Within and Across County Variation in SNAP Misreporting Using Linked ACS and Administrative Records

Benjamin Cerf Harris
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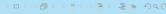U.S. Census Bureau

CARRA Seminar, June 27, 2013

Overview

What I do:

- Investigate how survey misreporting varies across counties in a given year
- Investigate how survey misreporting persists within counties over several years
- Identify other county level correlates of misreporting

Why I do it:

- Better understanding of the statistical problems can lead to solutions
- Differences in survey misreporting rates may provide information about how individuals' behavior differs across counties

Motivation I

- ▶ The Supplemental Nutrition Assistance Program (SNAP) served 40.3 million people in 2010 and is the largest federal program to reduce hunger.
- ▶ Nevertheless, an estimated 28 percent of eligible individuals did not participate during that same year.
- ▶ Reaching eligible non-participants requires information about up-take by detailed social, demographic, and geographic characteristics.
- ▶ Survey data have detailed characteristics, but there is substantial misreporting of SNAP (and other program) participation in surveys, which leads to biased survey estimates.

Motivation II

► Linking survey data with administrative records (AR) allow us to examine direction and magnitude of misreporting bias by social, demographic, and geographic characteristics.

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Types of Survey Misreporting

	Survey Response:	
	Participant	Non-Participant
In AR	SNAP Participant in Survey and AR	False-Negative (FN) error
Not in AR	False-Positive (FP) error	Non-Participant

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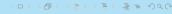
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- ▶ Without linked data, researchers can only identify **net underreporting** or **net overreporting** by comparing the total number of positive survey responses to the total number of individuals in the administrative records.
- ▶ With individual linked data, we can distinguish between FN and FP responses.

What we know about misreporting

- ▶ Misreporting in social and economic data is usually systematic, leading to bias that is often predictable.
- ▶ National estimates of net underreporting in SNAP range from 28 to 47 percent.
- ▶ Estimates of FN rates—usually at the state-level—range from 12 to 37 percent.
- ▶ FP rates are negligible.

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- Estimates of FN rates—usually at the state-level—range from 12 to 37 percent.
- FP rates are negligible. I will focus on FN rates.

Mechanisms thought to cause FN responses

Cognitive issues:

- ▶ Confusion about reference period of the question
- ▶ Confusion about to whom the question refers
- ▶ Faulty recall

Behavioral issues:

- ▶ Non-cooperativeness
- ▶ Social desirability bias, interviewer effects, stigma

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Research questions

Question 1: How much cross-sectional variation is there in FN and FP rates across counties in a given year?

Question 2: How persistent are FN and FP rates within counties over time?

Question 3: What are the main covariates of county-level FN and FP rates?

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Importance

Question 1: In a given year, spatial variation in misreporting could generate estimates that lead to faulty conclusions about which areas are in need of attention and resources.

Question 2: Persistence in misreporting within areas is important because estimates of the effectiveness of outreach on participation, or participation on other outcomes, will be downward biased in areas with persistently high FN rates.

Question 3: Correlates with county-level misreporting can allow researchers without direct information on misreporting rates to predict the sign and relative magnitude of misreporting bias within different counties.

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Summary of findings

Question 1: Both FN and FP rates vary substantially across counties within a given year.

Question 2: Some evidence of persistence of FN rates, especially within very populous counties. No evidence of persistence of FP rates.

Question 3: FN rates are:

▶ positively correlated with lagged FN rates, percent male, percent foreign born;

▶ negatively correlated with the length of the average SNAP spell and positive responses to questions about other transfer programs; and

▶ more persistent in highly-populated counties.

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Contributions

- First estimates of county-level FN and FP rates
- First analysis of dynamics of county-level FN and FP rates
- First estimates of correlates of county-level FN rates

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Data

- New York SNAP AR (2007–2010) linked to ACS (2008–2010)
- Texas SNAP AR (2005–2009) linked to ACS (2006–2009)
- Individual records linked by Protected Identification Key (PIK)
- ACS question refers to household-level participation
  - FN and FP responses determined based on household participation
  - Individual weights adjusted by inverse predicted probability of living in a household with at least one person assigned a PIK
- Drop ACS respondents with imputed values for SNAP participation
- County aggregates obtained from individual-level data
- Drop counties with fewer than 15 individuals in AR
- 828 county-years in total

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Analytic framework

Question 1: Distributional statistics

Question 2: Compare measured persistence (autocorrelation coefficients, variance decomposition) of county FN and FP rates to two extreme scenarios:

