

# Investigating spillovers of FTS programming on households' fruits and vegetables purchasing habit

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**FOOD SYSTEMS**  
COLORADO STATE UNIVERSITY



United States Department of Agriculture  
National Institute of Food and Agriculture

# DISCLAIMERS / ACKNOWLEDGEMENTS

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# Background and Motivation 1/2

## Why Farm to School?

Two major purposes (Allen and Guthman, 2006):

- providing children access to nutritious food
- providing markets for local growers



### Kids WIN

Farm to school provides all kids access to nutritious, high quality, local food so they are ready to learn and grow. Farm to school activities enhance classroom education through hands-on learning related to food, health, agriculture and nutrition.



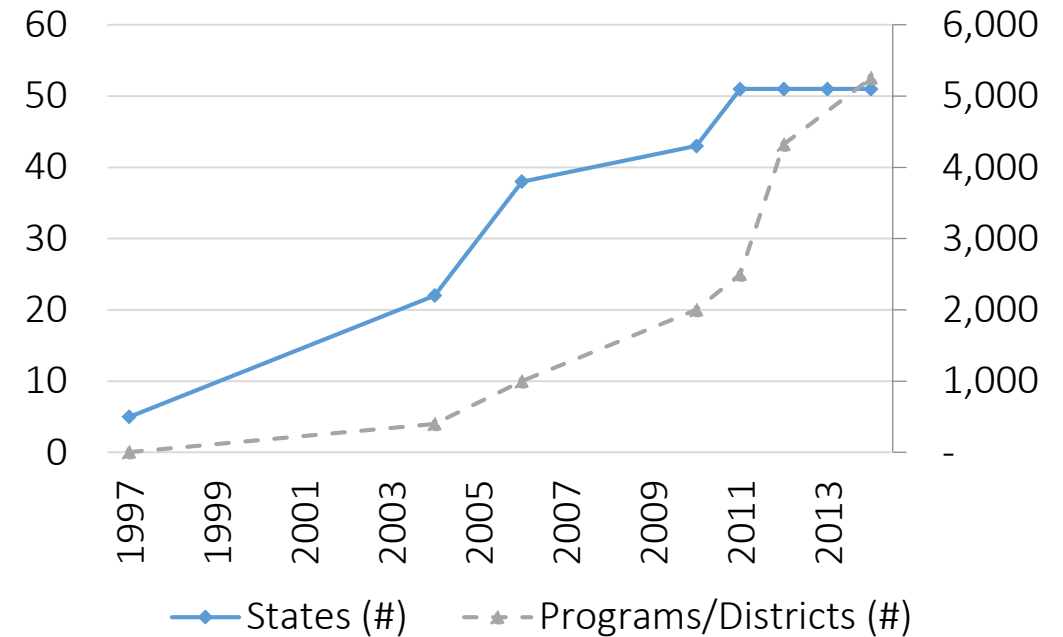
### Farmers WIN

Farm to school can serve as a significant financial opportunity for farmers, fishers, ranchers, food processors and food manufacturers by opening the doors to an institutional market worth billions of dollars.



### Communities WIN

Farm to school benefits everyone from students, teachers and administrators to parents and farmers, providing opportunities to build family and community engagement. Buying from local producers and processors creates new jobs and strengthens the local economy.



Growth of participating in farm to school programs in the U.S., by states and school districts, 1997-2014

Source: National Farm to School Network 2016.

## Background and Motivation 2/2

Evidence on FTSP's effectiveness to improve health outcomes in children is still limited (Prescott et al. Forthcoming).

However, in order to fully assess the effects of FTS on overall diets, one should also consider spillover effects to the entire household.

Example of research assessing spillovers of federal programs exists:

- Bhattacharya et al (2005) finds that while School Breakfast program recipients improve their nutritional outcomes, other household members experience fewer positive effects
- Ver Ploeg (2009) finds that children 5–17 living in WIC-participating families have higher HEI than children in non participating families

# Research Objectives

Does School Districts' participation in FTSP influence households with school age children Food-At-Home fruit and vegetables purchases?

