REPORT

Empirical Bayes Shrinkage Estimates of State Supplemental Nutrition Assistance Program Participation Rates in Fiscal Year 2012 to Fiscal Year 2014 for All Eligible People and Working Poor People

Final Report

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EXECUTIVE SUMMARY

The Supplemental Nutrition Assistance Program (SNAP) is a central component of U.S. policy to alleviate hunger and poverty. SNAP is the largest of the domestic food and nutrition assistance programs administered by the U.S. Department of Agriculture's Food and Nutrition Service. During fiscal year 2016, the program served over 44 million people in an average month at a total annual cost of nearly $67 billion in benefits.

This report presents estimates that measure the need for SNAP and the program's effectiveness at reaching its target population in each state for fiscal years 2012 to 2014. Need for the program is measured by estimated numbers of people eligible for SNAP. The program's performance is measured by estimated SNAP participation rates. In addition to estimates that pertain to all eligible people, we derived estimates for "working poor" people, that is, people who were eligible for SNAP and lived in households in which someone earned income from a job.

The estimates for all eligible people and for working poor people were derived jointly using empirical Bayes shrinkage estimation methods and data from the Current Population Survey Annual Social and Economic Survey (CPS ASEC), the American Community Survey, and administrative records. The shrinkage estimator averaged direct estimates of participation rates in each state with predictions from a regression model. The regression predictions were based on observed indicators of socioeconomic conditions in the states, such as the percentage of the total state population receiving SNAP benefits. The shrinkage estimates derived are substantially more precise than direct estimates from the Current Population Survey, the best source of current data on household incomes used to model program eligibility. Shrinkage estimators improve precision by "borrowing strength," that is, by using data for multiple years from all the states to derive each state's estimates for a given year and by using data from multiple sources, including sample surveys and administrative data. This report describes our shrinkage estimator in detail.

Final shrinkage estimates for FY 2012 and FY 2013 presented in this report differ slightly from the estimates presented in Cunnyngham (2016) and Cunnyngham et al. (2016) because of annual data updates. As a result, the estimates presented in this report should not be compared to those published in earlier reports.

I. INTRODUCTION

The Supplemental Nutrition Assistance Program (SNAP) is a central component of U.S. policy to alleviate hunger and poverty. The program's main purpose is "to permit low-income households to obtain a more nutritious diet . . . by increasing their purchasing power" (Food and Nutrition Act of 2008). SNAP is the largest of the domestic food and nutrition assistance programs administered by the U.S. Department of Agriculture's Food and Nutrition Service. During fiscal year 2016, the program served over 44 million people in an average month at a total annual cost of nearly $67 billion in benefits.

This report presents estimates that measure the need for SNAP and the program's effectiveness at reaching its target population in each state for fiscal years 2012 to 2014.[1] Need for the program is measured by estimated numbers of people eligible for SNAP. The program's performance is measured by estimated SNAP participation rates, the percentage of eligible people who actually participate in the program. In addition to presenting estimates that pertain to all eligible people, we present estimates for "working poor" people, that is, people who are eligible for SNAP and live in households in which someone earned income from a job or self-employment.

We derived estimates for all eligible people and working poor people for each state in each of the three fiscal years using empirical Bayes shrinkage estimation methods. Specifically, we used a shrinkage estimator that optimally averaged direct estimates of SNAP participation rates with predictions from a regression model. We obtained the direct estimates by applying SNAP eligibility rules to households in the Current Population Survey Annual Social and Economic Supplement (CPS ASEC) to estimate numbers of eligible people and using SNAP

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[1] The estimates presented here are also reported and compared with one another in Cunnyngham (2017).

Quality Control (QC) data to estimate numbers of participating people. The regression predictions drew on data from the American Community Survey (ACS), individual tax returns, population estimates, and administrative records.

The remainder of this introductory chapter provides an overview of indirect estimation and our shrinkage estimator. Chapter II describes, step by step, how we derived the shrinkage estimates presented here, and Chapter III presents state estimates for all eligible people and working poor people. Technical details and

U.S. Census Bureau Data

The **Current Population Survey (CPS)** is conducted monthly for the Bureau of Labor Statistics and is the primary source of current information on the labor force characteristics of the U.S. population. The CPS Annual Social and Economic Supplement (ASEC) includes additional data on work experience, income, and noncash benefits, and has a sample size of close to 100,000 households.

The **American Community Survey (ACS)** is conducted monthly in every county, American Indian and Alaska Native Area, Hawaiian Home Land, and Puerto Rico. Designed to replace the decennial census long form, it collects economic, social, demographic, and housing information on about three million households annually.

The Census Bureau develops annual **population estimates** using decennial census population estimates and administrative records and other data on births, deaths, net domestic migration, and net international migration.

More information on these data sources is available at http://www.census.gov.

additional information about our estimation methods are provided in Appendix A. Appendix B contains data for the figures presented in Cunnyngham (2017).

Direct estimates. The principal challenge in deriving state estimates like those presented in this report is the small sample size of the CPS ASEC. The optimal survey for estimating state SNAP eligibility would (1) have a large sample for all states, (2) be representative at the state level, and (3) contain the detail on household relationships and income sources needed to estimate program eligibility. Among the three leading surveys, the CPS ASEC comes closest to meeting these standards despite its small sample sizes for most states. Another national household survey, the Survey of Income and Program Participation (SIPP), contains more detail on relationships and income than the CPS ASEC, but is not representative at the state level (and has even smaller state samples). The third candidate, the ACS, is much larger than the CPS

ASEC but has fewer details on relationships and income sources. Additionally, unlike the CPS

ASEC's fixed reference period of the prior calendar year for all households, the ACS reference

period is the prior 12 months and so varies across households by up to a year, depending on

when respondents complete the survey. For these reasons, we use the CPS ASEC to estimate

SNAP eligibility.

However, estimates of SNAP eligibility and participation rates based only on the CPS ASEC

sample for the state and time period in question, or "direct" estimates, are imprecise for many

states. For example, to directly estimate West Virginia's Fiscal Year (FY) 2014 SNAP

participation rate, we used only FY 2014 CPS ASEC data on households from West Virginia.

Because of the potential errors introduced by the CPS ASEC surveying a small number of

families in West Virginia, we can be confident—by a commonly used standard—only that West

Virginia's SNAP participation rate in FY 2014 was between about 72 and 89 percent. This range

is wide, although typical, reflecting our substantial uncertainty about what West Virginia's

participation rate actually was.

Indirect estimators. To improve precision, statisticians have developed indirect estimators,

which borrow strength by using data from additional states, time periods, or data sources. The

assumption underlying indirect estimation is that what happened in other states and in other years

is relevant to estimating what happened in a particular state in a particular year.

A generally superior indirect estimator is the shrinkage estimator, which averages estimates

obtained from different methods. Fay and Herriott (1979) developed a shrinkage estimator that

combined direct sample and regression estimates of per capita income for small places that were

used to allocate funds under the General Revenue Sharing Program. In another application of

shrinkage methods, shrinkage estimates of poor school-aged children by state and county were

used in allocating Title I compensatory education funds for disadvantaged youth (National

Research Council 2000). Shrinkage estimators have also been used to develop state estimates of income-eligible infants and children for allocating funds under the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (Schirm 2000). The WIC eligibles estimator used several years of CPS ASEC data and combined direct estimates with predictions from a regression model.

