

# USDA Food Assistance Programs (SNAP, the National School Lunch Program, and the School Breakfast Program) and Healthy Food Choices: Quasi-Experimental Evidence from Geographic Variation in Food Prices

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November 2017\*

Preliminary: Please check before citing

*This project was supported with grants from the National Bureau of Economic Research and University of Kentucky Center for Poverty Research through funding by the U.S. Department of Agriculture, Economic Research Service and the Food and Nutrition Service, Agreement Numbers 58-5000-1-0050 and 58-5000-3-0066. The opinions and conclusions expressed herein are solely those of the author(s) and should not be construed as representing the opinions or policies of the sponsoring agencies*



Slides available at  
<http://www.github.com/garretchristensen/FoodAPSAPPAM2017>

# Outline

- ▶ SNAP Background
- ▶ Food Price Variation Background
- ▶ SNAP Sufficiency
- ▶ Nutrition: Methods
- ▶ Nutrition: Results
- ▶ Conclusion

# SNAP Background

The Supplemental Nutrition Assistance Program (SNAP) is one of the largest government assistance programs.

- ▶ 2016: 44m recipients, cost of \$70 billion FY2016

[Source: USDA FNS]

- ▶ Started in 1964
- ▶ Paid for by Feds (the farm bill), administered by states
- ▶ Electronic Balance Transfer (EBT) in early 2000s
- ▶ Name changed to SNAP in 2008.

# How It Works

## Eligibility:

- ▶ Less than \$2,250/\$3,500 in countable assets. (Not home, sometimes car.)
- ▶ Less than net monthly income 100% of FPL, Gross 130% (\$2,021/\$2,628 family of 4)
- ▶ Earned income, dependent care, medical expenses, child support, excess shelter deductions.
- ▶  $Benefits = MaxBenefits(\$649/month) - NetIncome * 0.3$

[Source:USDA FNS]

# Recent Issues

- ▶ Large increase in recipients after financial crisis.
- ▶ ARRA: Benefits increased \$80/month in 2009, decreased in 2013.
- ▶ Able bodied without dependents 18-49(ABAWDs) eligibility maxes out at 3/36 months. Waived with high unemployment—kicking back in after Great Recession.
- ▶ Food insecurity among recipient households remains quite high (Coleman-Jensen et al., 2014).

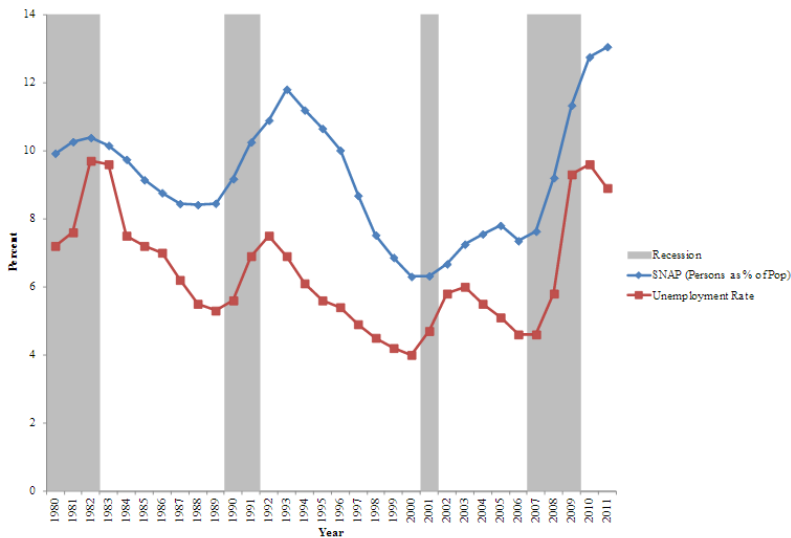
# Very Recent Issues

## Administration Proposals:

- ▶ \$193b (25+%) cut over 10 years
- ▶ Require ABAWDs work if <10% unemployment
- ▶ Eliminate minimum benefit (\$16)
- ▶ Eliminate increase in benefits beyond 6 people in household.

[Source: CBPP]

Figure 1: Trends in SNAP Participation and Unemployment Rate



Source: Author's calculations using CPS ASEC and BLS data

Ziliak 2015, "SNAP Matters"



