The Effect of SNAP on Food Spending, Diet Quality, and
Food Security; Sensitivity to SNAP and Income Reporting Error

Robert Moffitt, Johns Hopkins University and NBER, January 15, 2016

Summary

A reasonably large literature has now developed on the effect of the SNAP program on a variety of food outcomes, including food consumption and expenditure, diet quality, and food security. The findings from this literature (for recent reviews, see Bitler, 2016; Gregory et al., 2016; Hoynes et al., 2016; and Hoynes and Schanzenbach, forthcoming) have often shown positive effects, although in many cases the estimates from different studies form a uncomfortably wide range and include studies showing no statistically significant effects. The selection bias problem has been the most heavily discussed methodological problem in this literature, and a variety of solutions to that problem have been proposed and applied.

At the same time, the recognition of missreporting of SNAP participation and benefits in household surveys have become increasingly realized, which adds another layer of uncertainty to the literature just described since almost all those studies use household survey data. Aggregate SNAP participation and benefits from surveys like the CPS ASEC are below those reported in official administrative statistics, and there is some indication that the gap has widened over time. In addition, a few studies have been conducted which have matched survey reports to administrative data and have confirmed the existence of error in the survey reports (Marquis and Moore, 1990, is often the first one cited; there have been several more since then; citations not given because of space constraints).

The misreporting of SNAP is a subset of the larger problem of misreporting of income in general. An older literature emanating from the Census Bureau demonstrated that CPS income reports are below administrative totals. Today, almost all surveys ask questions about subcomponents of income and then add them up to get total income, and many of those subcomponents either have missing values or are misreported, either by underreporting of any receipt or underreporting of the amount, if receipt is reported. This issue also potentially affects the estimates of the effect of SNAP on food outcomes because almost all studies of SNAP effects select low-income households, and most of them include household income as a regressor (but not always, and sometimes endogeneity is addressed). Most surveys address the issue of missing income data with imputation but research on Census imputation procedures have shown them to be problematic (see below).

The nationally-representative FoodAPS data set offers an opportunity to study how missreporting of SNAP participation and benefits affects estimates of the effect of SNAP on food outcomes because both the major food outcome variables (consumption, diet quality, food security), and SNAP participation and benefits, were collected, but so were administrative data on SNAP participation and benefits. In addition, while no administrative data on other forms of income were collected, a small but nontrivial fraction of income subcomponents are missing on the FoodAPS data (because of Don't Knows and Refusals) and the USDA's contractor, Mathematica Policy Research, is currently developing imputation procedures for the missing data. This makes the FoodAPS income data problem similar to other surveys.

The study proposed here will focus on the effect of SNAP misreporting on estimates of the effect of the SNAP program on food outcomes, and will also study, as a supplementary exercise, whether missing and underreported income reports interact with the problem. The goals of the study are to (i) study the extent and determinants of survey SNAP misreporting, (ii) estimate models of the effect of SNAP on food outcomes as close as possible to those estimated in the past literature, and to determine whether SNAP misreporting affects those estimated effects; and (iii) determine whether estimates of the effects of SNAP on food outcomes are also sensitive to methods of income imputation and of correction for earnings

underreporting. If this project is supported, a fourth goal is to (iv) work with the other projects funded under this solicitation to reestimate their models with the SNAP survey reports (presuming that they will generally use the more accurate administrative reports) and to determine whether their estimates, likewise, are sensitive to this issue, which should be useful for the more general question of how research on SNAP effects are affected by misreporting.

Estimating the Effect of SNAP on Food Outcomes with the FoodAPS Data

The literatures summarized in the review studies cited above use data sets where both SNAP participation and food outcomes are measured, and these include well-known data sets like the CPS (for food insecurity), the PSID, SIPP, NHANES, NHIS, Fragile Families, and others. The FoodAPS survey does reasonably well in comparison to those studies in the data collected on food expenditure, diet quality and nutrition, and food insecurity, although for the third of these it only collected a 30-day measure and not the more commonly used 12-month measure, and both for adults and children. Given the space constraints on this proposal, the food data in the FoodAPS will not be discussed further. The questions on SNAP participation are reasonably comparable to those in other studies, although the question was asked in the FoodAPS both in the screener and in the interviews, so it may have been more salient to the respondents both for this reason and because they were asked permission to obtain SNAP administrative records, which could have affected the accuracy of their survey reports. One of the first tasks in this project will be to compare the distributions of survey-reported SNAP participation and benefits to those in other surveys, to assess comparability (assuming that neither USDA, MPR, or other researchers have yet done this).