In these and other applications of shrinkage estimation, the gain in precision from borrowing strength via a shrinkage estimator can be substantial. For example, the confidence intervals for the shrinkage estimates of WIC eligibles in 1992 were, on average, 61 percent narrower than the corresponding confidence intervals for the direct estimates (Schirm 1995). To obtain that same gain in precision with a direct estimator would require—according to rough calculations— more than a six-fold increase in sample size. The gain in precision from using shrinkage estimation for another application might not be the same as for the 1992 WIC estimates. In addition, shrinkage estimates derived for any one application are not guaranteed to be more accurate than estimates obtained using some other method. However, they have good statistical properties in general and we have found that for our specific application, shrinkage estimation can greatly improve precision.

Regression estimates. The first step of our shrinkage estimator is to use data from outside the CPS ASEC to estimate a regression model and formulate a prediction for each group (all eligible people and working poor people) in each state in each year.

Regression estimates are predictions based either on nonsample or on highly precise sample data. Figure I.1 illustrates how a regression estimator works. The simple example in the figure has only nine states and data for just one year on one predictor—the SNAP "prevalence" rate— that will be used to predict each state's SNAP participation rate for eligible people. The SNAP prevalence rate is measured by the percentage of all people (eligible and ineligible combined)

Figure I.1. An illustrative regression estimator
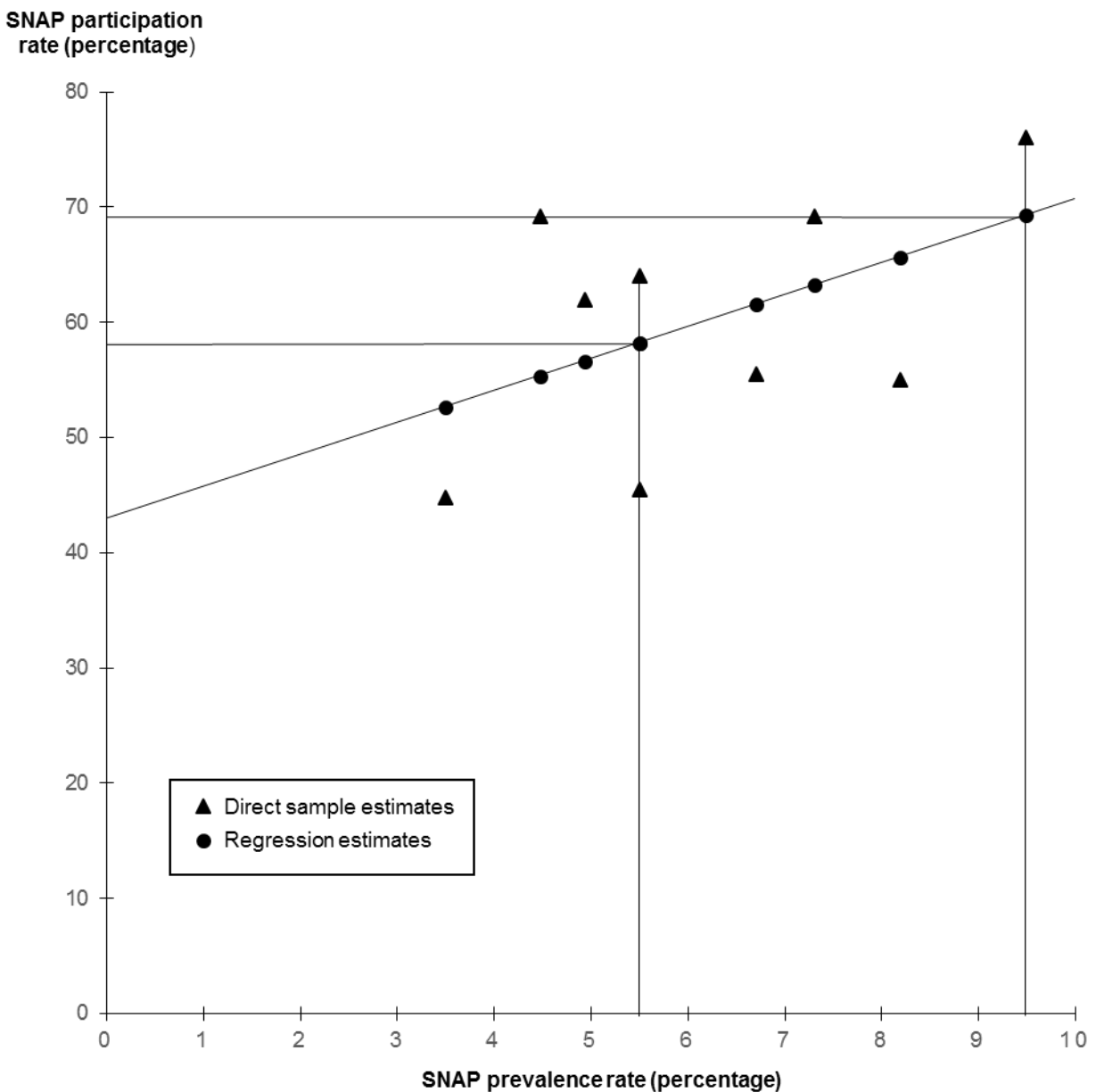
who received SNAP benefits, in contrast to the SNAP participation rate, which is measured by the percentage of eligible people who received SNAP benefits. The triangles in the figure correspond to direct sample estimates; a triangle shows the prevalence rate in a state (horizontal axis) and the sample estimate of the participation rate in that state (vertical axis). Not surprisingly, the graph suggests that prevalence and participation rates are systematically associated. States with higher percentages of all people participating in the program tend to have

higher percentages of eligible people participating, although the relationship is far from perfect. To measure this relationship between prevalence and participation rates and derive predictions, we can use a technique called "least squares regression" to draw a line through the triangles. Regression estimates of participation rates are points on that line, the circles in Figure I.1. The predicted participation rate for a particular state is obtained by moving up or down from the state's direct sample estimate (the triangle) to the regression line (where there is a circle) and reading the value from the vertical axis. For example, the regression estimator predicts a participation rate of just under 60 percent for both states with prevalence rates of about 5.5 percent. In contrast, for the state with about 9.5 percent of people receiving SNAP benefits, the predicted participation rate is nearly 70 percent.

Comparison of direct and regression estimators. Comparing how the direct and regression estimators use data reveals how the regression estimator borrows strength to improve precision. To derive direct estimates, we used only one year's CPS ASEC sample data from West Virginia to estimate the state's participation rate in that year. To derive regression estimates, we estimated a regression line from sample, administrative, and ACS data for multiple years and all the states and used the estimated line (with administrative and ACS data for West Virginia) to predict West Virginia's participation rate in a given year. In other words, the regression estimator not only uses the direct estimates from every state for multiple years to develop a regression estimate for a single state in a single year, but also incorporates data from outside the sample, namely, data in administrative records systems and the ACS. To improve precision even further, the estimator borrows strength across groups—all eligible people and working poor people—by deriving estimates for the groups jointly.

The regression estimator can improve precision by using additional data to identify states with direct estimates that seem too high or too low because of sampling error (error from

drawing a sample of the population that has a higher or lower participation rate than the entire state population has.) For example, when a state has a low SNAP prevalence rate and values for other predictors that are consistent with a low SNAP participation rate, our regression estimator will predict a low participation rate for that state. If the direct estimate for that state is high, the regression estimate will be lower than the direct estimate. On the other hand, if the sample data for a state show a lower participation rate than expected in light of the SNAP prevalence rate and the other predictors, the regression estimate for that state will be higher than the direct estimate.