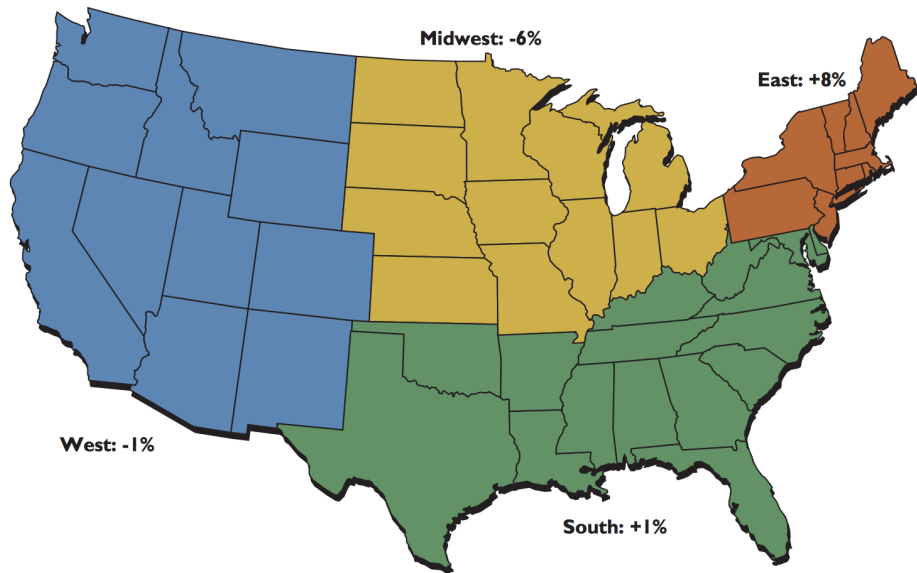
# Our Research I

- ▶ While legislated maximum SNAP benefits are fixed across 48 states, food prices vary significantly across geographic locations.
- ▶ Deductions for costs of housing, medical care, and dependent care help may not be sufficient to equalize real value of SNAP benefits geographically.
  - ▶ Small scale study in Philadelphia (Breen et al., 2011).
  - ▶ Quarterly Food at Home Price Database (QFAHPD) price variation (35 market groups) shows a \$10 increase in food price leads to 2.7 percentage point (5%) increase in household food insecurity. (3.1 pp, 12% for children) (Gregory & Coleman-Jensen, 2013).

# Our Research II

- ▶ What fraction of recipients can actually afford the TFP locally?
- ▶ **What does SNAP relative generosity do to nutrition?**
  - ▶ Literature: SNAP overall leads to modest changes in diet quality (Gregory et al. 2014).
- ▶ Other data (QFAPHD): What does SNAP relative generosity do to child health? (Bronchetti, Christensen, Hoynes)

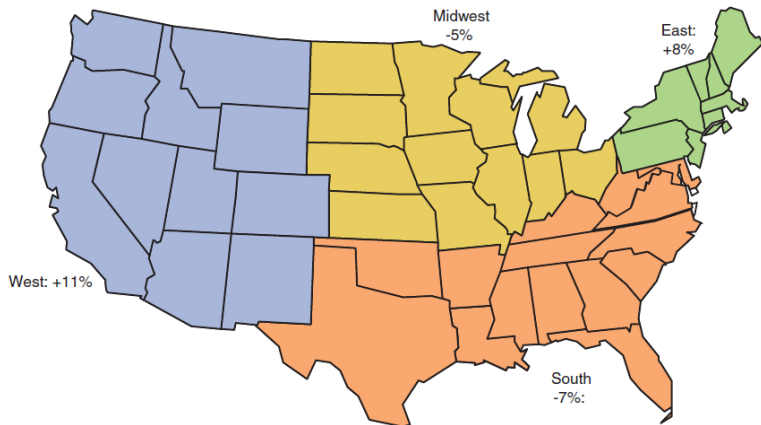
## Variation in food prices from national average, 2004-07



Source: Calculations by USDA, Economic Research Service using Bureau of Labor Statistics' average retail price data.

Figure1

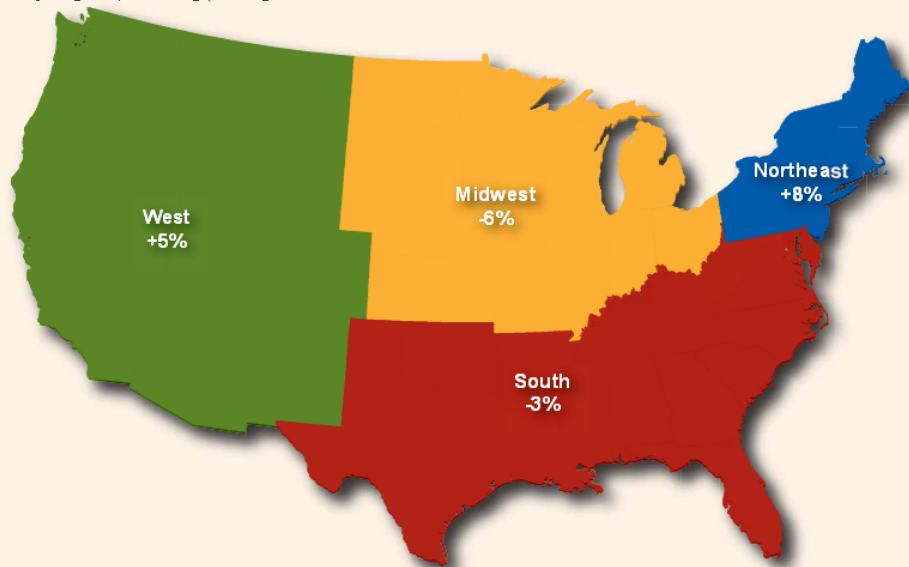
## Regional food prices differ from the national average

