The Effect of SNAP and School Food Programs on Food Spending, Diet Quality, and Food Security: Sensitivity to Program and Income Reporting Error

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Goals

- Fairly large literature by now on the effects of SNAP on various food-related outcomes
- Smaller literature on the effects of school programs
- Reviews: Bitler (2016), Gregory et al. (2016), Hoynes et al. (2016), Hoynes and Schanzenbach (2016), among others
- Results often show favorable effects of program participation but a nontrivial number of insignificant effects and a few wrong-signed
- The main methodological issue discussed in the lit to possibly explain the weakness of many findings is selection bias
- But another hypothesis is measurement error in survey-measured SNAP participation

- Goal of this project: to use the FoodAPS data on survey-measured SNAP participation and from the administrative data to see if correcting for measurement error changes the estimates of the effect of SNAP on food-related outcomes
- Will also study school food programs: have not gotten to that yet
- And will study income reporting error: have not gotten to that yet, either

Econometrics of Measurement Error

- In linear models with classical measurement error in a single X in a regression, OLS coefficient is biased downward in absolute value (i.e., biased toward zero)
- With nonclassical measurement error or with other X's in the equation, all bets are off
- In models with a dichotomous single X and classical measurement error in that X (i.e., measurement error that is independent of the error term in the outcome equation), get downward biased OLS coefficient as well, at least if measurement error is not too large (see below)

- Does IV which takes care of the selection bias problem also take care of measurement error?
- Answer is no; even with a valid instrument, the IV coefficient on the binary X is biased and consistent (in simple case, biased upward)
- There are methods for correcting for this bias, but they generally require stronger assumptions or data (parametric measurement error, use of higher order moments, multiple measures, etc.)

- Let y be the outcome variable, P^* be true participation, P^r be reported participation, and β is the true effect
- Assume measurement error is uncorrelated with the error term in the y equation
- OLS reg of y on P^r yields coefficient $\beta(1 - q_1\pi_{10} - q_2\pi_{01})$ where π_{10} is the rate of false negatives (if the true is 1, the report is 0) and π_{01} is rate of false positives (true is 0, report is 1)
  and where q_1 and q_2 are fractions (i.e., between 0 and 1)
- If π_{10} or π_{01} is correlated with the error term in the y equation, OLS yields a different biased coefficient

- If you run IV with instrument Z used to instrument P^r, the coefficient on predicted P^r is

$$\frac{\beta}{(1-\pi_{10}-\pi_{01})} \tag{1}$$

  and hence is biased upward in absolute value
- This assumes that Z is a valid instrument for P^r as well as for P^*, i.e., it is independent of the measurement error
- Again, if measurement error is correlated with the error term in the y equation, the bias is different

Approach

- Run OLS and IV, using survey reports of SNAP participation and admin data
- Take admin data as truth for now (comments below on the likely effect of this)
- Use state-specific SNAP rules as instruments
- Identify a few studies before which have done this and attempt to roughly imitate them

Table: Summary of Key Studies

Study	Subsample	Dataset	IV	Dependent Variable
Greenhalgh-Stanley et al (2013)	$\geq$ 60 years-old \$3,000 and \$5,000 asset limit monthly income $\leq$ PL+ \$500	Health and Retirement Study (HRS) 2000-2008 recertification period	Outreach, CAPs, EBT implementation,	SNAP participation Food Insecurity
Shaefer and Gutierrez (2012)	HH w/ at least one adult and one child, $<$150 PL	SIPP 1996,2001,2004	short recertification period	FSP participation Food Insecurity
Ratcliffe et al (2010)	HH w/ $<$150PL, \$4000 or \$5000 asset limit	SIPP 1996,2001,2004	biometric technology outreach spending partial/full immigrant eligibility	FSP participation Food Insecurity
Kabbani and Yazbeck (2004)	$<$ 185 PL	April 1995,97,99,01 CPS Food Security Supplements	short recertification monthly reporting EBT implementation outreach spending	FSP participation Food Insecurity
Gregory et al (2013)	HH with 200 PL at least 19	2003-2008 NHANES	use of BBCE, exempt one vehicle from asset test	HEI, macro-nutrients intake
Gregory et al (2016)	HH with $<$130 PL	2009-2011 CPS-FSS	citizenship, certification interval	Food Insecurity
Deb and Gregory (2016)	HH with $<$185 PL	2006-2013 Dec. CPS -FSS	Outreach spending	Food Spending Food Insecurity
Kabbani and Yazbeck	HH with $<$185 PL	April 1995, 97, 99, 01	citizenship, certification	FSP participation
Baum (2007)	Individuals with no more than a HS education	NLSY79 NLSY79	value of vehicles elderly	Obesity

Data

- Analytic Sample : $<$ 200% Poverty Level, at least 1 child, Asset level below $3,000, with Match consent
- We limit sample so that
  - it includes households that are more likely to be SNAP eligible
  - Misreporting rates are relatively high

Table: SNAPNOWREPORT by SNAPNOWHH

	SNAPNOWHH			
SNAPNOWREPORT	0	1	Missing	Total
0	0.459	0.0356	0	0.494
1	0.004	0.500	0	0.504
don't know	0	0	0.000	0.000
refused	0	0.001	0	0.001
Total	0.463	0.537	0.000	1