However, on the central issue of how to address selection bias in SNAP participation, the FoodAPS data set cannot be used to replicate those studies which use the historical introduction of SNAP (Hoynes and Schanzenbach, 2009), RCTs, simple panel data fixed-effects methods, or panel data or repeated cross-section studies which use over time policy variation in the SNAP program (possibly combined with DID comparing high-income to low-income households) to estimate food outcome effects (individual studies not cited for brevity; as Hoynes and Schanzenbach (forthcoming) have noted, simple RD methods and sibling difference methods are unlikely to work for SNAP). Instead, the best that can be done is to use cross-sectional policy variation in state options (e.g., recertification is one that has seemed to work reasonably well in past work), which have come into play mostly since the early 2000s when states were allowed to more easily exercise such options (a few other variables have also been used as IVs and will be tested here). Among other studies using those policy variables (for brevity, see the citations on p.22 of Bitler (2016) for a list of other studies using state-level policies), Ganong and Liebman (2013) have shown those variables to significantly affect SNAP participation, so they appear to pass minimal tests for strength of instruments. One exercise that will be conducted here will be to obtain the Ganong-Liebman data (which they have already posted on their website) and to estimate both their models--which used over-time variation in those SNAP policies (and other variables) in estimating the effects of those policies on SNAP participation--and to compare them to simple cross-sectional models using cross-sectional variation in policies, with their data. This will allow a determination of whether SNAP participation effects using a cross-section are similar to the state fixed-effects methods they use. (In addition, if other investigators on the successful FoodAPS proposals in this competition propose other ways to address the selection problem with these data, the P.I. will add those methods to his study.)

Methodological Issues

A few relatively straightforward methodological points about misreporting are worth making. One is that the standard result that classical errors-in-variables problems bias coefficients toward zero is far too simple for this problem. For one thing, it has been established that the assumption that measurement error is random is false and that reporting errors in surveys are typically "nonclassical," meaning they are correlated with both observables (education, age, income, etc.) as well as with the unobservables in the outcome

equation itself. For another, the binary variable of the typical SNAP participation variable changes the standard result and it can no longer be assured that OLS coefficients are biased toward zero. In addition, if the true SNAP participation variable is correlated with the error term in the outcome equation because of selection bias, that can make whatever bias arises arises from measurement error greater or smaller.

A key additional point is that addressing the selection bias problem by IV (with valid instruments, that is) may also serve to reduce or even eliminate the measurement problem at the same time. The standard solution to the errors-in-variables problem is, in fact, IV using instruments that are correlated with the true value of the variable in question but uncorrelated either measurement error or the unobservables in the outcome equation. Many of the policy-related instruments used to address the SNAP selection bias problem plausibly satisfy these conditions and hence address the reporting error problem at the same time. This will be extensively analyzed in this study; see below.

Yet another methodological point is that administrative data cannot be accepted as truth completely and unequivocally. Aside from sometimes definitional differences between survey and administrative data, there are many opportunities for error in matching, which often uses probabilistic matching methods (as does FoodAPS), possible mismatches in the calendar months in which participation occurs, errors in the family unit (SNAP uses a different definition than FoodAPS, and the FoodAPS only asked SNAP questions at the household, not the individual, level) and simple errors in the administrative data. Indeed, almost all exact matches between survey data and administrative data show differences in both ways--some positive reports in the survey that do not appear in the administrative data as well as the opposite (see Abowd and Stinson (2013), for example, for a discussion why survey data reports might be *more* accurate in some cases). Thus, there may be true positives rather than false positives; and the errors in the administrative data could in principle imply that benefit reports in the survey could be more accurate. In the FoodAPS data, 15.7% of households who reported SNAP participation in either the survey or administrative data had reported in the former and not the latter (User's Guide, p.14).

Finally, the econometric literature on measurement error has shown that measurement error in one RHS variable can bias the coefficients of other variables with which it is correlated. SNAP participation and benefits are highly correlated with household income both for behavioral reasons and mechanical reasons.

Studying the Sensitivity of SNAP Effect Estimates to SNAP and Income Misreporting

The natural first step in the project is simply a descriptive comparison of SNAP survey-reported participation and benefit amounts to those in the administrative data, assessing the frequency and magnitude of differences in the reports (see p.14 of the User's Guide for the crude rates of underreporting of participation; the codebooks have more detail, including the complicating factor that two different administrative data sets were used, and matches were made with one but not the other for some households; this will be addressed). How those with different values in the survey and administrative data compare in their socioeconomic characteristics with the same values will be examined, and how food outcomes differ for those with different and same values will also be shown (because of space constraints, we do not go into detail on the food outcomes to be used, but will just use those in the past literature which are available in the FoodAPS, as well as outcomes of particular interest to this project, e.g., child outcomes). Simple OLS regressions will be conducted as a summary descriptive tool showing how discrepancy of reports are correlated with various other variables, either conditional or unconditional on other variables.

The natural second step is an in-depth analysis of discrepancies in survey and administrative reports of SNAP participation and benefits. Regressions of the discrepancy (e.g., the numerical difference, or a MNL for different classifications of discrepancies) on household characteristics, on the administrative SNAP reports, on potentially endogenous variables like income, are all standard approaches to examining measurement error.

