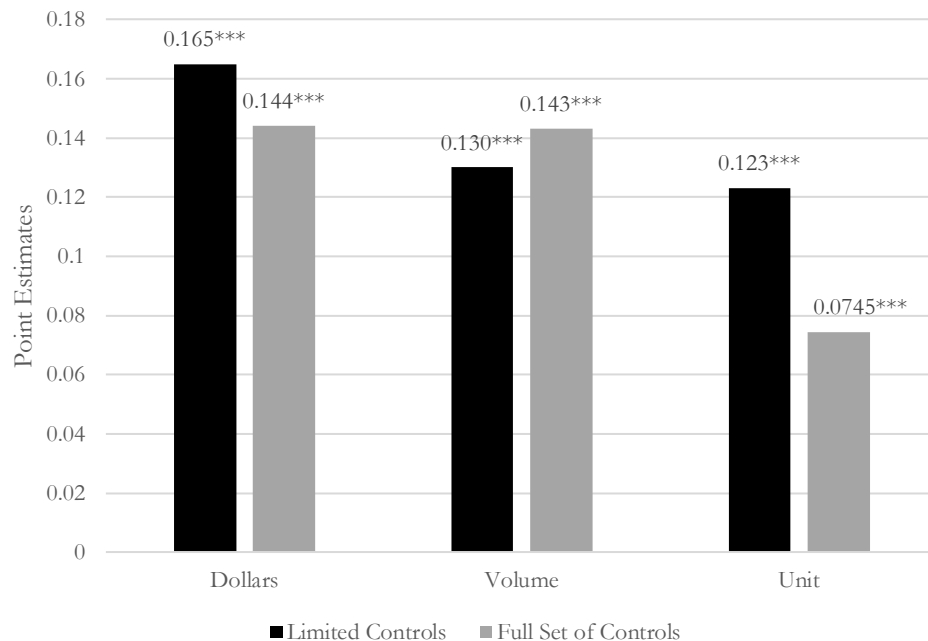Total Dollars Spent:
- Negative but insignificant

Unit Sales:
- Positive but insignificant

Volume Sales:
- 1% increase in Volume Sales associated with 0.6 percentage point decline in food insufficiency

Suggests households may reduce spending and shifting to smaller food sizes if experiencing food hardship

Results: State Weekly Retail Food Sales Significantly Related to Food Insufficiency; Wrong-Signed Estimates

All estimates include various sets of controls. Weekly retail food sales included in natural logarithmic form.
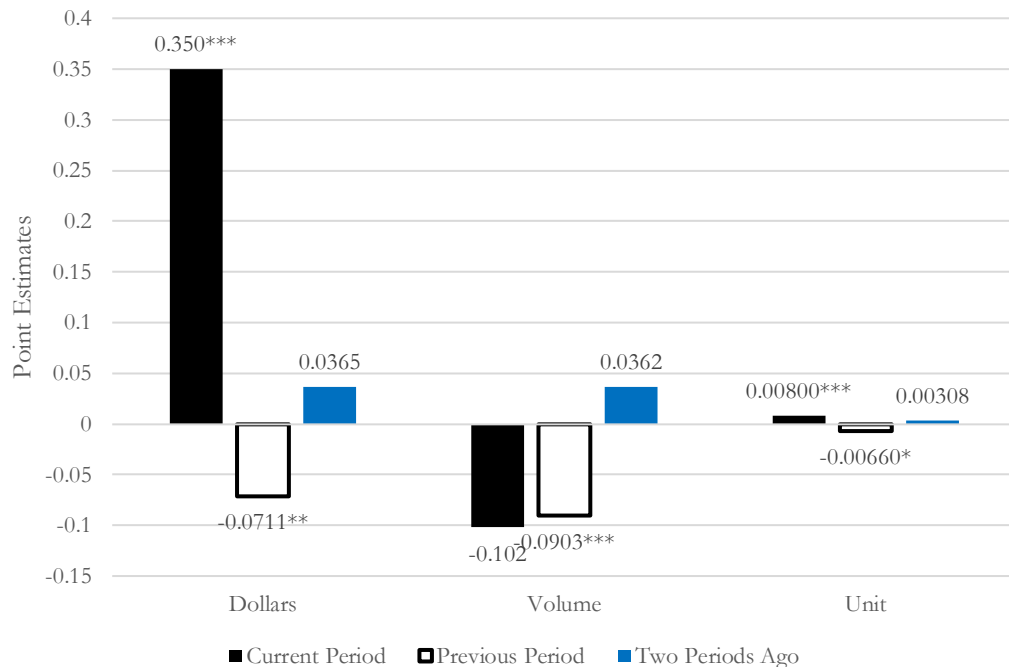
Estimates Using State Data

Total Dollars Spent, Unit Sales, and Volume Sales:

- 1% increase relates to ~ 0.1 point *increase* in food insufficiency

Need better controls?