N = 1298

Rates and Correlates of Measurement Error

- The false negative and false positive rates are from the column percents in this table
- Also: we have started with food insecurity as the dependent variable: LFS (Low Food Security) and VLFS (Very Low Food Security), which are 30-day adult measures in FoodAPS

Table: Rates of Misreporting and LFS, by different subsample

	sample	<2PL	<2PL <3K	<2PL <3K, child
False Negative	0.0662	0.0579	0.0562	0.0649
	(0.0106)	(0.00786)	(0.00711)	(0.0103)
False Positive	0.0088	0.0085	0.0113	0.0087
	(0.0050)	(0.0044)	(0.0058)	(0.0050)
LFS	0.146	0.133	0.156	0.147
	(0.0135)	(0.012)	(0.0135)	(0.0136)
VLFS	0.0271	0.0354	0.0419	0.0267
	(0.00428)	(0.00521)	(0.00613)	(0.00418)
N	1299	2706	2408	1325

Table: Determinants of Misreporting

	False Negative		False Positive	
	Coeff.	s.e.	Coeff.	s.e.
No. Children	0.000	0.008	0.002	0.007
Elderly	-0.004	0.026	-0.005	0.003
Non-metro	-0.052***	0.011	0.014	0.015
Own Housing	-0.008**	0.014	-0.011	0.007
Black	0.010	0.013	-0.007	0.019
Hispanic	-0.008	0.018	-0.010	0.010
Age	-0.000	0.001	-0.001	0.001
Male	0.025	0.023	-0.015	-0.015
less than HS	-0.001	0.000	-0.001	-0.001
HS grad	-0.025	0.023	0.003	0.011
Married	0.057*	0.032	0.008	0.013
Widowed	0.030	0.034	-0.007	0.009
log(income)	0.021**	0.008	-0.027	0.021
Report Excellent Health	-0.046	0.034	-0.011	0.010
Working	0.034*	0.020	-0.014	0.018
LFS (if added)	-0.090	0.024	-0.002	0.259
N	1256		1047	

Sample: <2PL, < $3000 asset level

Table: Effect of SNAP participation on LFS, by report status

SNAPNOWHH		Difference			
1	0				w/ child, consent
	Report	All	w/ child	w/ child, consent	State admin
1	0	0.69	-0.012	-0.09	0.016
1	1	0.53	-0.013	-0.011	-0.007
0	1	0.71	-0.017	-0.016	-0.018
0	0	0.87	-0.16	-0.014	0.006
N		2406	1323	1298	1120

Subsample: <2PL, <3K. The value of true effect, $E(LFS|SNAPNOWHH = 1) - E(LFS|SNAPNOWHH = 0)$, by Reported SNAP participation status.

OLS

- Regs on SNAPNOWHH and SNAPNOWREPORT, with and without X's

Table: LFS on SNAPNOWREPORT and LFS on SNAPNOWHH

	(1)	(2)	(3)	(4)	(5)	(6)
SNAPNOW	-0.006	-0.017	-0.017	-0.027	-0.025	-0.028
REPORT	(0.031)	(0.034)	(0.034)	(0.030)	(0.030)	(0.030)
SNAPNOW	-0.006	-0.017	-0.016	-0.028	-0.026	-0.030
HH	(0.030)	(0.030)	(0.034)	(0.031)	(0.031)	(0.032)
Controls						
Head char.	No	Yes	Yes	Yes	Yes	Yes
Household char.	No	No	Yes	Yes	Yes	Yes
Economic var.	No	No	No	Yes	Yes	Yes
Other Program	No	No	No	No	Yes	Yes
State char.	No	No	No	No	No	Yes
N	1296	1289	1289	1241	1241	1241

Coefficients on SNAPNOWREPORT and SNAPNOWHH are obtained from two separate regressions.

IV

- Same

Table: IV estimates of LFS on SNAP participation

	(1)	(2)	(3)	(4)	N
SNAPNOWHH	-0.115	0.051	-0.030	0.108	1242
	(0.479)	(0.216)	(0.470)	(0.211)	
SNAPNOWREPORT	-0.113	0.060	-0.026	0.126	1241
	(0.494)	(0.208)	(0.482)	(0.217)	
Head Char	Yes	Yes	Yes	Yes	
Household Char	Yes	Yes	Yes	Yes	
Economic Var	Yes	Yes	Yes	Yes	
Other Program	No	Yes	No	Yes	
State char.	No	Yes	No	Yes	

Instruments for (1) and (2) : Outreach per capita, % earners with short recertification interval, use of biometric technology, (3) and (4) : Outreach, % earners with short recertification interval, use of biometric technology

Conclusions

- Measurement error is very small in FoodAPS, although it depends somewhat on what sample is used
- As a consequence, it makes no difference whatsoever to the estimated effects of SNAP participation on outcomes whether one uses the survey report or the admin report
- Same result whether one uses IV or OLS
- Have taken admin report as true, but if they have error, then the true measurement error is even smaller than what we have estimated and hence the effect on SNAP estimates is even smaller
- Measurement error has a slight correlation with Xs but not much with error term in LFS equations