A limitation of the regression estimator is "bias." Some states really have higher or lower participation rates than predicted with the regression estimator. Such errors in regression estimates reflect bias. Although the regression estimator borrows strength, using data from all the states and multiple years as well as administrative and ACS data, it makes no further use of the sample data after estimating the regression line. It treats the entire difference between the sample and regression estimates as sampling error, that is, error in the direct estimate. No allowance is made for prediction error, that is, error in the regression estimate. Although not all, if any, true state participation rates lie on the regression line, the assumption underlying the regression estimator is that they do.

Shrinkage estimator. The shrinkage estimator strikes a compromise between the limitations of the direct estimator (imprecision) and the regression estimator (bias) by combining the two estimates. As illustrated in Figure I.2, the shrinkage estimator takes a weighted average of the direct and regression estimates, weighting them according to their relative accuracy. When the direct estimate is more precise than the regression estimate, the estimator gives more weight to the direct estimate. On the other hand, when the regression estimate is more precise than the direct estimate, the estimator gives more weight to the regression estimate. The larger samples drawn in large states support more precise direct estimates, so shrinkage estimates tend to be

closer to the direct estimates for large states. The weight given to the regression estimate depends

on how well the regression line "fits." If we find good predictors reflecting why some states have

higher participation rates than other states, we say that the regression line "fits well." The

shrinkage estimate will be closer to the regression estimate when the regression line fits well

than when the line fits poorly.

Figure I.2. Shrinkage estimation
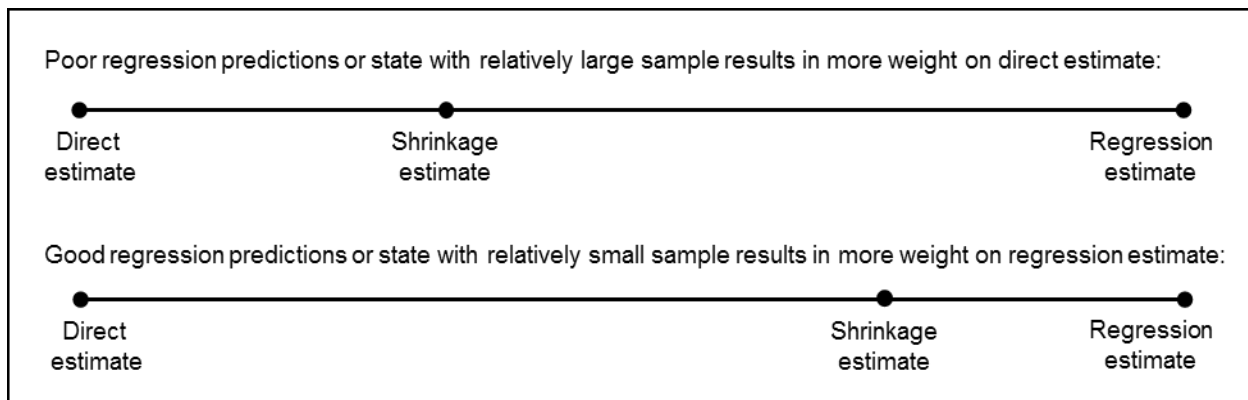
The direct and regression estimates are optimally weighted to improve accuracy by

minimizing a measure of error that reflects both imprecision and bias. By accepting a little bias,

the shrinkage estimator may be substantially more precise than the direct sample estimator. By

sacrificing a little precision, the shrinkage estimator may be substantially less biased than the

regression estimator. The shrinkage estimator optimizes the tradeoff between imprecision and

bias.

II. A STEP-BY-STEP GUIDE TO DERIVING STATE ESTIMATES

This chapter describes our procedure for estimating state SNAP participation rates for all eligible people and working poor people and the numbers of people eligible for SNAP benefits for FY 2012 to FY 2014. This procedure, summarized by the flow chart in Figure II.1, has the following four steps:

1. From CPS ASEC data, SNAP administrative data, and population estimates, derive direct estimates of state SNAP participation rates.

2. Using a regression model and the direct estimates derived in Step 1, predict state SNAP participation rates based on SNAP administrative, individual income tax, and ACS data and population estimates.

3. Using a shrinkage estimator, average the direct estimates from Step 1 and the regression predictions from Step 2 to obtain preliminary shrinkage estimates of state SNAP participation rates.

4. Adjust the preliminary shrinkage estimates from Step 3 using national estimates of eligible people derived from the CPS ASEC to obtain final shrinkage estimates of state SNAP participation rates.

Each step is described in the remainder of this chapter. Additional technical details are provided in Appendix A.

A. From CPS ASEC data and SNAP administrative data, derive direct estimates of state SNAP participation rates

A SNAP participation rate is obtained by dividing an estimate of the number of people participating in SNAP by an estimate of the number of people eligible for SNAP, with the resulting ratio expressed as a percentage. We used SNAP QC data to estimate numbers of participants in an average month in the fiscal year and CPS ASEC data to estimate numbers of eligible people in an average month. Because the CPS ASEC collects income data for the prior calendar year, we obtained estimates of eligible people in FY 2014 (October 2013 through September 2014) from the 2014 and 2015 CPS ASEC. To derive a participation rate for working poor people, we divided the number of working poor participants by the number of

Figure II.2. The estimation procedure
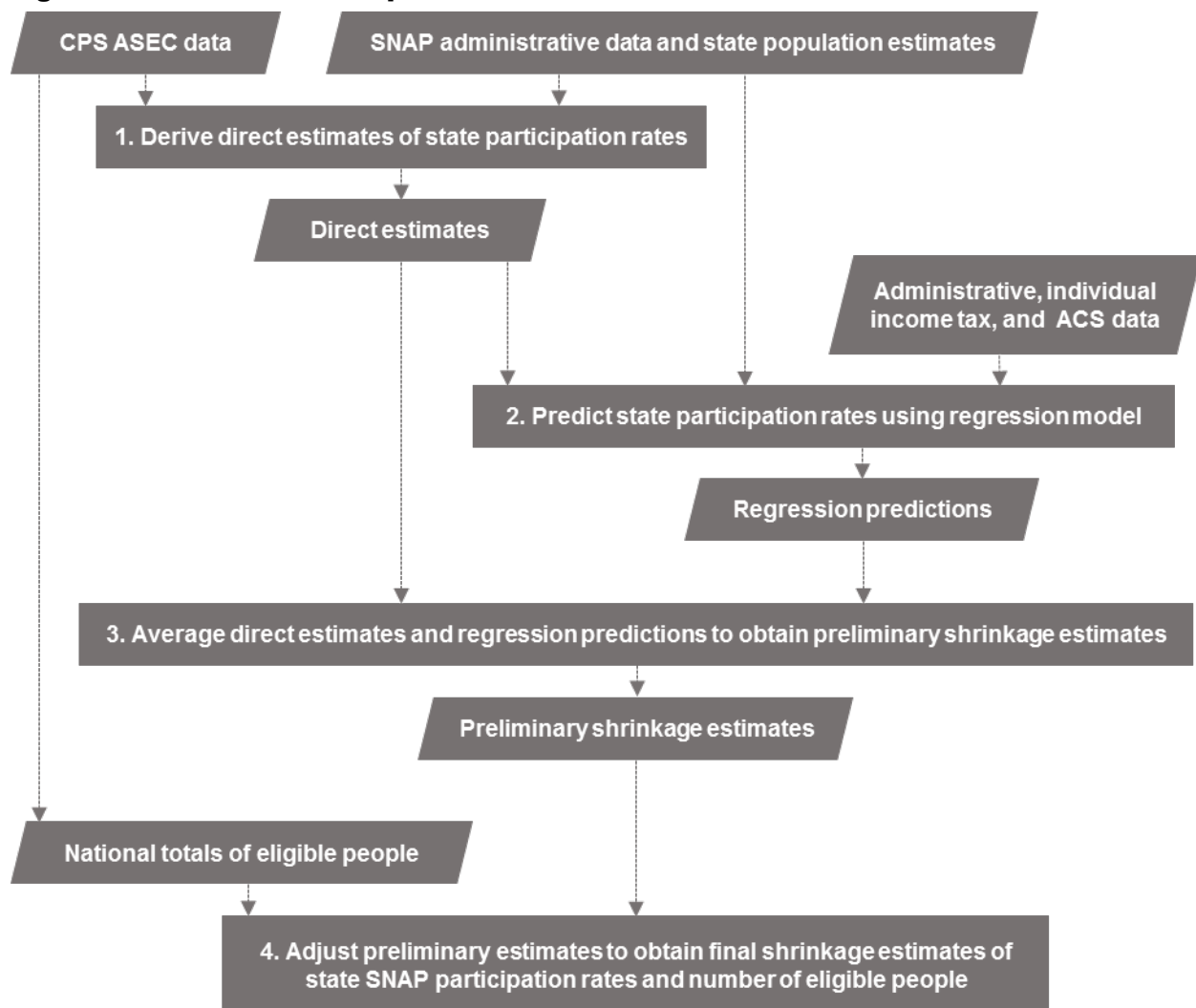
eligible working poor people. Appendix A presents direct estimates and their standard errors for each group (all eligible people and working poor people) in each state for each of the three fiscal years.

