

# Food insecurity and school performance of US children through eighth grade

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# Hardship and Cognitive Scores

- Gaps between students from low- and higher-income families exist at school entry and widen over time (Carneiro and Heckman, 2003).
- Does food insecurity (FI) cause similar test score gaps in children?
- Does FI affect non cognitive attributes?
- Empirical concern is that FI may proxy for other conditions/behaviors common in low-income households
- Policy relevance: will food assistance make a difference or is poverty the real problem?

# Selected Literature

- Alaimo et al. (2001)
  - Finds associations of FI with math scores and grade retention with NHAMESIII data
- Jyoti et al. (2005)
  - Found negative associations between FI and both, math and reading scores in dynamic models
  - Transition into FI predict decreases in reading scores in difference-in-difference models
- Hernandez and Jacknowitz (2009)
  - Found transient FI associated with lower cognitive performance in toddlers with ECLS-B data

# Food Insecurity

- Based on 18 questions
  - Least severe "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more."
  - Most severe "In the last 12 months, did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food?"
- Other studies use either Food Secure vs. not or an indicator of whether one condition was affirmed

# US Household Food Security Survey Module – 18 items

Questions refer to the previous 12 months and are answered as either often true, sometimes true or never true.

1. We worried whether our food would run out before we got money to buy more.
2. The food we bought just didn't last, and we didn't have money to get more.
3. We couldn't afford to eat balanced meals
4. Did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?
5. ---How often did this happen- almost every month, some months but not every month, or in only 1 or 2 months?
6. Did you ever eat less than you felt you should because there wasn't enough money for food?
7. Were you ever hungry but didn't eat because there wasn't enough money for food?
8. Did you lose weight because there wasn't enough money for food?
9. Did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?
10. ---How often did this happen – almost every month, some months but not every month, or in only 1 or 2 months?
11. We relied on only a few kinds of low-cost food to feed our children because we were running out of money to buy food.
12. We couldn't feed our children a balanced meal because we couldn't afford that.
13. Our children were not eating enough because we just couldn't afford enough food.
14. Did you ever cut the size of your children's meals because there wasn't enough money for food?
15. Did any of your children ever skip meals because there wasn't enough money for food?
16. --- How often did this happen – almost every month, some months but not every month, or in only 1 or 2 months?
17. Were your children ever hungry but you just couldn't afford more food?
18. Did your children ever not eat for a whole day because there wasn't enough money for food?

# Contributions

- Examine the impact of FI on cognitive and non-cognitive performance
- Explore different measures of FI
- Use a wider array of controls
- Fixed effects specifications with 4 waves of data for cognitive outcomes and 3 for non cognitive
- Test if persistent vs. recent FI affects test scores

# Data – Early Childhood Longitudinal Study – Kindergarten cohort (ECLS-K)

- The only large national study that follows a cohort of children from K to middle school.
- Representative of US school children. Cohort of 1998-99 kindergartners.
- Data collected in Grades K, 1, 3, 5, 8
- Parent food insecurity survey in spring of K, 3, 5, 8. Survey refers to previous 12 months.
- Test scores from spring of school year.

# Food Insecurity (FI) --Measures

- The raw score is the number of questions affirmed (out of 18 max)
- The Scale score is computed using the Rasch model and is continuous if at least one condition was affirmed
- USDA definitions
  - Marginally food secure (at least one condition)
  - Food Insecure (3 or more conditions)
  - Very low food security (6 or more conditions)

# Appendix: List of covariates from surveys in Gr. K, 3, 5, and 8

|   |   |                                       |  |
|---|---|---------------------------------------|--|
| <u>Race/ethnicity</u>                                       | Black, Hispanic, Asian<br>Other nonwhite  | <u>Household resources</u>            | Income, SES, Parent education  |
| <u>Child disadvantages</u>                                  | Parent report of child disability, ELL, hearing problems, birth weight  | <u>Family structure</u>               | Two bio parents, single parent, lives with one bio parent and other adult, # of kids in home   |
| <u>Conditions at home</u><br><br><u>Conditions at birth</u> | Exercise, health insurance, frequency of parent reading to child, number of books<br><br>WIC, teen mother, mother over 35 | <u>School and geographic location</u> | Free lunch %, region, urban/rural, public school, principal reports of parental involvement, teacher turnover, overcrowding, neighborhood problems |

# Types of analyses

- Cross sectional results for K, 3, 5, 8 individually.
- Fixed effects panel data controlling for time-invariant household or student specific characteristics.
- Does persistence of food insecurity matter?