- Measure the effects of repeated exposures (i.e. treatment + dose)
- By metro and non-metro households
- By age / number of the children in the households

**NOTE: Results are preliminary and incomplete!**

# Empirical Approach, Data, and Estimation 1/3

Method: Endogenous Dose-Response Model – EDR (Baum and Cerulli, 2016)

## **Method (in a nutshell) :**

1. “Treatment” and “Dose” equations are estimated first using a Heckman selection model (Heckman 1979) where “Treatment” is the selection equation
2. Predicted values of Treatment and Dose are used in the “Outcome” equation in place of observed ones

## Why the EDR model?

- Nutrition/ public health lit show that longer interventions are more effective on children’s health related outcomes → “doses” matter
- Households may self-select in areas more conducive to FTS; also a school district’s (SD) decisions to participate and continue FTS are endogenous

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# Empirical Approach, Data, and Estimation 2/3

For the specification of the treatment and the dose equation we follow Botkins and Roe (2018) and Bonanno and Mendis (2019)

Treatment Equation  $P(FTS_{it} = 1) = \Phi(SDch_{it}, \textit{Market}_{it}, Demand_{it}, Policies_{it} | \gamma)$

Dose Equation  $FTSY_{it} = f(SDch_{it}, Demand_{it}, Policies_{it}, \textit{Act}_{it-v} | \theta)$

Outcome Equation; Household Monthly Expenditure in FV; FV expenditure shares

$$FV_{it} = \alpha_0 + \sum_k \alpha_k X_{kit} + FTS_{it} \sum_l \delta_l (X_{lit} - \bar{X}_l) + ATE * FTS_{it} + D * FTS_{it} * FTSY_{it} + S_{it} + M_{it} + R_{it} + e_{it}$$

- $X_i$ : HH size, Home ownership, Child's age, HH income, HH head ethnicity and race, HH head education level etc...
- S, M and R are Fixed Effects (Region, Monthly, and RUCCs)



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# Empirical Approach, Data, and Estimation 3/3

**Data:** IRI Consumer Network Panel (2011-2015), matched with Farm To School Census Data (academic years 2011-2012 and 2013-2014)

## Matching

- Based on Zip-code, and distance from the HH Block Centroid to the SD Centroid

IRI-CNP FV purchases aggregated at the monthly level - Households with Children from the “Static Panel” purchasing FV retained in the data