B. Using a regression model, predict state SNAP participation rates based on administrative, ACS, and other data

To derive regression estimates for the three fiscal years and for all eligible people and working poor people, we included all of the states, not just nine as in our illustrative example in Chapter 1, and we used seven predictors, not just one. The seven predictors used for the estimates in this report measure the following:

- Percentage of the population receiving SNAP benefits according to administrative data and population estimates

- Percentage of renter occupied housing units that spent 50 percent or more of household income on rent and utilities according to ACS one-year estimates

- Percentage of children under age 18 with household income under 50 percent of the federal poverty level according to ACS one-year estimates

- Percentage of occupied housing units that are owner occupied according to ACS one-year estimates

- Percentage of civilian employed people age 16 and older who were in service occupations according to ACS one-year estimates

- Percentage of people age 65 and older not claimed on tax returns or claimed on tax returns with adjusted gross income under the federal poverty level according to individual income tax data and population estimates

- Percentages of all people not claimed on tax returns according to individual income tax data and population estimates

These seven predictors were selected as the best from a longer list described in Table A.13, which provides complete definitions and sources for the predictors. The third through sixth predictors listed above were included in last year's model. Other predictors used in the previous model were (1) the percentage of the population correctly receiving SNAP benefits under regular program rules according to administrative data and population estimates, (2) the percentage of civilian employed people age 16 and older who were employed in the private sector according to ACS one-year estimates, and (3) the percentage of children ages 5 to 17 approved to receive free lunches under the National School Lunch Program according to administrative data and population estimates.

Appendix A presents the regression estimates and their standard errors. The standard errors tend to be fairly equal across the states and much smaller than the largest standard errors for direct estimates, reflecting substantial gains in precision from regression for the states with the most error-prone direct estimates.

C. Using shrinkage methods, average the direct estimates and regression predictions to obtain preliminary shrinkage estimates of state SNAP participation rates

To derive preliminary estimates of state SNAP participation rates, we averaged the direct

estimates calculated in Step 1 and the regression predictions from Step 2 using an empirical

Bayes shrinkage estimator. (See Appendix A for a description of the empirical Bayes methods

we used.) We call the estimates from this step "preliminary" because we make some fairly small

adjustments to them in the next step. Appendix A presents the preliminary shrinkage estimates of

state SNAP participation rates for all eligible people and working poor people for all three fiscal

years.

D. Adjust the preliminary shrinkage estimates to obtain final shrinkage estimates of state SNAP participation rates and numbers of eligible people

We adjusted the preliminary shrinkage estimates of participation rates in two ways. First, we

adjusted the rates so that the counts of eligible people implied by the rates sum to the national

count of eligible people estimated directly from the CPS ASEC. Second, we adjusted the rates so

that no state's estimated rate was greater than 100 percent. These adjustments were carried out

separately for each year and for the two groups (all eligible people and working poor people).

The following description of the adjustments will focus on the FY 2014 estimates for all eligible

people. In Appendix A, we describe the results of the adjustments for other years and for

working poor people and discuss our adjustment method in more detail.

To implement the first adjustment, we calculated preliminary estimates of the numbers of

eligible people from the preliminary estimates of participation rates derived in Step 3 and the

administrative estimates of the numbers of SNAP participants obtained in Step 1. The state

estimates of eligible people summed to 51,993,244 for FY 2014, and the national total for FY

2014 estimated directly from the CPS ASEC was 51,025,996. To obtain estimated numbers of

eligible people for states that sum (aside from rounding error) to the direct estimate of the national total, we multiplied each of the state preliminary estimates of eligible people by $51,025,996 / 51,993,244$ (≈ 0.9814). Such benchmarking of estimates for smaller areas to a relatively precise estimated total for a larger area is common practice.

After carrying out this first adjustment, six states, Maine, Michigan, Oregon, Vermont, Washington, and Wisconsin had fewer estimated eligible people than participants in FY 2014, implying participation rates over 100 percent. To cap participation rates at 100 percent, we performed a second adjustment. Specifically, we increased the number of eligible people in Maine, Michigan, Oregon, Vermont, Washington, and Wisconsin so that the number of eligible people in those states equaled the number of participants. We reduced the number of eligible people in the other 44 states and the District of Columbia by an equivalent number and in proportion to their numbers of eligible people. This adjustment, which moved small numbers of eligible people among states, did not change the national total. Moreover, except for the states with participation rates initially over 100 percent, this adjustment did not change any state's participation rate by more than four tenths of a percentage point. The rounded participation rates for some states did increase by one percentage point, however.

Applying this adjustment, we obtained our final shrinkage estimates of the numbers of people eligible for SNAP. From those estimates and our administrative estimates of the numbers of SNAP participants, we derived final shrinkage estimates of participation rates. Our final shrinkage estimates are presented in the next chapter.

III. STATE ESTIMATES OF SNAP PARTICIPATION RATES AND NUMBER OF ELIGIBLE PEOPLE

Tables III.1 and III.2 present our final shrinkage estimates of SNAP participation rates and the number of people eligible, respectively, in each state for FY 2012 to FY 2014 for all eligible people and for working poor people. These shrinkage estimates are relatively precise; they have much smaller standard errors and narrower confidence intervals than the CPS ASEC direct estimates. Tables III.3 to III.8 display approximate 90 percent confidence intervals showing the uncertainty remaining after using shrinkage estimation to derive the estimates in Tables III.1 and III.2. One interpretation of a 90 percent confidence interval is that there is a 90 percent chance that the true value—that is, the true participation rate or the true number of eligible people—falls within the estimated bounds. For example, although our best estimate is that West Virginia's participation rate for all eligible people was 82 percent in FY 2014 (see Table III.1), the true rate may have been higher or lower. However, according to Table III.5, the chances are 90 in 100 that the true rate was between 76 and 88 percent, an interval that is 69 percent as wide as the interval (72 and 89 percent, as cited in Chapter I) around the direct estimate. A narrower interval means that we are less uncertain about the true value. According to our calculations, a shrinkage confidence interval for a participation rate is, on average, only about 62 percent as wide as the corresponding direct confidence interval. Thus, shrinkage substantially improves precision and reduces our uncertainty.