# Usefulness of panel data (K,3,5,8)

- Makes use of within-household variation in food insecurity to estimate the effect of FI on outcomes.
- There is tremendous variation over time in food insecurity within households.

# Persistence of Food Insecurity

| # of Years | Food Insecurity |         | Severe FI |         |
|------------|-----------------|---------|-----------|---------|
|            | Freq.           | Percent | Freq.     | Percent |
| 0          | 6,255           | 82.67   | 7,160     | 94.63   |
| 1          | 758             | 10.02   | 294       | 3.89    |
| 2          | 305             | 4.03    | 78        | 1.03    |
| 3          | 192             | 2.54    | 29        | 0.38    |
| 4          | 56              | 0.74    | 5         | 0.07    |
| Total      | 7,566           | 100.00  | 7,566     | 100.00  |

Table 3. Estimated coefficients on food insecurity in mathematics achievement regressions

|   | Grade K<br>(n=13,335) |                    | Grade 8<br>(n=7,143) |                    | Panel (K, 3, 5, 8)<br>(n=6,373) |
|---|-----------------------|--------------------|----------------------|--------------------|---------------------------------|
|   | OLS – no<br>controls  | OLS –<br>controls  | OLS – no<br>controls | OLS –<br>controls  | Fixed effects                   |
| <u>Model A</u><br>Any Food Insecurity   | -5.44<br>(0.24)***    | -0.39<br>(0.26)    | -13.55<br>(1.43)***  | 0.09<br>(1.23)     | 0.07<br>(0.30)                  |
| <u>Model B</u><br>Food Insecure by USDA<br>definition (3 or more)             | -5.34<br>(0.31)***    | -0.12<br>(0.32)    | -13.42<br>(1.88)***  | -0.08<br>(1.57)    | -0.24<br>(0.39)                 |
| <u>Model C</u><br>Raw score (# of items of 18)                                | -0.93<br>(0.05)***    | -0.09<br>(0.05)    | -1.88<br>(0.25)***   | 0.03<br>(0.21)     | -0.09<br>(0.06)                 |
| <u>Model D</u><br>Scale score (Rasch)   | -1.18<br>(0.06)***    | -0.10<br>(0.06)    | -2.51<br>(0.30)***   | 0.00<br>(0.26)     | -0.07<br>(0.07)                 |
| <u>Model E</u><br>Marginal FI   | -5.04<br>(0.32)***    | -0.44<br>(0.34)    | -12.41<br>(1.99)***  | -0.63<br>(1.01)    | 0.27<br>(0.38)                  |
| Insecure FI   | -5.66<br>(0.35)***    | -0.26<br>(0.38)    | -14.68<br>(2.52)***  | 0.13<br>(0.99)     | 0.10<br>(0.43)                  |
| Severe FI   | -6.47<br>(0.62)***    | -0.66<br>(0.70)    | -13.56<br>(2.20)***  | -1.27<br>(1.39)    | -1.38<br>(0.73)*                |
| <u>Additional results</u><br>Early poverty status<br>(proxied by WIC receipt) | -7.81<br>(0.19)***    | -1.27<br>(0.24)*** | -16.83<br>(0.94)***  | -2.74<br>(0.58)*** | --                              |



# Impact of Persistence on Cognitive Skills

|         |             | Severe FI |         | FI     |          |
|---------|-------------|-----------|---------|--------|----------|
| Math    | One Year    | -0.996    | 1.169   | -0.454 | 0.768    |
|         | Two Years   | -0.915    | 2.162   | -1.141 | 1.157    |
|         | Three Years | -1.547    | 3.254   | -1.495 | 1.255    |
| Reading | One Year    | -2.239    | 1.440   | -2.580 | 0.940 ** |
|         | Two Years   | 1.434     | 2.641   | -0.810 | 1.418    |
|         | Three Years | -7.172    | 3.975 * | -0.612 | 1.540    |