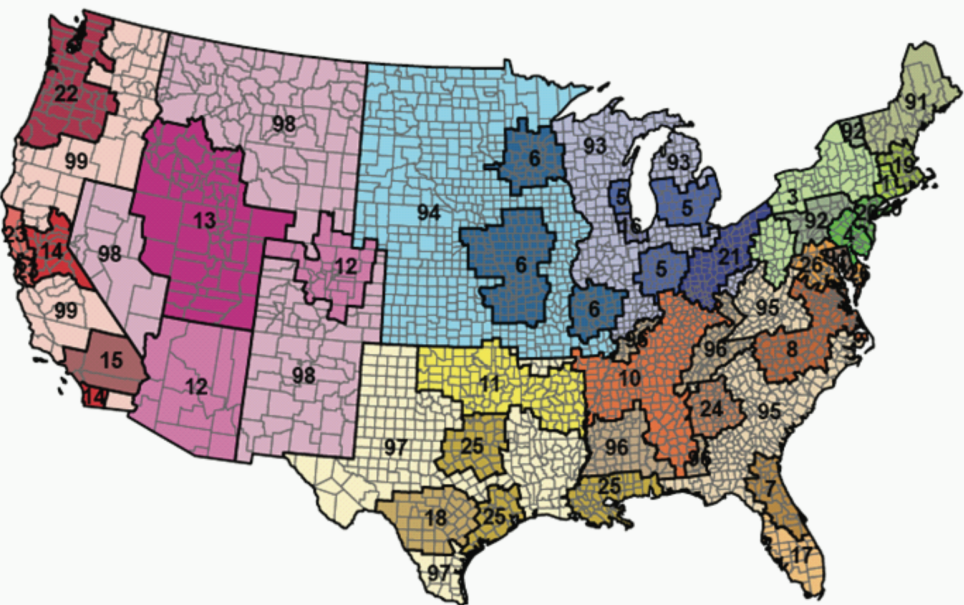


Source: Economic Research Service/USDA, using Bureau of Labor Statistics' average price data and Nielsen Homescan Data, 1998-2003.

## Food prices—variation from national average

*Retail food prices, on average, are highest in the East and lowest in the Midwest.*





▸ QFAHPD Visualization

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Our data: At census block group level, but no map.  
Sorry!

# FoodAPS

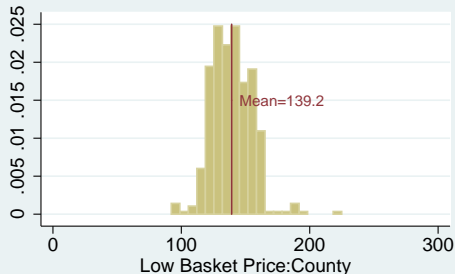
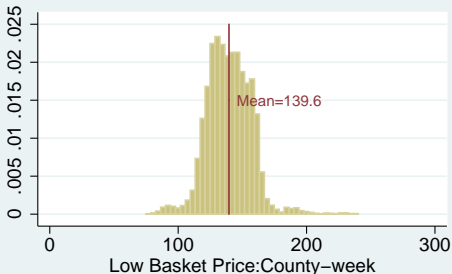
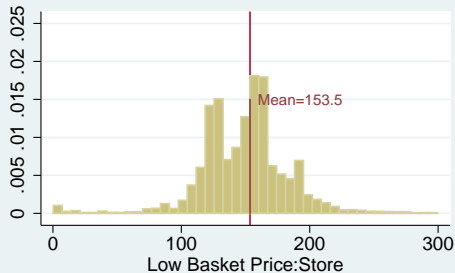
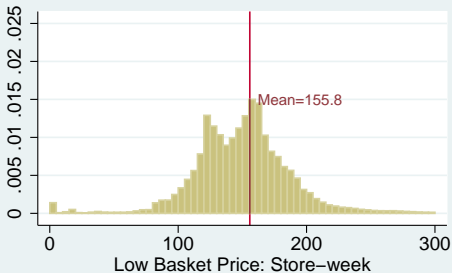
“USDA’s National Household Food Acquisition and Purchase Survey (FoodAPS) is the first nationally representative survey of American households to collect unique and comprehensive data about household food purchases and acquisitions.”

- ▶ FoodAPS lets us look at the relationship between food prices and SNAP adequacy at a much finer geographical level.
- ▶ Gunderson et al. use IRI InfoScan data at store (or regional chain) level to build basketprice measure.
- ▶ Index modeled after Thrifty Food Plan (TFP).



# Basket Prices

Medians by Store-week, Store, County-week, and County



# The Thrifty Food Plan (TFP)

- ▶ Well-defined basket of foods to obtain a nutritious diet at a minimal cost.
- ▶ You're supposed to be able to buy TFP with 30% of net income + food stamp benefits.
- ▶ That's where the 649 comes from:

$$\text{Benefits} = \text{MaxBenefits}(\$649/\text{month}) - \text{NetIncome} * 0.3$$

# SNAP Sufficiency for TFP

Are SNAP benefits adequate for SNAP households to purchase the TFP? If not, what is the shortfall?

Compare TFP cost to:

- ▶ SNAP benefit received + 30% of net income
- ▶ Legislated maximum SNAP benefit

# Sufficiency Rates of SNAP for Recipient Households by Distance from Stores

|                      | Average<br>Net Income | N    | Average<br>Max Benefits | N    |
|----------------------|-----------------------|------|-------------------------|------|
| Census Region Median | 78%                   | 1444 | 83%                     | 1581 |
| State Median         | 79%                   | 1444 | 76%                     | 1581 |
| County Median        | 79%                   | 1436 | 74%                     | 1572 |
| 20-mile Median       | 78%                   | 1338 | 73%                     | 1464 |
| 10-mile Median       | 78%                   | 1311 | 73%                     | 1433 |
| 5-mile Median        | 77%                   | 1224 | 72%                     | 1338 |
| 3.4-mile Median      | 77%                   | 1174 | 74%                     | 1281 |
| 2.5mile Median       | 77%                   | 1123 | 72%                     | 1225 |
| 10-nearest Median    | 79%                   | 1338 | 77%                     | 1464 |
| 5-nearest Median     | 78%                   | 1332 | 71%                     | 1458 |