Despite the impressive gains in precision, however, substantial uncertainty about the true participation rates for some states remains even after the application of shrinkage methods. Nevertheless, as discussed in Cunnyngham (2017), the shrinkage estimates are sufficiently precise to show, for example, whether a state's SNAP participation rate was probably near the

top, near the bottom, or in the middle of the distribution of rates in a given year. That is enough

information for many important purposes, such as guiding an initiative to improve program

performance.

Final shrinkage estimates for FY 2012 and FY 2013 presented in this report differ slightly

from the estimates presented in Cunnyngham (2016) and Cunnyngham et al. (2016) for three

reasons.

1. **We made minor adjustments to the methodology used to estimate the numbers of eligible people.** The changes, described in Farson Gray and Cunnyngham (2016) slightly affect the eligibility of noncitizens.

2. **The shrinkage estimator uses data from three years to estimate participation rates for each year.** Annually, data for the most recent year are added and data for the oldest year are dropped. As a result, the estimates for 2012 and 2013 presented in this report are based on 2012 to 2014 data, and the corresponding estimates published in Cunnyngham et al. (2016) are based on 2011 to 2013 data.

3. **The shrinkage estimator incorporates a regression model that is updated each year.** Each year we choose a regression model that best predicts participation rates for all three years and both groups (all eligible people and eligible working poor.) Although we place a premium on maintaining consistency in regression predictors from year to year, differences between 2011 data (used in the previous estimates) and 2014 data (used in the current estimates) resulted in the use of a different regression model. Different regression models lead to slight differences in predicted participation rates, which in turn lead to slight differences in estimated participation rates.

Because of these updates, the estimates presented in this report should not be compared to

those published in earlier reports.

Table III.1. Final shrinkage estimates of SNAP participation rates

	All eligible people			Working poor people		
	2012	**2013**	**2014**	**2012**	**2013**	**2014**
Alabama	89	88	86	82	78	70
Alaska	86	85	86	71	74	75
Arizona	78	76	68	72	71	59
Arkansas	77	73	70	72	67	60
California	64	68	66	49	53	51
Colorado	73	79	76	65	71	69
Connecticut	88	90	94	76	79	79
Delaware	97	98	100	85	92	87
District of Columbia	95	97	96	50	63	49
Florida	91	92	90	75	75	72
Georgia	94	96	89	81	81	73
Hawaii	66	75	83	54	63	71
Idaho	89	89	84	84	84	82
Illinois	93	99	100	75	81	81
Indiana	85	89	88	85	86	84
Iowa	98	96	97	94	95	94
Kansas	72	77	74	65	70	68
Kentucky	89	88	84	76	73	67
Louisiana	84	88	76	74	78	64
Maine	100	100	100	98	96	92
Maryland	89	95	97	75	83	81
Massachusetts	87	87	85	64	68	65
Michigan	100	100	100	99	100	95
Minnesota	83	87	88	77	80	82
Mississippi	84	85	83	84	81	73
Missouri	92	92	86	82	80	74
Montana	77	81	77	72	77	73
Nebraska	72	78	77	67	73	74
Nevada	61	63	65	48	52	57
New Hampshire	84	85	84	80	80	79
New Jersey	73	78	75	69	72	69
New Mexico	92	94	92	88	90	85
New York	81	87	86	70	77	77
North Carolina	81	81	78	73	72	65
North Dakota	64	69	64	61	66	65
Ohio	85	92	87	77	82	76
Oklahoma	80	77	76	68	65	58
Oregon	100	100	100	90	96	95
Pennsylvania	86	89	88	78	79	78
Rhode Island	88	96	96	72	80	80
South Carolina	88	86	79	82	81	70
South Dakota	81	88	94	82	90	93
Tennessee	100	100	99	81	80	78
Texas	75	76	73	69	68	66
Utah	82	77	74	73	69	66
Vermont	100	100	100	93	99	95
Virginia	85	85	83	80	82	78
Washington	99	100	100	75	83	84
West Virginia	80	81	82	82	79	76
Wisconsin	96	100	100	89	94	97
Wyoming	63	58	59	63	57	56
United States	83	85	83	72	74	70

Table III.2. Final shrinkage estimates of number of people eligible for SNAP

	All eligible people			Working poor people		
	2012	**2013**	**2014**	**2012**	**2013**	**2014**
Alabama	976	999	1,012	379	423	443
Alaska	105	107	101	54	53	48
Arizona	1,215	1,244	1,310	625	679	738
Arkansas	638	674	680	290	299	326
California	5,862	5,765	5,959	3,212	3,185	3,453
Colorado	633	595	613	309	301	316
Connecticut	388	398	388	159	173	163
Delaware	126	129	122	57	57	60
District of Columbia	138	135	132	40	45	51
Florida	3,420	3,539	3,620	1,613	1,625	1,599
Georgia	1,906	1,879	1,901	903	898	954
Hawaii	234	225	206	128	132	112
Idaho	245	235	229	140	146	127
Illinois	1,858	1,873	1,813	832	873	863
Indiana	1,056	1,020	1,001	466	458	488
Iowa	351	368	359	179	209	182
Kansas	411	406	396	223	224	214
Kentucky	897	931	917	355	408	400
Louisiana	1,030	1,025	1,112	444	464	510
Maine	213	209	198	82	81	82
Maryland	704	708	702	300	310	299
Massachusetts	861	896	885	284	312	314
Michigan	1,570	1,549	1,503	650	634	686
Minnesota	526	523	498	259	253	270
Mississippi	744	755	761	296	310	305
Missouri	1,006	997	986	511	445	429
Montana	142	143	146	64	75	65
Nebraska	225	216	211	124	116	110
Nevada	479	481	508	239	241	250
New Hampshire	114	114	114	46	47	50
New Jersey	999	1,001	1,052	419	456	481
New Mexico	428	426	436	204	215	213
New York	3,428	3,322	3,276	1,565	1,463	1,488
North Carolina	1,809	1,855	1,812	813	958	783
North Dakota	72	65	66	32	32	31
Ohio	1,961	1,796	1,830	803	747	841
Oklahoma	726	775	748	376	384	371
Oregon	631	654	663	293	263	287
Pennsylvania	1,808	1,785	1,797	612	677	745
Rhode Island	161	159	161	60	58	69
South Carolina	927	958	1,006	374	391	450
South Dakota	125	117	105	61	61	51
Tennessee	1,300	1,339	1,317	610	560	599
Texas	4,782	4,816	4,866	2,691	2,673	2,726
Utah	335	322	305	195	177	179
Vermont	73	77	77	29	32	32
Virginia	1,068	1,104	1,094	485	478	524
Washington	848	854	872	395	357	387
West Virginia	391	389	408	133	130	145
Wisconsin	709	700	695	333	363	343
Wyoming	53	65	59	26	29	32
United States	50,708	50,716	51,026	23,770	23,979	24,682

Table III.3. Approximate 90 percent confidence intervals for final shrinkage estimates for 2012, all eligible people