Certainty: Ranking of counties in FN and FP distributions never change

Lottery: Individual FN and FP responses are randomly assigned

Question 3: Multivariate regression

Variation Across Counties

Table 1: Yearly Distribution of County-Level SNAP FN Rates

	State Mean	Mean over Counties	Standard Deviation	Min	Percentile 10	50	90	Max	90:10 ratio
New York									
2008	30.2	30.7	14.5	0.0	15.2	30.8	44.9	70.4	2.9
2009	27.4	28.1	10.5	7.6	16.8	26.8	38.7	75.3	2.3
2010	28.6	27.7	9.9	10.7	18.3	25.0	40.0	56.2	2.2
Texas									
2006	38.2	37.9	24.6	0.0	2.3	37.1	68.7	100	29.4
2007	40.4	40.1	24.5	0.0	4.9	39.6	73.1	100	15.0
2008	35.4	36.2	23.2	0.0	7.5	34.2	63.3	100	8.5
2009	32.4	30.8	21.5	0.0	0.0	30.0	56.3	100	-

Source: County aggregates from 2005-2009 TX / 2007-2010 NY SNAP AR linked with 2006-2010 ACS

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2009	27.4	28.1	10.5	7.6	16.8	26.8	38.7	75.3	2.3
2010	28.6	27.7	9.9	10.7	18.3	25.0	40.0	56.2	2.2
Texas									
2006	38.2	37.9	24.6	0.0	2.3	37.1	68.7	100	29.4
2007	40.4	40.1	24.5	0.0	4.9	39.6	73.1	100	15.0
2008	35.4	36.2	23.2	0.0	7.5	34.2	63.3	100	8.5
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Variation Within Counties I

Table 2: Stability in the FN Rate Distribution

| | Percentage of Counties Ranked in Quartile: | | | | | |
| | 1st | | | 4th | | |
	Certainty	Reality	Lottery	Certainty	Reality	Lottery
New York						
Never	75.0	50.0	87.1	75.0	53.2	77.4
1 year	0.0	27.4	11.3	0.0	21.0	19.4
2 years	0.0	17.7	1.6	0.0	21.0	3.2
3 years	25.0	4.8	0.0	25.0	4.8	0.0
Texas						
Never	75.0	39.4	66.1	75.0	42.9	68.5
1 year	0.0	40.2	25.2	0.0	44.1	28.0
2 years	0.0	14.6	6.7	0.0	11.4	3.5
3 years	0.0	5.9	2.0	0.0	1.6	0.0
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Variation Within Counties II

Table 3. Autocorrelation of County Misreporting

	False-Negative Rates				False-Positive Rates		
	t	t-1	t-2		t	t-1	t-2
t	1.0			t	1.0		
t-1	0.1*	1.0		t-1	0.0	1.0	
t-2	0.1***	0.1***	1.0	t-2	0.1**	-0.1**	1.0

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False-Negative Rate Correlates I

Table 4. OLS Estimates of County FN Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Co. FN Rate (l1)	0.068**	0.050***	0.041**	0.039**	0.031	0.023	0.024	-0.018
	(0.02)	(0.01)	(0.011)	(0.011)	(0.017)	(0.024)	(0.022)	(0.011)
% reporting PA							-1.791***	-1.583***
							(0.338)	(0.068)
% reporting SSI							-0.964**	-0.661*
							(0.281)	(0.297)
Avg. mo. on SNAP								-2.364***
								(0.419)
Additional Controls:								
SNAP Usage								X
HHLD Structure						X	X	X
Disability					X	X	X	X
Language				X	X	X	X	X
Demo. & Educ.			X	X	X	X	X	X
Geo. & Econ.		X	X	X	X	X	X	X
Observations	828	828	828	828	828	828	828	828
Adjusted R-squared	0.042	0.055	0.072	0.072	0.088	0.097	0.11	0.182

Source: County aggregates from 2005-2009 TX / 2007-2010 NY SNAP AR linked with 2006-2010 ACS

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HHLD Structure						X	X	X
Disability					X	X	X	X
Language				X	X	X	X	X
Demo. & Educ.			X	X	X	X	X	X
Geo. & Econ.		X	X	X	X	X	X	X
Observations	828	828	828	828	828	828	828	828
Adjusted R-squared	0.042	0.055	0.072	0.072	0.088	0.097	0.11	0.182

Source: County aggregates from 2005-2009 TX / 2007-2010 NY SNAP AR linked with 2006-2010 ACS

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False-Negative Rate Correlates I