## Sufficiency Rates of SNAP for Recipient Households by Distance from Stores

|                       | Average<br>Net Income | N    | Average<br>Max Benefits | N    |
|-----------------------|-----------------------|------|-------------------------|------|
| Census Region Minimum | 100%                  | 1444 | 100%                    | 1581 |
| State Minimum         | 99%                   | 1444 | 100%                    | 1581 |
| County Minimum        | 94%                   | 1436 | 100%                    | 1572 |
| 20-mile Minimum       | 95%                   | 1338 | 100%                    | 1464 |
| 10-mile Minimum       | 93%                   | 1311 | 100%                    | 1433 |
| 5-mile Minimum        | 91%                   | 1224 | 99%                     | 1338 |
| 3.4-mile Minimum      | 90%                   | 1174 | 100%                    | 1281 |
| 2.5mile Minimum       | 90%                   | 1123 | 99%                     | 1225 |
| 10-nearest Minimum    | 91%                   | 1338 | 100%                    | 1464 |
| 5-nearest Minimum     | 89%                   | 1332 | 98%                     | 1458 |
| 2-nearest Minimum     | 83%                   | 1332 | 85%                     | 1458 |

## Characteristics of Households by SNAP Sufficiency

| Characteristic                 | SNAP Recipients |        |         | SNAP Eligible |        |         |
|--------------------------------|-----------------|--------|---------|---------------|--------|---------|
|                                | No              | Yes    | P-value | No            | Yes    | P-value |
| Family Size                    | 2.78            | 2.65   | 0.43    | 2.52          | 2.21   | 0.11    |
| Household Max Age              | 50.83           | 49.35  | 0.30    | 53.22         | 53.00  | 0.89    |
| Household Min Age              | 27.00           | 28.14  | 0.65    | 34.82         | 37.21  | 0.43    |
| <b>Household Income (\$1K)</b> | 2392            | 1950   | 0.05    | 3059          | 2355   | 0.04    |
| Percent of Poverty Line        | 141.95          | 124.20 | 0.12    | 209.82        | 172.74 | 0.08    |
| HH Has Earned Income           | 0.50            | 0.53   | 0.57    | 0.60          | 0.55   | 0.21    |
| Household Max Education        | 20.08           | 19.65  | 0.10    | 20.76         | 20.24  | 0.09    |
| HH Has Elderly Member          | 0.30            | 0.27   | 0.40    | 0.38          | 0.37   | 0.83    |
| <b>Metro Area</b>              | 0.97            | 0.83   | 0.01    | 0.97          | 0.83   | 0.02    |
| High Food Security             | 0.34            | 0.32   | 0.52    | 0.45          | 0.50   | 0.44    |
| Marginal Food Security         | 0.25            | 0.21   | 0.24    | 0.23          | 0.19   | 0.13    |
| Low Food Security              | 0.24            | 0.26   | 0.57    | 0.21          | 0.16   | 0.08    |
| Very Low Food Security         | 0.18            | 0.21   | 0.40    | 0.11          | 0.16   | 0.02    |
| Trouble Paying Bills           | 0.30            | 0.27   | 0.45    | 0.18          | 0.17   | 0.83    |
| High Price Area                | 0.88            | 0.00   | 0.00    | 0.90          | 0.00   | 0.00    |
| Northeast                      | 0.22            | 0.09   | 0.25    | 0.29          | 0.09   | 0.13    |
| Midwest                        | 0.24            | 0.34   | 0.33    | 0.16          | 0.35   | 0.05    |
| South                          | 0.33            | 0.43   | 0.25    | 0.32          | 0.42   | 0.33    |
| West                           | 0.21            | 0.14   | 0.49    | 0.22          | 0.14   | 0.39    |

# Nutrition: Overview

- ▶ Use local relative generosity of SNAP to measure nutrition impacts.
- ▶ Cross-sectional data: use Oster's 2016 improvement to Altonji, Elder, Taber 2005 method to compare with and without observable controls.
- ▶ National School Lunch Program and the School Breakfast Program as mediators.
- ▶ Outcomes:
  - ▶ Healthy Eating Index (total, fruit, veg)
  - ▶ Percent of calories from added sugar, solid fat, alcohol
  - ▶ Alcohol (Grams)
  - ▶ Self-reported nutrition status

# Healthy Eating Index

- ▶ Created by USDA's Center for Nutrition Policy and Promotion (CNPP) to assess conformance to the *Dietary Guidelines for Americans*. Updated every five years. (Guenther et al.).
- ▶ Valid for age  $> 2$ .
- ▶ Nine adequacy, three moderation components.
- ▶ Density approach (per 1000 calories).
- ▶ Zeros prevalent in component scores.
- ▶ National average 60/100.



# Healthy Eating Index

| HEI-2010 Dietary Component | Max Score | Moderation |
|----------------------------|-----------|------------|
| Total Fruit                | 5         |            |
| Whole Fruit                | 5         |            |
| Total Vegetables           | 5         |            |
| Greens and Beans           | 5         |            |
| Whole Grains               | 10        |            |
| Dairy                      | 10        |            |
| Total Protein Foods        | 5         |            |
| Seafood and Plant Proteins | 5         |            |
| Fatty Acids                | 10        |            |
| Refined Grains             | 10        | M          |
| Sodium                     | 10        | M          |
| Empty Calories             | 20        | M          |

Note: See CNPP factsheet for scoring standards.