	Participation rate (percent)		Number of eligible people (thousands)	
	Lower bound	Upper bound	Lower bound	Upper bound
Alabama	84	94	921	1,032
Alaska	80	92	97	112
Arizona	74	83	1,147	1,283
Arkansas	72	82	597	680
California	62	66	5,637	6,086
Colorado	68	78	590	677
Connecticut	83	94	364	412
Delaware	91	100	118	133
District of Columbia	87	100	127	149
Florida	87	94	3,284	3,555
Georgia	90	99	1,818	1,994
Hawaii	61	71	217	252
Idaho	83	94	229	261
Illinois	88	97	1,771	1,944
Indiana	80	90	995	1,116
Iowa	92	100	330	373
Kansas	67	76	386	437
Kentucky	84	93	850	943
Louisiana	79	88	974	1,086
Maine	93	100	201	224
Maryland	84	94	665	744
Massachusetts	81	92	808	913
Michigan	94	100	1,489	1,651
Minnesota	78	88	496	557
Mississippi	79	89	700	788
Missouri	86	98	944	1,068
Montana	71	82	132	152
Nebraska	66	78	207	244
Nevada	56	66	438	520
New Hampshire	78	89	107	122
New Jersey	68	78	935	1,063
New Mexico	87	98	402	454
New York	78	85	3,282	3,574
North Carolina	77	85	1,719	1,899
North Dakota	58	70	65	78
Ohio	81	90	1,858	2,065
Oklahoma	76	85	684	769
Oregon	94	100	600	662
Pennsylvania	82	90	1,725	1,892
Rhode Island	83	94	151	172
South Carolina	83	92	879	975
South Dakota	73	89	113	137
Tennessee	94	100	1,224	1,375
Texas	72	78	4,584	4,980
Utah	76	87	312	357
Vermont	94	100	69	77
Virginia	79	91	998	1,138
Washington	93	100	801	895
West Virginia	74	86	362	421
Wisconsin	91	100	669	748
Wyoming	56	69	48	59
United States	82	84	50,015	51,401

Table III.4. Approximate 90 percent confidence intervals for final shrinkage estimates for 2013, all eligible people

	Participation rate (percent)		Number of eligible people (thousands)	
	Lower bound	Upper bound	Lower bound	Upper bound
Alabama	84	93	945	1,053
Alaska	79	91	99	114
Arizona	72	81	1,171	1,317
Arkansas	68	78	628	720
California	65	70	5,548	5,981
Colorado	74	84	556	634
Connecticut	85	96	374	422
Delaware	92	100	121	137
District of Columbia	90	100	125	146
Florida	89	96	3,398	3,681
Georgia	91	100	1,795	1,963
Hawaii	70	81	209	241
Idaho	84	95	220	251
Illinois	95	100	1,788	1,958
Indiana	84	94	962	1,077
Iowa	91	100	347	390
Kansas	72	81	383	429
Kentucky	83	92	881	980
Louisiana	84	93	970	1,080
Maine	93	100	197	221
Maryland	90	99	672	744
Massachusetts	82	92	842	949
Michigan	94	100	1,473	1,625
Minnesota	82	92	494	552
Mississippi	80	90	713	797
Missouri	86	98	935	1,058
Montana	75	86	133	153
Nebraska	72	84	199	232
Nevada	58	68	442	520
New Hampshire	80	90	107	122
New Jersey	74	83	940	1,062
New Mexico	88	100	399	454
New York	83	90	3,188	3,455
North Carolina	77	85	1,766	1,944
North Dakota	64	74	60	70
Ohio	87	96	1,708	1,884
Oklahoma	72	81	728	823
Oregon	94	100	624	684
Pennsylvania	85	93	1,700	1,869
Rhode Island	91	100	150	168
South Carolina	82	90	909	1,008
South Dakota	80	95	107	127
Tennessee	94	100	1,262	1,415
Texas	72	79	4,616	5,017
Utah	71	83	298	345
Vermont	94	100	73	81
Virginia	79	90	1,032	1,175
Washington	95	100	811	898
West Virginia	76	87	363	416
Wisconsin	95	100	663	737
Wyoming	53	63	59	70
United States	84	86	50,063	51,369

Table III.5. Approximate 90 percent confidence intervals for final shrinkage estimates for 2014, all eligible people

	Participation rate (percent)		Number of eligible people (thousands)	
	Lower bound	Upper bound	Lower bound	Upper bound
Alabama	81	90	957	1,066
Alaska	80	91	95	108
Arizona	64	72	1,233	1,388
Arkansas	65	75	635	725
California	64	69	5,727	6,191
Colorado	71	81	573	653
Connecticut	88	100	364	412
Delaware	95	100	115	129
District of Columbia	89	100	122	142
Florida	87	93	3,478	3,761
Georgia	85	93	1,810	1,991
Hawaii	77	89	191	221
Idaho	78	90	213	245
Illinois	95	100	1,732	1,893
Indiana	83	92	946	1,056
Iowa	92	100	338	380
Kansas	70	78	372	420
Kentucky	79	88	868	966
Louisiana	72	80	1,051	1,173
Maine	94	100	187	209
Maryland	92	100	665	739
Massachusetts	80	90	833	938
Michigan	95	100	1,429	1,578
Minnesota	83	93	469	527
Mississippi	79	87	724	798
Missouri	81	92	921	1,052
Montana	71	82	135	156
Nebraska	72	83	196	226
Nevada	59	70	464	552
New Hampshire	79	90	106	121
New Jersey	71	80	990	1,114
New Mexico	86	98	409	463
New York	82	90	3,132	3,420
North Carolina	75	82	1,722	1,902
North Dakota	58	70	60	72
Ohio	83	92	1,739	1,920
Oklahoma	72	81	703	793
Oregon	94	100	631	694
Pennsylvania	84	92	1,715	1,879
Rhode Island	90	100	151	171
South Carolina	74	84	946	1,065
South Dakota	87	100	97	113
Tennessee	93	100	1,244	1,390
Texas	70	75	4,681	5,051
Utah	69	80	282	329
Vermont	94	100	73	81
Virginia	78	89	1,024	1,165
Washington	94	100	826	917
West Virginia	76	88	379	436
Wisconsin	95	100	658	731
Wyoming	54	64	54	64
United States	82	84	50,372	51,680

Table III.6. Approximate 90 percent confidence intervals for final shrinkage estimates for 2012, working poor people

	Participation rate (percent)		Number of eligible people (thousands)	
	Lower bound	Upper bound	Lower bound	Upper bound
Alabama	74	90	343	416
Alaska	63	80	47	60
Arizona	65	79	565	685
Arkansas	66	79	263	317
California	45	53	2,941	3,482
Colorado	58	72	275	342
Connecticut	68	83	142	175
Delaware	77	94	51	63
District of Columbia	39	60	31	49
Florida	69	81	1,484	1,742
Georgia	75	88	828	977
Hawaii	48	60	113	143
Idaho	76	91	127	153
Illinois	69	81	764	899
Indiana	77	92	425	507
Iowa	85	100	162	196
Kansas	59	71	204	242
Kentucky	69	82	325	386
Louisiana	68	81	405	482
Maine	87	100	73	90
Maryland	68	83	271	330
Massachusetts	56	72	249	318
Michigan	90	100	589	711
Minnesota	69	84	235	284
Mississippi	76	92	268	323
Missouri	74	90	462	561
Montana	64	79	57	70
Nebraska	59	75	109	138
Nevada	40	55	203	275
New Hampshire	71	89	41	51
New Jersey	61	76	372	466
New Mexico	80	96	185	223
New York	64	77	1,419	1,710
North Carolina	67	78	748	878
North Dakota	52	70	27	37
Ohio	71	84	734	873
Oklahoma	61	75	338	413
Oregon	81	100	262	324
Pennsylvania	71	84	561	664
Rhode Island	63	80	53	67
South Carolina	74	89	340	407
South Dakota	72	92	53	69
Tennessee	73	89	549	671
Texas	64	74	2,503	2,879
Utah	65	81	174	216
Vermont	83	100	26	32
Virginia	71	89	432	538
Washington	67	82	356	435
West Virginia	72	92	118	149
Wisconsin	81	98	300	365
Wyoming	54	71	22	30
United States	70	74	23,155	24,384