The third step is simply to estimate food outcome equations (food expenditure, diet quality, food security) which do not adjust for the selection bias problem but use the SNAP administrative data as truth, the survey data as truth, or the combination as truth (the combination uses SNAP participation in either the survey or administrative data, and seems to be the preferred variable in the FoodAPS codebook; for the 122 households which did not give consent, the survey report is used). These three ways to define SNAP participation and benefits will be the main focus, although there are additional variants that will be tested because two different administrative sources were used in the FoodAPS, which means that there are more possible classifications as to what is true and what is false. An attempt will be made to replicate the outcome variables, specifications (i.e., which control variables are present) and samples (e.g., excluding the high-educated or high-income) used in prior work, and whether the results match those in past work using only survey methods will be examined. Matching methods may also be tested here.

The fourth step will be to apply IV to correct for selection bias, using the cross-sectional policy instruments and any others that are suggested to the PI or used in other authors in this project (citizenship and state error rates are additional ones) A comparison of how IV estimates differ depending on which of the three SNAP participation or benefit variables (see above) is used will provide the preliminary answer to the question of whether IV seems to correct for misreporting as well as selection bias. The same attempt to replicate variables, specifications, and samples used in prior work will be made, as well as a comparison of results using only survey measures.

A fifth step will be to estimate bounds for the SNAP effect, modifying the methods of Kreider et al. (2012), to assess how the bounds change when using the three types of SNAP participation and benefit variables. Kreider et al. constructed bounds for selection bias as well as for misreporting of SNAP participation, so the latter bounds are not needed for the FoodAPS data if the SNAP administrative data are taken as truth, but they are still needed if error in those administrative data are used (indeed, Kreider et al. find that the alternative assumptions of false vs true positives has a significant effect on their bounds). An important problem with Kreider et al., however, is that they did not use instruments, and they only estimated bounds for the ATE (i.e., the SNAP effect on outcomes that would occur if 100 percent of the potentially eligible population participated), which may be quite different than the LATE estimated with IV. On the first of these, one could still construct bounds if the instruments are partly invalid (i.e., correlated with the error term in the outcome equation), which is a possibility with the cross-sectional instruments usable for the FoodAPS. On the second of these, one could construct bounds for the LATE instead of the ATE. Both of these will be investigated for this study.

Addressing the possibility that the administrative data have some error will be covered in all the steps above. The sensitivity of tests to the assumption of false vs. true positives in the FoodAPS will be revealed by the three ways to calculate SNAP participation and their variants mentioned above. Whether the results are sensitive to any of these choices when IV is used will, as already noted, implicitly reveal whether even error in the administrative data can be addressed by IV. The bounds analysis method is one place where sensitivity to assumptions of the accuracy of the administrative data can be explicitly addressed.

A sixth step will be to assess the effects of the above steps if different methods for imputing missing values of income are used. Almost every study in the literature has selected only low-income households and the majority have included income as an independent variable, despite endogeneity concerns. The FoodAPS data has a relatively small number of missing income observations (a few percent, personal communication from J. Kirlin, USDA) but their contractor (MPR) is working on imputation methods. This is an active area of research, for it has been shown that standard hot deck procedures can introduce bias in regression coefficients, and some newer methods have been proposed such as stepwise regression imputation (see, e.g., Hokayem, 2016; simply throwing out observations with imputed data is sometimes correct and sometimes not). In addition, recent internal work at the Census Bureau matching IRS and Social Security earnings reports to CPS data show that employment and earnings are often undereported in the lower tail of the

earnings distribution; the several studies in this literature can be used to develop imputation methods for income corrections in the FoodAPS data, and sensitivity tests to the method used can be conducted. (Space constraints do not allow a discussion of the inclusion of cash transfers in the income variable or of other in-kind program receipt in the equation; this will be addressed as well; see Moffitt (2016) for a discussion of multiple program receipt among SNAP recipients).

It is expected that considerable robustness checking to alternative specifications and treatment of the data, variable definitions, etc. will be part of all steps described above.

The results from the analysis will be used to provide adjustment methods to other researchers who only have error-filled SNAP participation and benefits data. Rates of missreporting by characteristic as well as variances of measurement error, possible correlations with instruments, and other outputs could be used by other researchers to conduct sensitivity tests to their analyses. In addition, the lessons from the exercise may be useful to other awardees under this solicitation more immediately.

Budget and Disclosure and COI

The P.I. requests $25,000 of investigator support and $15,000 of research assistance for the very time-consuming and data-intensive research described here. The P.I. perceives no conflicts of interest and has completed an up-to-date NBER disclosure. The P.I. has conducted several studies of the Food Stamp and SNAP programs, including effects of cashout, effects on diet quality adjusting for selection bias, effect on labor supply, and effects on food security (references not given).

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