# Nutrition: Controlling for Observables

$$\text{Nutrition}_{ij} = \alpha + \beta \cdot f(\text{TFP}_{ij}, \text{MAXSNAP}_{ij}) + X_{ij} \cdot \theta + \delta_j + \epsilon_{ij}$$

- ▶ Focus on  $\log(\text{SNAPMAX}_{ij}/\text{TFP}_{ij})$  as independent variable of interest, though it could be  $\log(\text{TFP}_{ij})$ , sufficiency[0/1], or gap[continuous].
- ▶  $X$  is rural, metro, income, trouble with bills, large expenditure, household size, car ownership, tobacco use, days since SNAP receive, WIC eligibility, WIC use, age, race, sex, non-food CPI (9).
- ▶ State fixed effects

# Methods: Controlling for Observables

- ▶ Individual level
  - ▶ Assume FAH consumed by all, assign FAFH to individual
- ▶ Primary sample: SNAP participants
  - ▶ Children and adults separately
- ▶ Placebo: > 300% Federal
- ▶ Regressions weighted according to complex survey design.

User's Guide Pg 55

## Methods: Oster 2016

$$Y = \beta X + \Psi \omega^0 + W_2 + \epsilon$$

$X$  is treatment of interest.

$\omega$  observed,  $W$  is not.

What happens to our effect estimate if we assume the unobservables have a similar correlation to treatment as the observables?

Depends on relative degree of selection on observed and unobserved variables ( $\delta$ ), as well as  $R^2$  resulting from controlling for unobservables,  $R_{max}$ .

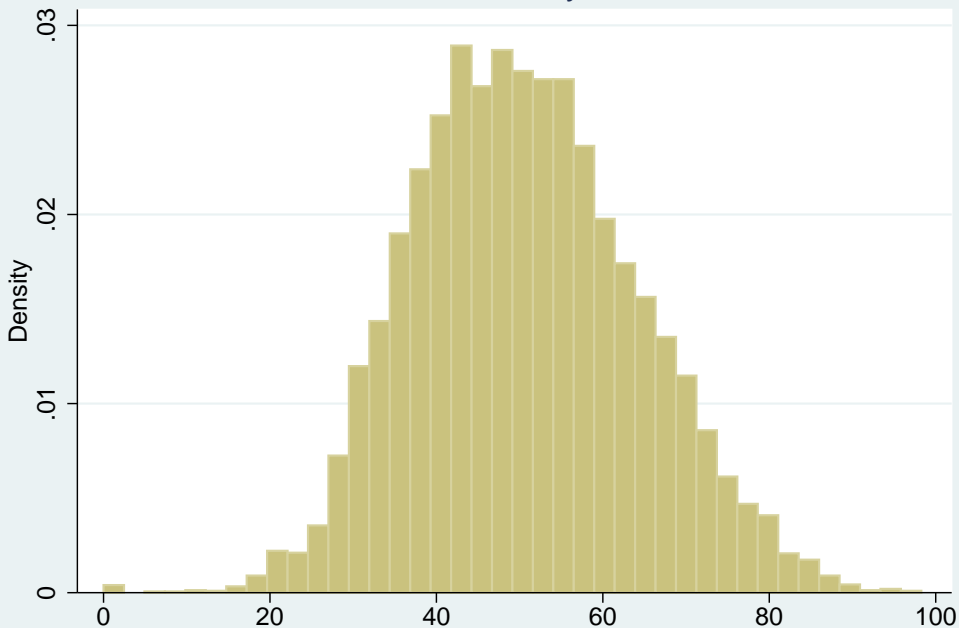
Altonji, Elder, Taber (2005) implicitly assume  $R_{max}=1$ . Perhaps unlikely due to measurement error or idiosyncratic variation.

Bellows & Miguel 2009, Nunn & Wantchekon 2011 assume  $R_{max} = \tilde{R} + (\tilde{R} - \hat{R})$ .

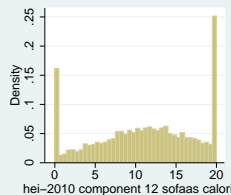
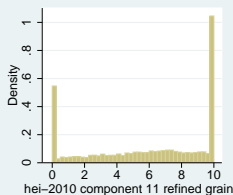
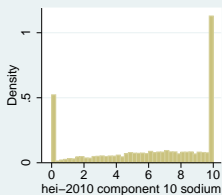
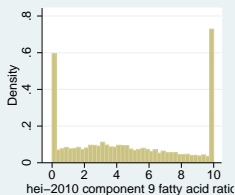
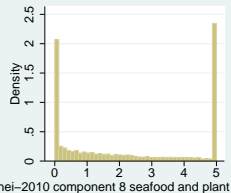
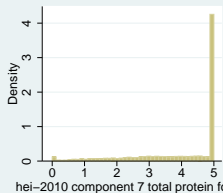
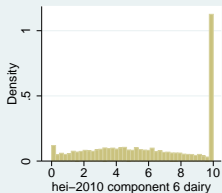
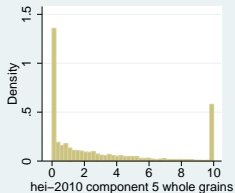
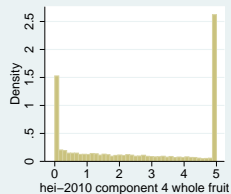
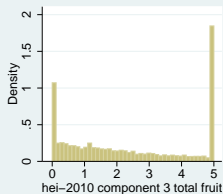
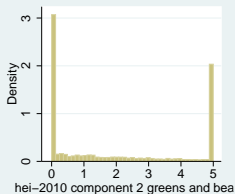
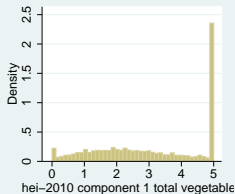
$R_{max}$  is a flexible parameter in Oster's method, but  $1.3 \times \tilde{R}$  performs well in tests.