Table III.7. Approximate 90 percent confidence intervals for final shrinkage estimates for 2013, working poor people

	Participation rate (percent)		Number of eligible people (thousands)	
	Lower bound	Upper bound	Lower bound	Upper bound
Alabama	71	85	383	463
Alaska	66	83	47	59
Arizona	64	78	611	747
Arkansas	60	75	267	332
California	49	57	2,931	3,440
Colorado	64	79	269	332
Connecticut	71	87	155	190
Delaware	83	100	51	62
District of Columbia	50	75	36	54
Florida	69	81	1,492	1,757
Georgia	75	88	824	971
Hawaii	55	70	116	148
Idaho	76	92	132	160
Illinois	75	87	806	941
Indiana	79	94	418	498
Iowa	86	100	190	229
Kansas	64	76	205	242
Kentucky	67	80	372	444
Louisiana	71	84	425	504
Maine	86	100	72	90
Maryland	75	90	282	337
Massachusetts	61	75	278	346
Michigan	91	100	578	689
Minnesota	73	87	231	276
Mississippi	73	90	278	342
Missouri	73	88	403	488
Montana	70	85	67	82
Nebraska	65	81	103	129
Nevada	45	60	207	275
New Hampshire	71	88	42	52
New Jersey	64	80	406	506
New Mexico	82	99	195	235
New York	70	83	1,340	1,587
North Carolina	66	78	878	1,038
North Dakota	58	75	28	36
Ohio	75	89	686	807
Oklahoma	58	71	345	422
Oregon	86	100	236	289
Pennsylvania	72	86	619	735
Rhode Island	72	89	52	64
South Carolina	74	88	357	426
South Dakota	79	100	53	68
Tennessee	72	87	507	613
Texas	63	73	2,485	2,861
Utah	61	77	157	197
Vermont	89	100	28	35
Virginia	73	90	427	530
Washington	75	90	324	390
West Virginia	70	88	115	144
Wisconsin	85	100	329	398
Wyoming	49	65	25	34
United States	72	76	23,380	24,578

Table III.8. Approximate 90 percent confidence intervals for final shrinkage estimates for 2014, working poor people

	Participation rate (percent)		Number of eligible people (thousands)	
	Lower bound	Upper bound	Lower bound	Upper bound
Alabama	63	78	397	489
Alaska	67	84	43	54
Arizona	53	65	664	813
Arkansas	53	67	289	364
California	47	55	3,171	3,734
Colorado	61	76	283	349
Connecticut	71	88	145	180
Delaware	78	96	54	66
District of Columbia	39	60	40	61
Florida	66	78	1,466	1,732
Georgia	66	79	869	1,038
Hawaii	64	79	99	124
Idaho	73	90	114	140
Illinois	75	87	796	930
Indiana	77	91	446	530
Iowa	85	100	165	200
Kansas	62	75	194	233
Kentucky	61	74	361	438
Louisiana	58	70	463	557
Maine	83	100	74	90
Maryland	74	89	271	328
Massachusetts	58	73	279	349
Michigan	87	100	626	747
Minnesota	75	90	246	295
Mississippi	66	80	276	333
Missouri	66	81	384	474
Montana	65	80	58	71
Nebraska	66	82	98	122
Nevada	50	65	216	285
New Hampshire	70	88	45	56
New Jersey	62	76	431	532
New Mexico	77	92	193	232
New York	71	84	1,358	1,618
North Carolina	59	70	714	851
North Dakota	56	75	27	36
Ohio	70	83	768	914
Oklahoma	52	64	334	408
Oregon	86	100	259	315
Pennsylvania	71	84	682	808
Rhode Island	72	89	61	77
South Carolina	63	77	405	494
South Dakota	83	100	45	56
Tennessee	71	86	541	657
Texas	61	71	2,538	2,913
Utah	59	74	158	200
Vermont	85	100	29	35
Virginia	69	87	465	583
Washington	76	92	351	423
West Virginia	66	85	127	163
Wisconsin	88	100	311	375
Wyoming	49	64	27	36
United States	69	72	24,063	25,301

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APPENDIX A

THE ESTIMATION PROCEDURE: ADDITIONAL TECHNICAL DETAILS

This appendix provides additional information and technical details about our four-step procedure to estimate state SNAP participation rates for all eligible people and working poor people. Each step is discussed in turn.

1. **From CPS ASEC data and SNAP administrative data, derive direct estimates of state SNAP participation rates for each of the three fiscal years 2012 to 2014**

We derived direct estimates of participation rates for all eligible people for a given fiscal year according to:

$$(1) \quad Y_{1,i} = 100 \frac{P_i(\varepsilon_{1,i}/100)}{(E_{1,i}/100)T_i},$$

where $Y_{1,i}$ is the estimated participation rate for all eligible people for state i ($i = 1,\ldots,51$); P_i is the number of people participating in SNAP according to adjusted SNAP Program Operations data;[2] $\varepsilon_{1,i}$ is the percentage of participating people who are correctly receiving benefits and eligible under federal SNAP rules according to SNAP Quality Control (SNAP QC) data; $E_{1,i}$ is the estimated number of people who are eligible for SNAP according to a microsimulation model based on CPS ASEC data, expressed as a percentage of the CPS ASEC population; and T_i is the estimated resident population according to decennial census and administrative records (mainly vital statistics) data.[3]

We excluded from our estimates of participants two groups that are not included in our estimates of eligible people. First, we excluded participants who were ineligible for SNAP but received benefits in error. Second, we excluded participants who were eligible through state

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[2] SNAP program operations data are adjusted to exclude people who received SNAP benefits only because of a natural disaster. SNAP Program Operations data include the full population of SNAP cases, so participant counts are not subject to sampling error. Participant figures, including counts of participants eligible only through disaster assistance, were provided by the Food and Nutrition Service.

[3] The Census Bureau derives population estimates by subtracting from decennial census counts people "exiting" the population (due to death or net out-migration) and adding people "entering" the population (due to birth or net in-migration).

expanded categorical eligibility policies but would not meet federal SNAP income and asset criteria.

We estimated the percentage of people who were eligible for SNAP according to:

$$(2) \quad E_{1,i} = 100 \frac{Z_{1,i}}{N_i},$$

where $Z_{1,i}$ is the CPS ASEC estimate of the number of eligible people and N_i is the CPS ASEC estimate of the population. To derive fiscal year estimates, we combined two years of the CPS ASEC. For example, to estimate $Z_{1,i}$ for FY 2014, we used data from the 2014 CPS ASEC (simulating October through December 2013) and the 2015 CPS ASEC (simulating January through September 2014). To estimate N_i for FY 2014, we used a weighted average of population estimates from the two CPS ASEC files. Estimated percentages are more precise than estimated counts because the sampling errors in the numerators and denominators of percentages tend to be positively correlated and, therefore, partially cancel each other out.

We similarly derived sample estimates of participation rates for working poor people for a given year according to:

$$(3) \quad Y_{2,i} = 100 \frac{P_i(\varepsilon_{2,i}/100)}{(E_{2,i}/100)T_i}$$

and

$$(4) \quad E_{2,i} = 100 \frac{Z_{2,i}}{N_i},$$

Where $Y_{2,i}$ is the estimated participation rate for working poor people for state i; $\varepsilon_{2,i}$ is the percentage of SNAP participants who are working poor, correctly receiving SNAP benefits, and eligible under federal SNAP rules according to SNAP QC data; $E_{2,i}$ is the percentage of people

who are working poor and eligible for SNAP according to the CPS ASEC; $Z_{2,i}$ is the CPS ASEC

estimate of the number of eligible working poor people, and P_i, T_i, and N_i are as defined above.