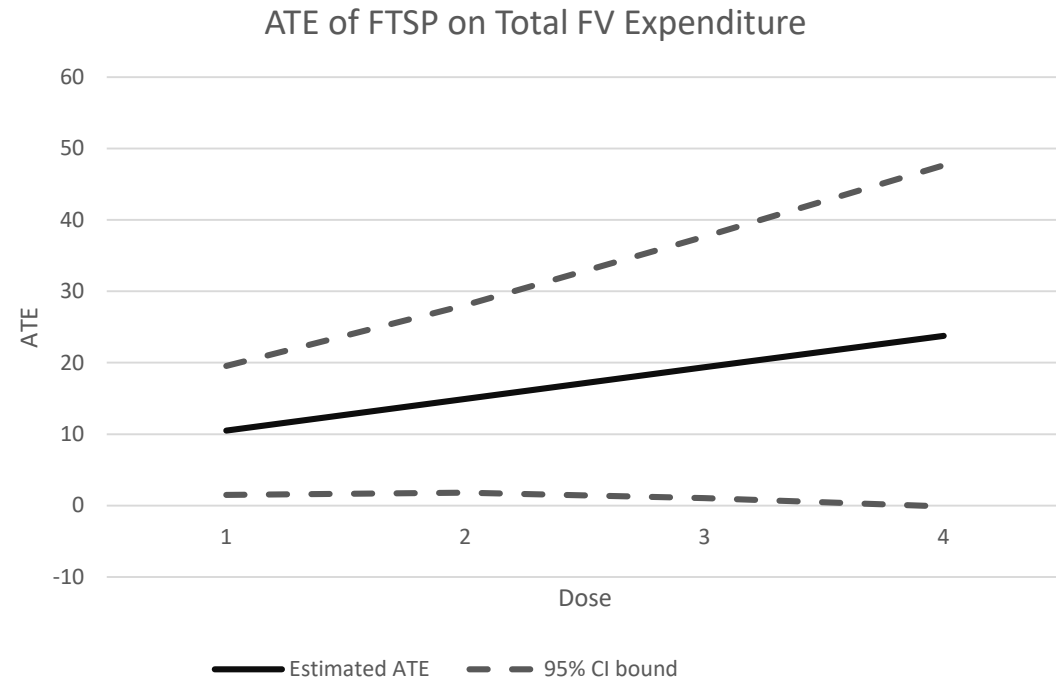
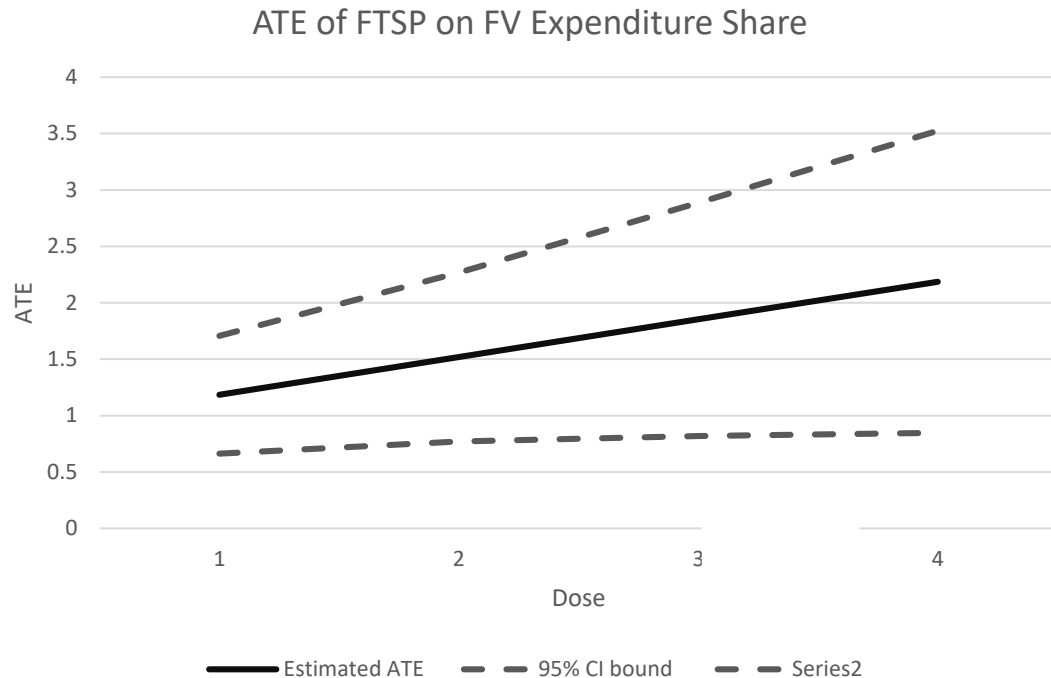
- FV: all fresh, frozen, canned, and dried fruits and vegetables which are included in the National School Lunch Program (NSLP) and School Breakfast Program (SBP)

SD participation and continuation in FTS for missing years of the FTS Census, were imputed either via interpolation or via probit regression and out-of sample predictions