- Week Fixed Effects or Weekly Initial UI Claims & COVID Severity
- State Fixed Effects

Results: Lags of State Weekly Food Sales Associated with Increases in Food Insufficiency

All estimates include various sets of controls. Weekly retail food sales included in natural logarithmic form.

Estimates Using State Data and Lags of Weekly Food Sales

Current Period Total Dollars Spent and Unit Sales:
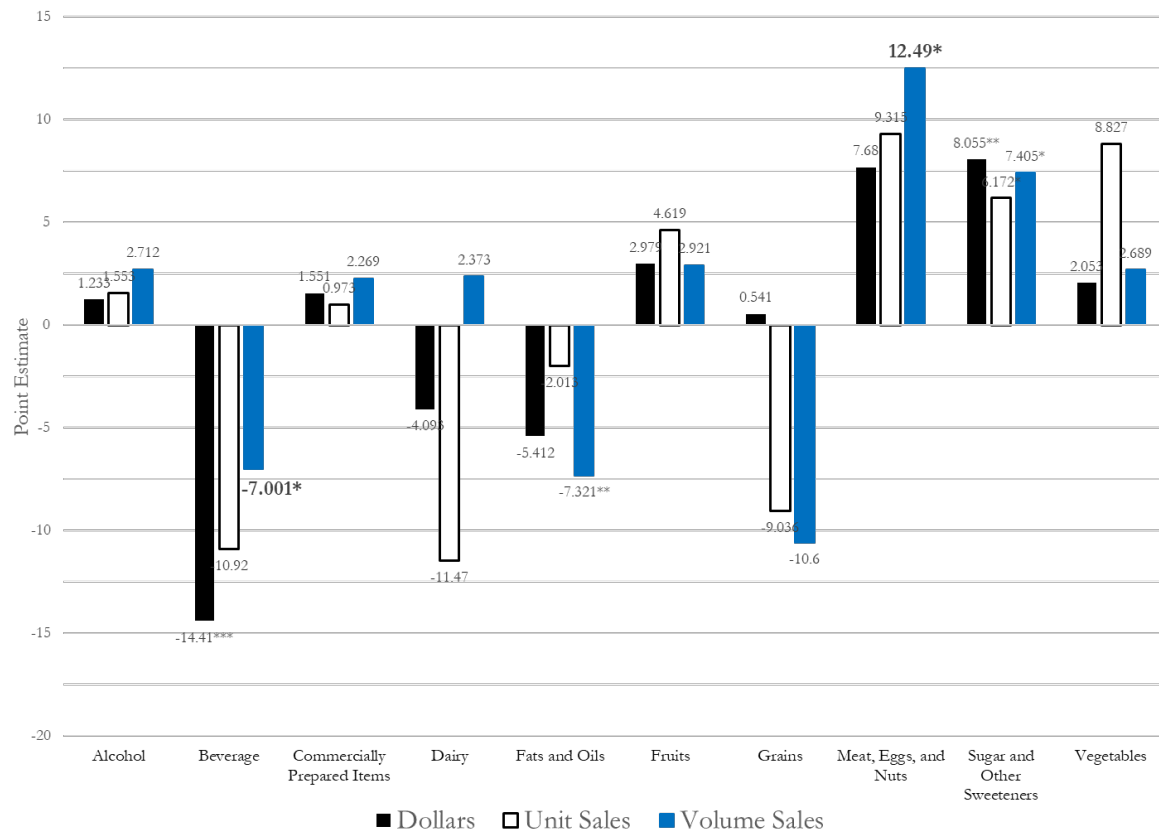- Positively related to food insufficiency

Prior Period Total Dollars Spent, Unit Sales, and Volume Sales:
- Negatively related to food insufficiency

Reflects managing by using food from pantry, etc?

Results: Weekly Retail Food Sales Categories Related to Food Insufficiency

Categories Positively Related to Food Insufficiency:
- Meats, Eggs, and Nuts
- Sugar and Other Sweeteners

Categories Negatively Related to Food Insufficiency
- Beverages
- Fats and Oils

Household-Level Data on Food Spending

Can Examine:

- Are households more intensely related to "deals"?
  - Total Food Expenditures with and without discount
- Do relationships vary by presence of children or focusing on households below median income?
- How are households adjusting the type of food they purchase?
  - Perishable versus Non-Perishable
  - Inferior (Cheap Proteins; Frozen/Canned Fruits & Vegetables) versus Normal Foods (Fresh Produce; Fresh Meat; Snacks)

Next Steps

1. Include Lags in More Models
2. Add indicators for food from food banks and SNAP receipt
3. More exploration of Categories and Subcategories of Food Spending
4. Explore Marginal Food Insufficiency a better outcome
5. Other suggestions?

Conclusions

Food Hardship Has Lasting Detrimental Effects on Households

- Making Use of Federal Data Investments Might be a Promising Tool to Addressing Food Hardship Early

Early Results Suggest that Food Insufficiency Associated with:

- Food Spending Levels (and Lags of Food Spending)
- Spending in Food Categories Related to "Luxuries" versus "Necessities"

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