$$\beta^* \approx \tilde{\beta} - \delta(\hat{\beta} - \tilde{\beta}) \frac{R_{max} - \tilde{R}}{\tilde{R} - \hat{R}}$$

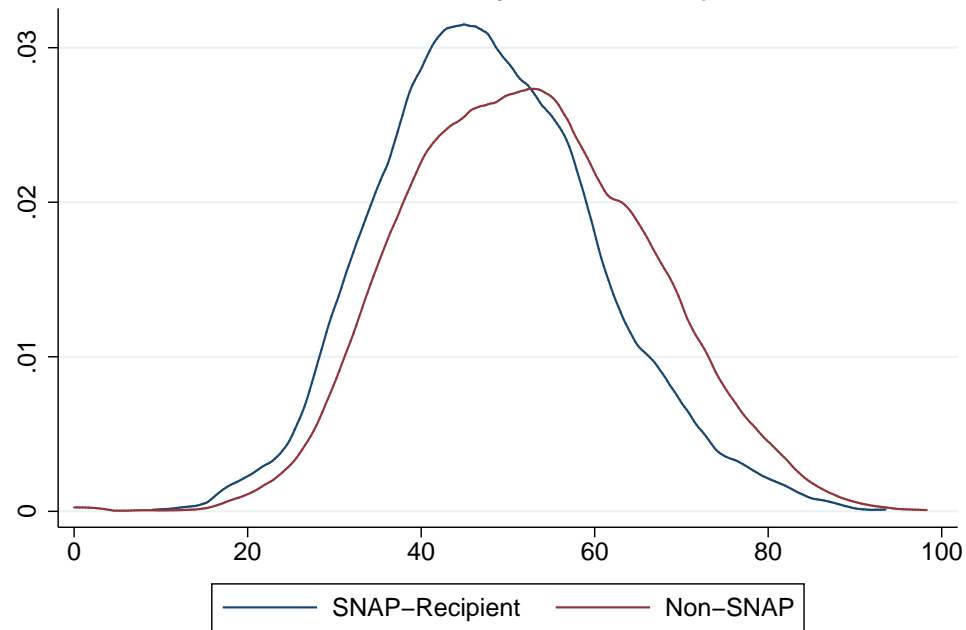
# HEI 2010 Score by Individual



# HEI Category Scores

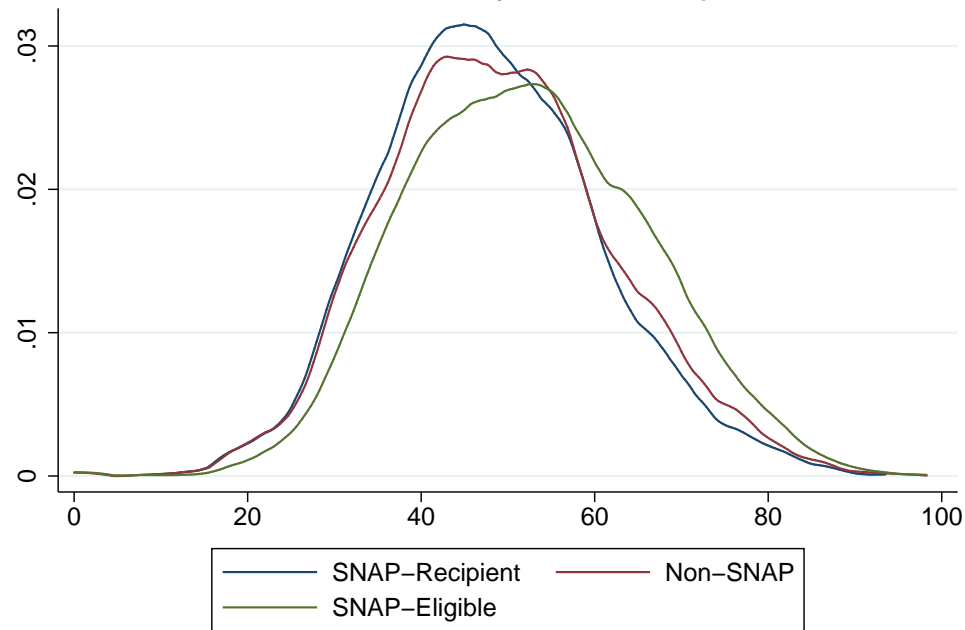


## Individual HEI Scores by SNAP Recipient Status

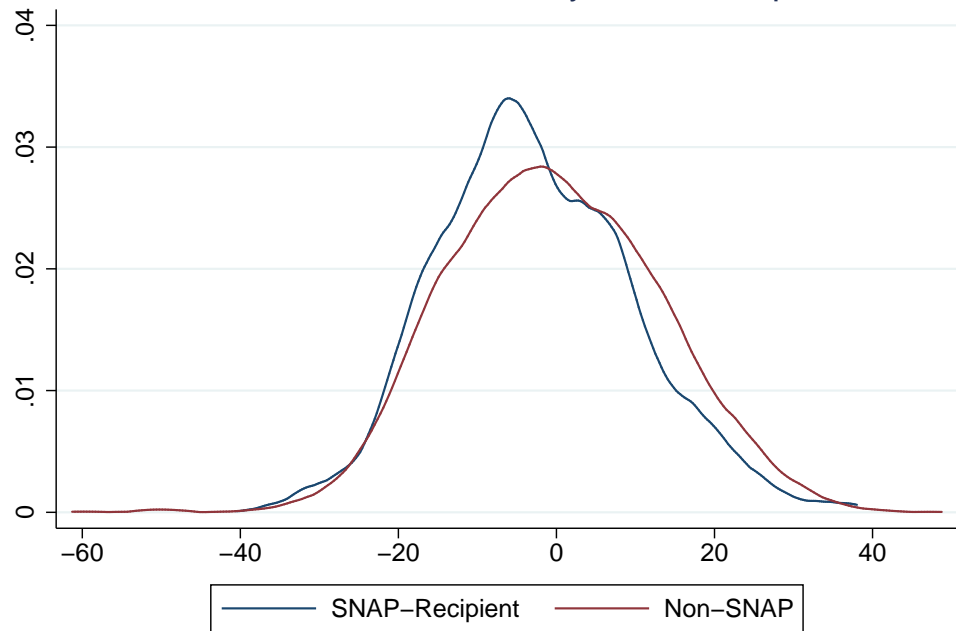




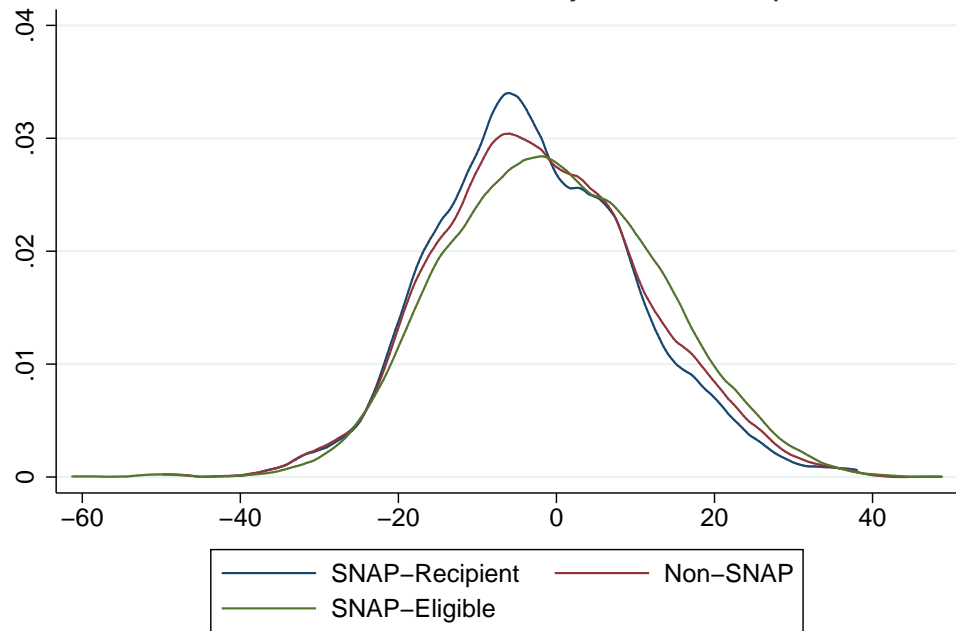
# Individual HEI Scores by SNAP Recipient Status



# Individual HEI Score Residuals by SNAP Recipient Status



# Individual HEI Score Residuals by SNAP Recipient Status



# HEI Total: SNAP Children 2-17

|                                   | (1)               | (2)               | (3)              | (4)               |
|-----------------------------------|-------------------|-------------------|------------------|-------------------|
| ln(SNAPMAX/TFP)                   | -2.938<br>(6.426) | 11.55*<br>(5.919) | 18.17<br>(12.54) | 20.65*<br>(11.35) |
| School Breakfast                  |                   |                   |                  | 1.020<br>(2.757)  |
| School Lunch                      |                   |                   |                  | -4.482<br>(6.768) |
| N                                 | 990               | 975               | 975              | 842               |
| $R^2$                             | 0.001             | 0.160             | 0.225            | 0.296             |
| Mean                              | 53.11             | 53.11             | 53.11            | 53.13             |
| Effect10                          | -0.280            | 1.100             | 1.731            | 1.968             |
| Beta( $R_{max} = 1$ )             |                   | 141.4             | 118.6            | 116.1             |
| Delta( $R_{max} = 1$ )            |                   | -0.0600           | -0.115           | -0.177            |
| Beta( $R_{max} = 1.3\tilde{R}$ )  |                   | 20.26             | 28.14            | 32.63             |
| Delta( $R_{max} = 1.3\tilde{R}$ ) |                   | -0.904            | -1.044           | -1.139            |
| Controls                          | NO                | YES               | YES              | YES               |