# Empirical Results 1/3

## Estimated Average Treatment Effects (ATE)

$$\frac{\partial FV_{it}}{\partial FTS_{it}} = ATE + D * FTSY_{it}$$

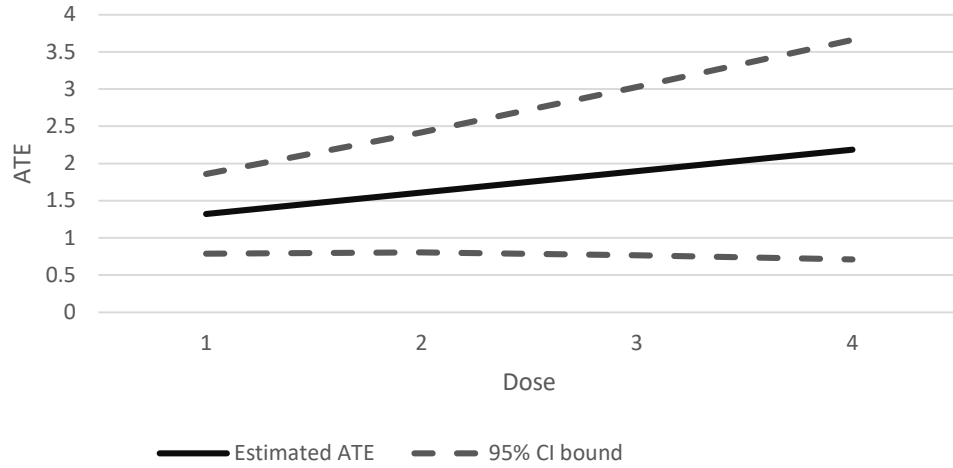


# Empirical Results 2/3

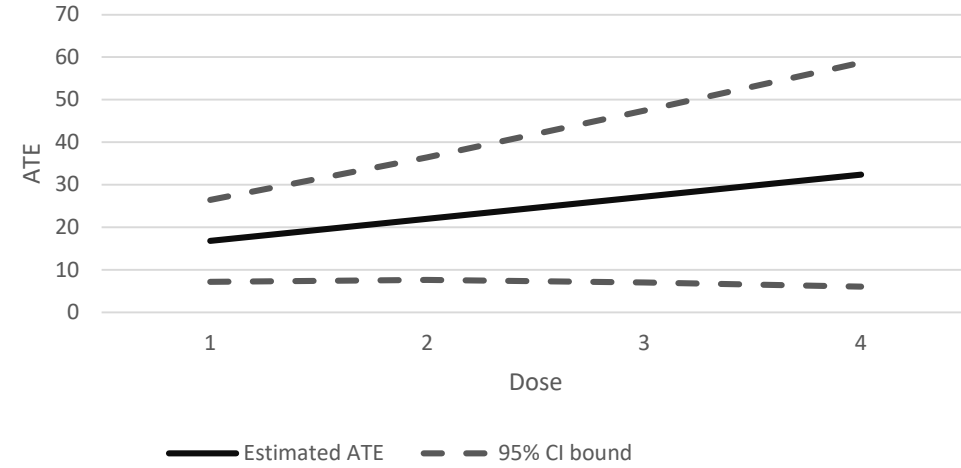
$$\frac{\partial FV_{it}}{\partial FTS_{it}} = ATE + D * FTSY_{it}$$

## Estimated Average Treatment Effects (ATE) by Metro and Non-Metro HHs subsamples

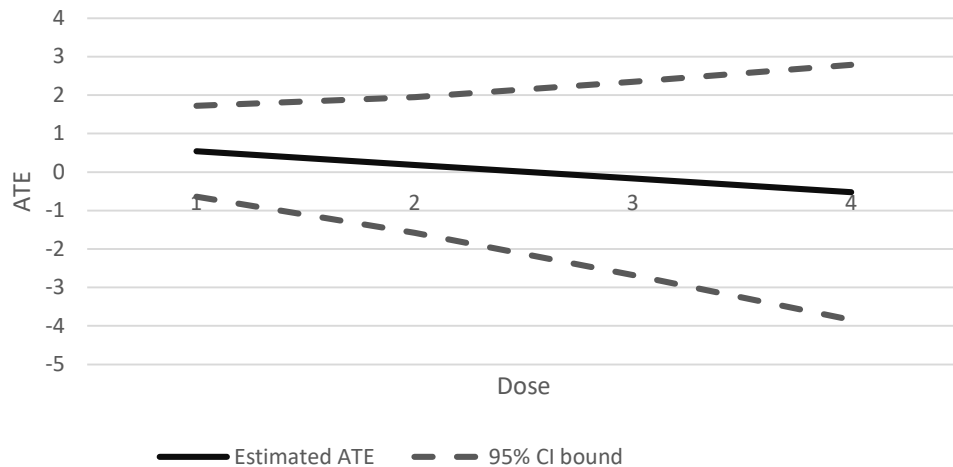
ATE of FTSP on FV Expenditure Share in Metro