Table 4. OLS Estimates of County FN Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Co. FN Rate (l1)	0.068**	0.050***	0.041**	0.039**	0.031	0.023	0.024	-0.018
	(0.02)	(0.01)	(0.011)	(0.011)	(0.017)	(0.024)	(0.022)	(0.011)
% reporting PA							-1.791***	-1.583***
							(0.338)	(0.068)
% reporting SSI							-0.964**	-0.661*
							(0.281)	(0.297)
Avg. mo. on SNAP								-2.364***
								(0.419)
Additional Controls:								
SNAP Usage								X
HHLD Structure						X	X	X
Disability					X	X	X	X
Language				X	X	X	X	X
Demo. & Educ.			X	X	X	X	X	X
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False-Negative Rate Correlates II

Table 5. OLS Estimates of County FN Rates, Populous Counties

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Co. FN Rate (l1)	0.527***	0.409***	0.297**	0.279**	0.236**	0.207*	0.203*	0.201
	-0.064	-0.083	-0.083	-0.076	-0.084	-0.082	-0.089	-0.114
% reporting PA							-0.842	-0.906
							-1.353	-1.389
% reporting SSI							-0.612	-0.525
							-0.73	-0.747
Avg. mo. on SNAP								-0.148
								-0.611
Additional Controls:								
SNAP Usage								X
HHLD Structure						X	X	X
Disability					X	X	X	X
Language				X	X	X	X	X
Demo. & Educ.			X	X	X	X	X	X
Geo. & Econ.		X	X	X	X	X	X	X
Observations	159	159	159	159	159	159	159	159
Adjusted R-squared	0.509	0.537	0.584	0.593	0.605	0.604	0.6	0.589

Source: County aggregates from 2005-2009 TX / 2007-2010 NY SNAP AR linked with 2006-2010 ACS

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False-Negative Rate Correlates II

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SNAP Usage								X
HHLD Structure						X	X	X
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Source: County aggregates from 2005-2009 TX / 2007-2010 NY SNAP AR linked with 2006-2010 ACS
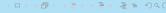
Conclusions

- ▶ I provide the first estimates of county-level FN and FP rates and the first analysis of dynamics of county FN and FP rates.
- ▶ I find evidence of substantial cross-sectional variation in FN and FP rates.
- ▶ I also find modest evidence of persistence of FN rates, especially in very populous counties.
- ▶ Researchers interested in county comparisons or county-level policy evaluation should be wary of how of misreporting bias across (and within) counties.
- ▶ Correlates of FN rates can help researchers predict the sign and relative magnitude of county-level misreporting bias.

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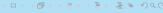
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Limitations

- Does not clarify what mechanism might be driving FN and FP responses
- Does not address spatial autocorrelation between proximate counties

Future work

- Analysis of spatial autocorrelation between proximate counties
- Analysis of how (lagged) county FN rates influence individual likelihood of an FN response
- Analysis of correlates of individual FN responses in the absence of faulty recall or confusion about whom the question references
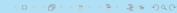
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Thank you!

PIK Rates

Table 6. Sample Sizes and Match Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
					In a HHLD with ≥ 1 PIKd member	% In a HHLD with ≥ 1 PIKd member	
	Total Records	Total Records with PIK	% with Matched PIK	Unique PIKs			Matched to the ACS
NY SNAP 2007-2008	5,954,834	5,834,981	98.0	2,998,761			26,463
NY SNAP 2008-2009	6,740,531	6,611,830	98.1	3,408,191			30,431
NY SNAP 2009-2010	7,753,054	7,614,618	98.2	3,825,187			36,213
TX SNAP 2005-2006	7,327,507	7,298,759	99.6	4,413,601			38,426
TX SNAP 2006-2007	7,229,520	7,205,895	99.7	4,365,529			37,051
TX SNAP 2007-2008	7,269,888	7,206,216	99.1	4,283,236			35,889
TX SNAP 2008-2009	8,155,224	8,032,693	98.5	4,754,083			39,486
NY ACS 2008	265,384	241,035	90.8		249,891	94.2	
NY ACS 2009	265,764	238,777	89.8		249,937	94.0	
NY ACS 2010	265,493	246,336	92.8		252,376	95.1	
TX ACS 2006	309,280	279,321	90.3		295,927	95.7	
TX ACS 2007	304,360	273,251	89.8		289,251	95.0	
TX ACS 2008	303,661	272,131	89.6		286,979	94.5	
TX ACS 2009	306,081	270,579	88.4		289,251	94.5	

Source: New York SNAP AR, 2007–2010; Texas SNAP AR, 2005–2009; 1-Year ACS, 2006–2010

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