# Nutrition Outcomes: SNAP Children 2-17

|   | (1)<br>HEI Veg   | (2)<br>HEI Fruit | (3)<br>SOFA       |
|---|------------------|------------------|-------------------|
| $\ln(\text{SNAPMAX}/\text{TFP})$        | 1.751<br>(1.272) | 1.102<br>(1.632) | -11.90<br>(12.11) |
| N                                       | 1065             | 1065             | 1065              |
| $R^2$                                   | 0.201            | 0.158            | 0.230             |
| Mean                                    | 3.201            | 2.573            | 31.79             |
| Effect10                                | 0.167            | 0.105            | -1.134            |
| $\text{Beta}(R_{\max} = 1.3\tilde{R})$  | 2.672            | 2.121            | -18.64            |
| $\text{Delta}(R_{\max} = 1.3\tilde{R})$ | -1.500           | -0.941           | -1.387            |
| Controls                                | YES              | YES              | YES               |
| State FE                                | YES              | YES              | YES               |

# Nutrition Outcomes: > 300% FPL Children 2-17—Placebo Sample

|   | (1)<br>HEI Total  | (2)<br>HEI Veg    | (3)<br>HEI Fruit  | (4)<br>SOFA      | (5)<br>Alcohol    |
|---|-------------------|-------------------|-------------------|------------------|-------------------|
| $\ln(\text{SNAPMAX}/\text{TFP})$        | -34.45<br>(50.43) | -0.113<br>(3.927) | -1.159<br>(4.500) | 7.891<br>(16.79) | -21.05<br>(456.2) |
| N                                       | 230               | 257               | 257               | 257              | 257               |
| $R^2$                                   | 0.442             | 0.535             | 0.477             | 0.364            | 0.421             |
| Mean                                    | 53.02             | 3.205             | 2.565             | 31.81            | 67.22             |
| Effect10                                | -3.284            | -0.0108           | -0.110            | 0.752            | -2.006            |
| $\text{Beta}(R_{\max} = 1.3\tilde{R})$  | -42.51            | 0.101             | -0.970            | 7.848            | -20.99            |
| $\text{Delta}(R_{\max} = 1.3\tilde{R})$ | -3.255            | 0.538             | 4.922             | 20.06            | 22.47             |
| Controls                                | YES               | YES               | YES               | YES              | YES               |
| State FE                                | YES               | YES               | YES               | YES              | YES               |

# Results

## Nutrition Outcomes: SNAP Adults

|   | (1)<br>HEI Total | (2)<br>HEI Veg   | (3)<br>HEI Fruit | (4)<br>SOFA       | (5)<br>Alcohol    |
|---|------------------|------------------|------------------|-------------------|-------------------|
| $\ln(\text{SNAPMAX}/\text{TFP})$        | 10.27<br>(10.49) | 1.475<br>(1.062) | 0.401<br>(1.188) | -8.201<br>(6.069) | -21.38<br>(83.26) |
| Observations                            | 2145             | 2311             | 2311             | 2311              | 2311              |
| R-squared                               | 0.168            | 0.089            | 0.176            | 0.127             | 0.066             |
| Mean                                    | 53.18            | 3.206            | 2.589            | 31.78             | 67.97             |
| Effect10                                | 0.978            | 0.141            | 0.0382           | -0.782            | -2.038            |
| $\text{Beta}(R_{\max} = 1.3\tilde{R})$  | 18.42            | 2.235            | 1.217            | -13.44            | -17.95            |
| $\text{Delta}(R_{\max} = 1.3\tilde{R})$ | -0.909           | -1.027           | -0.501           | -1.166            | 4.310             |
| Controls                                | YES              | YES              | YES              | YES               | YES               |
| State FE                                | YES              | YES              | YES              | YES               | YES               |

# Results

## Obesity: SNAP Adults

|   |                     | Obese               |                   |                    | Overweight         |                  |
|---|---------------------|---------------------|-------------------|--------------------|--------------------|------------------|
|   | (1)                 | (2)                 | (3)               | (4)                | (5)                | (6)              |
| $\ln(\text{SNAPMAX}/\text{TFP})$        | 0.367***<br>(0.121) | 0.352***<br>(0.102) | 0.422*<br>(0.248) | 0.0644<br>(0.0846) | 0.120*<br>(0.0654) | 0.106<br>(0.171) |
| Observations                            | 2350                | 2289                | 2289              | 2350               | 2289               | 2289             |
| R-squared                               | 0.008               | 0.074               | 0.106             | 0.000              | 0.062              | 0.093            |
| Mean                                    | 0.280               | 0.280               | 0.280             | 0.581              | 0.581              | 0.581            |
| Effect10                                | 0.0350              | 0.0335              | 0.0402            | 0.00614            | 0.0115             | 0.0101           |
| $\text{Beta}(R_{\max} = 1.3\tilde{R})$  |                     | 0.407               | 0.503             |                    | -2.419             | -0.225           |
| $\text{Delta}(R_{\max} = 1.3\tilde{R})$ |                     | -10.69              | -6.547            |                    | -0.389             | 0.383            |
| Controls                                |                     | YES                 | YES               |                    | YES                | YES              |
| State FE                                |                     |                     | YES               |                    |                    | YES              |



# Nutrition

## Tentative conclusions

- ▶ Some suggestive evidence of improvements in HEI with higher SNAP purchasing power.
- ▶ Sign indicates more fruit and vegetables, less sugar, fat, and alcohol.
- ▶ Similar (insignificant) HEI results in children and adults.
- ▶ Significantly higher obesity among SNAP recipient adults with higher SNAP purchasing power.

Thank You