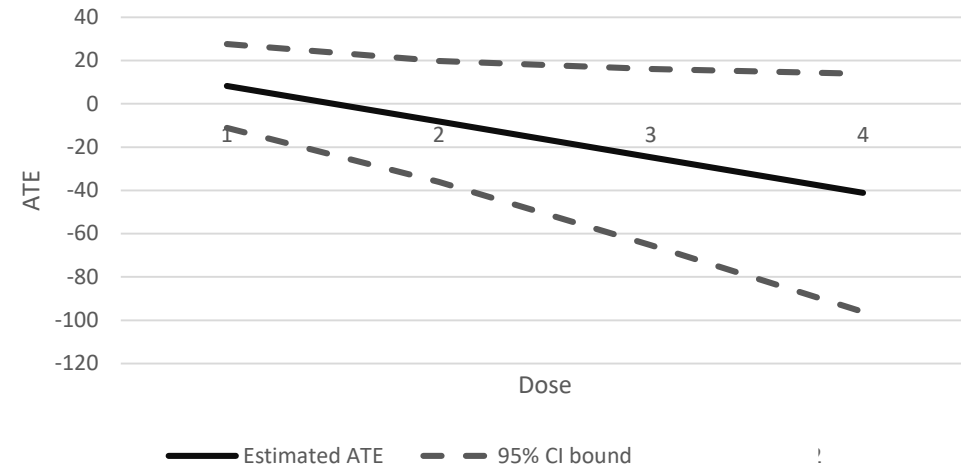
ATE of FTSP on Total FV Expenditure in Metro



ATE of FTSP on FV Expenditure Share in Non-Metro



ATE of FTSP on Total FV Expenditure in Non-Metro

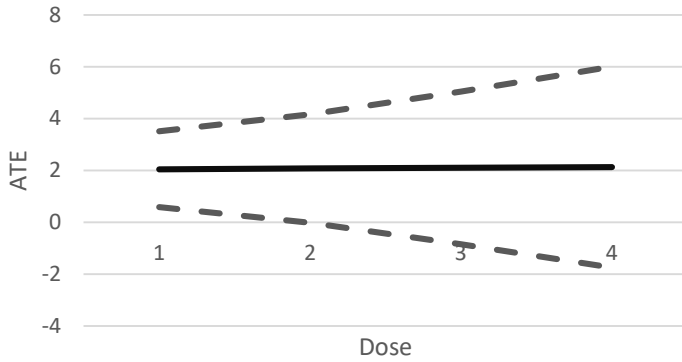


# Empirical Results 3/3

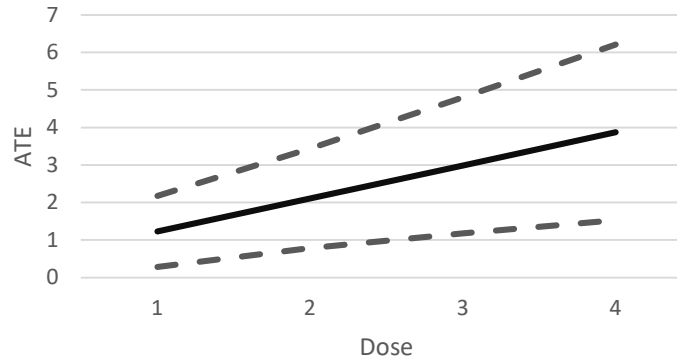
$$\frac{\partial FV_{it}}{\partial FTS_{it}} = ATE + D * FTSY_{it}$$

Estimated Average Treatment Effects (ATE) on FV Expenditure Share by HHs subsample which belongs to the “Children” categories