We also examine non-cognitive  
outcomes from K, 3, and 5

# Non Cognitive Skills

- The measures are adapted from the Social Skills Rating System of Gresham and Elliott (1990)
  - **Approaches to Learning** (attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization)
  - **Self Control** (respecting the property rights of others, controlling temper, accepting peer ideas for group activities, and responding appropriately to pressure from peers)
  - **Externalizing behaviors** (the frequency with which a child argues, fights, gets angry, acts impulsively, and disturbs ongoing activities)
- Assessed by the teacher

# Food insecurity's impact on non cognitive skills

|               |          | K                   |                     | 3rd                 |                     | 5th                 |                     | Fixed Effects       |
|---------------|----------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|               |          | No Controls         | Controls            | No Controls         | Controls            | No Controls         | Controls            | Controls            |
| App. Learning | Marginal | -0.166**<br>(0.019) | -0.009<br>(0.021)   | -0.198**<br>(0.031) | -0.040<br>(0.029)   | -0.213**<br>(0.030) | -0.042<br>(0.028)   | -0.003<br>(0.018)   |
|               | Insecure | -0.191**<br>(0.021) | -0.017<br>(0.023)   | -0.251**<br>(0.033) | -0.060*<br>(0.032)  | -0.258**<br>(0.030) | -0.068<br>(0.029)   | -0.017<br>(0.021)   |
|               | Severe   | -0.264**<br>(0.040) | -0.094**<br>(0.044) | -0.385**<br>(0.057) | -0.121**<br>(0.053) | -0.361**<br>(0.050) | -0.106**<br>(0.047) | -0.040<br>(0.040)   |
| Control       | Marginal | -0.095**<br>(0.018) | 0.009<br>(0.020)    | -0.157**<br>(0.028) | -0.039<br>(0.027)   | -0.159**<br>(0.026) | -0.038<br>(0.026)   | 0.008<br>(0.018)    |
|               | Insecure | -0.117**<br>(0.020) | -0.015<br>(0.022)   | -0.209**<br>(0.030) | -0.076**<br>(0.030) | -0.184**<br>(0.027) | -0.052**<br>(0.027) | -0.009<br>(0.021)   |
|               | Severe   | -0.185**<br>(0.037) | -0.079*<br>(0.042)  | -0.206**<br>(0.051) | -0.037<br>(0.050)   | -0.246**<br>(0.044) | -0.100**<br>(0.044) | -0.032<br>(0.040)   |
| Externalizing | Marginal | 0.075**<br>(0.018)  | -0.012<br>(0.020)   | 0.117**<br>(0.027)  | 0.018<br>(0.026)    | 0.124**<br>(0.025)  | 0.008<br>(0.024)    | -0.047**<br>(0.016) |
|               | Insecure | 0.114**<br>(0.020)  | 0.025<br>(0.023)    | 0.162**<br>(0.029)  | 0.056**<br>(0.029)  | 0.122**<br>(0.026)  | 0.003<br>(0.025)    | -0.011<br>(0.019)   |
|               | Severe   | 0.141**<br>(0.038)  | 0.028<br>(0.043)    | 0.231**<br>(0.050)  | 0.071<br>(0.048)    | 0.147**<br>(0.043)  | -0.006<br>(0.042)   | 0.072**<br>(0.035)  |

# Conclusions

- Food Insecurity does not appear to have a robust effect on cognitive outcomes
  - Finding is robust to several controls and to alternative measures of FI
- Fixed effects models show a significant but very small impact of only severe food insecurity
  - Detail in the measure of FI matters
- Persistence in FI status
  - Low persistence
  - No significant impact
- Limited impact on non-cognitive outcomes

# Discussion

- Some of the controls as mediators
  - Parental Depression
  - Reading to children, number of books
- Longitudinal models
  - Time Varying Controls
- Relationship between cognitive and non cognitive outcomes
- Measurement error
- WIC participation