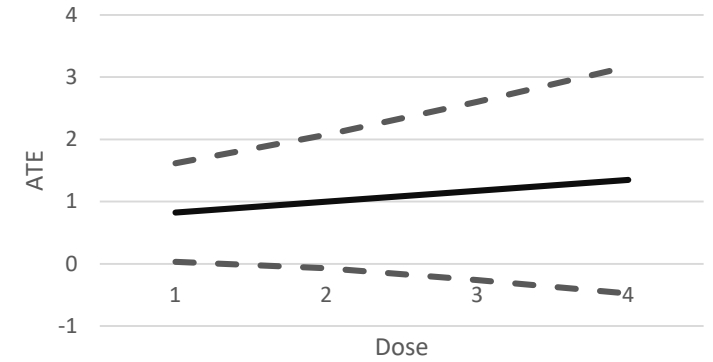
Children 0-6



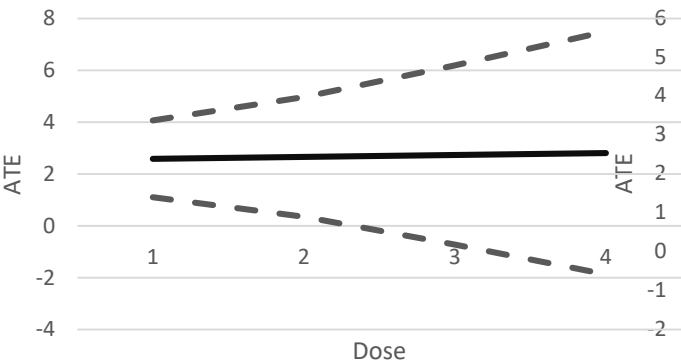
Children 6-13



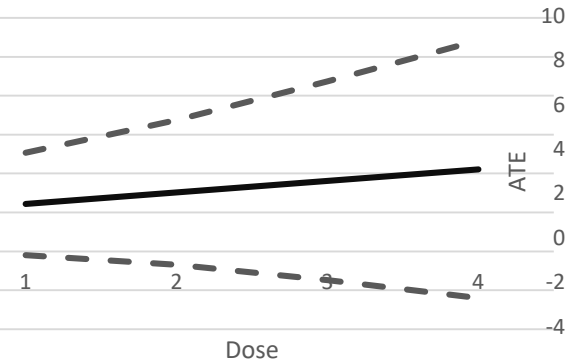
Children 13-18



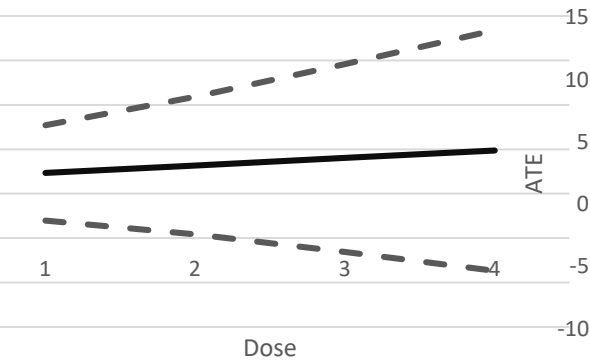
Children 0-6 & 6-13



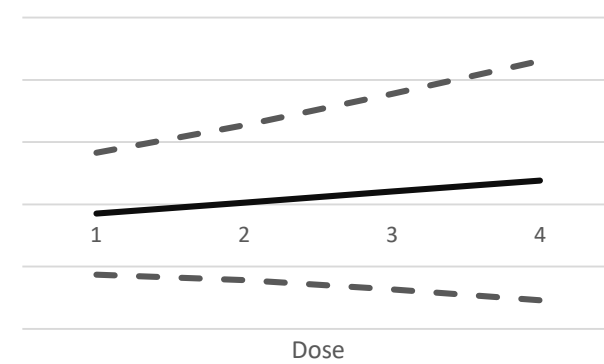
Children 6-13 & 13-18



Children 0-6 & 13-18



Children 0-6, 6-13, & 13-18



— Estimated ATE    - - - 95% CI bound

# Next Steps

1. Evaluate the validity of identification assumption and test for different IVs
2. Subsamples by poverty thresholds/income categories
3. Falsification exercises
  - HHs without children
  - Categories that should not be affected by FTS (Suggestions are welcome)
4. Different ways to measure “doses” of FTS participation (by number of activities perhaps?)

**Thank You**