We define as working poor any person who is eligible for SNAP and lives in a household in

which a member earns money from a job. Working poor people who are participating in SNAP

are identified slightly differently in the SNAP QC data than in the CPS ASEC. Specifically, a

participant household is identified as working poor if the household had earnings according to

the edited SNAP QC datafile or, prior to editing, had multiple indicators of earnings that suggest

a household was very likely to have a member who worked (Figure A.1).[4]

Figure A.1. Algorithm to identify working poor households

A household is identified as working poor if it meets one of the following criteria:

1) Earnings in the edited SNAP QC data

2) Multiple indicators of earnings in the unedited SNAP QC data

    a) At least one person with earned income AND

        i) An earned income deduction or a workforce participation variable indicating employment OR

        ii) Earned and unearned income that sum to total income, or earned income with the earned income deduction already subtracted and unearned income that sum to the total income (some states subtract the earned income deduction from income deemed by an ineligible member before recording it on the file)

    b) An earned income deduction AND

        i) At least one person with a workforce participation variable indicating employment OR

        ii) Earnings implied by the earned income deduction and unearned income that sum to total income OR

        iii) Gross income that is more than the earned income implied by the earned income deduction and both unearned and earned income equal zero (to account for household records that have no recorded individual income amounts but do have what appear to be consistent household-level indicators)

We derived SNAP eligibility estimates for states by applying SNAP rules to CPS ASEC

households. However, some key information needed to determine whether a household is eligible

for SNAP is not collected in the CPS ASEC. For example, there are no data on asset balances or

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[4] Vigil et al. (2015) describe the procedure for editing the SNAP QC data.

expenses deductible from gross income. Also, it is not possible to ascertain directly which members of a dwelling unit purchase and prepare food together or which members may be ineligible for SNAP under provisions of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 and subsequent legislation pertaining to noncitizens. Yet another limitation is that only annual, rather than monthly, income amounts are recorded.

We have developed methods to address these data limitations. These methods—including procedures for identifying the members of the SNAP household within the (potentially) larger CPS ASEC household, taking account of the restrictions on participation by noncitizens, distributing annual amounts across months, and imputing net income—are described in Farson Gray and Cunnyngham (2016) and earlier reports in that series.[5] These reports also describe how we applied SNAP gross and net income tests and calculated the benefits for which an eligible household would qualify.

In addition to our point estimates of participation rates, we need estimates of their sampling variability. We can estimate the variances of $Y_{1,i}$ and $Y_{2,i}$ as follows:[6]

(5) $\mathrm{var}(Y_{1,i}) = $ variance due to $E_{1,i}$ when $\varepsilon_{1,i}$ is fixed $+$ variance due to $\varepsilon_{1,i}$ when $E_{1,i}$ is fixed

$$= \mathrm{var}_{E_1|\varepsilon_1}(Y_{1,i}) \; + \; \mathrm{var}_{\varepsilon_1|E_1}(Y_{1,i})$$

and

(6) $\mathrm{var}(Y_{2,i}) = $ variance due to $E_{2,i}$ when $\varepsilon_{2,i}$ is fixed $+$ variance due to $\varepsilon_{2,i}$ when $E_{2,i}$ is fixed

$$= \mathrm{var}_{E_2|\varepsilon_2}(Y_{2,i}) \; + \; \mathrm{var}_{\varepsilon_2|E_2}(Y_{2,i}).$$

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[5] Because our focus in this document is on participation among people who are eligible for SNAP, these estimates of SNAP eligibility counts and participation rates do not include people who are not legally entitled to receive SNAP benefits, such as Supplemental Security Income (SSI) recipients in California who receive cash in lieu of SNAP benefits. It might be useful in other contexts, however, to consider participation rates among those eligible for SNAP or a cash substitute.

[6] Correctly-eligible rates for all eligible participants and eligible working poor participants are estimated from SNAP QC data and subject to sampling error, although it is small relative to other sources of error in the estimated participation rates. In taking into account these sampling errors, we take into account the correlation between the sampling error associated with the correctly eligible rate and sampling error associated with the correctly eligible working poor rate.

When a variable is held fixed, we fix it at its point estimate. Note that we do not include covariance terms in these expressions because the estimates of $E_{1,i}$ and $\varepsilon_{1,i}$—like the estimates of $E_{2,i}$ and $\varepsilon_{2,i}$—are based on independent samples.

For a given year, we estimated $\mathrm{var}_{E_1|\varepsilon_1}(Y_{1,i})$ and $\mathrm{var}_{E_2|\varepsilon_2}(Y_{2,i})$ using a replication method called the Successive Difference Replication Method (SDRM) with 160 replicate weights developed by the U.S. Census Bureau for the CPS ASEC; that is

$$(7) \quad \mathrm{var}_{E_1|\varepsilon_1}(Y_{1,i}) = \frac{4}{160} \sum_{r=1}^{160} (Y_{1,i(r)} - Y_{1,i})^2,$$

where is the rth ($r = 1,\ldots,160$) replicate estimate with the same form as $Y_{1,i}$ and calculated using the rth set of replicate weights.

The replicate estimates $Y_{1,i(r)}$ are obtained by replicating $E_{1,i}$; that is,

$$(8) \quad E_{1,i(r)} = 100 \frac{Z_{1,i(r)}}{N_{i(r)}}$$

and

$$(9) \quad Y_{1,i(r)} = 100 \frac{P_i(\varepsilon_{1,i}/100)}{(E_{1,i(r)}/100)T_i}.$$

Then, we can assess the degree of sampling variability (estimate the variance of $Y_{1,i}$) by using Equation (7).

We obtain estimates of sampling error variances pertaining to the participation rates for working poor people in the same manner, substituting $Z_{2,i}$, the CPS ASEC sample estimate of the number of eligible working poor in state i, for $Z_{1,i}$; $Z_{2,i(r)}$, the rth replicate estimate of $Z_{2,i}$, for $Z_{1,i(r)}$; $E_{2,i}$ for $E_{1,i}$; $E_{2,i(r)}$ for $E_{1,i(r)}$; $\varepsilon_{2,i}$ for $\varepsilon_{1,i}$; and $Y_{2,i(r)}$ for $Y_{1,i(r)}$, in Equations (7) to (9). This results in:

$$(10) \quad \text{var}_{E_2|\varepsilon_2}(Y_{2,i}) = \frac{4}{160} \sum_{r=1}^{160} (Y_{2,i(r)} - Y_{2,i})^2 ,$$

Next, based on Equation (1) we can estimate $\text{var}_{\varepsilon_1|E_1}(Y_{1,i})$ according to:

$$(11) \quad \text{var}_{\varepsilon_1|E_1}(Y_{1,i}) = \left(100 \frac{P_i}{T_i E_{1,i}} \right)^2 \text{var}(\varepsilon_{1,i}),$$

because $P_{1,i}$ and T_i are constants (or, at least, subject to negligible sampling variability) and $E_{1,i}$

is held fixed at its point estimate. Also note that we estimated $\varepsilon_{1,i}$ (the correctly-eligible rate) and

$\varepsilon_{2,i}$ (the percentage of participants who are working poor and correctly eligible) from the SNAP

QC sample data as follows:

$$(12) \quad \varepsilon_{1,i} = 100 \frac{\sum_h m_{i,h} \varepsilon_{1,i,h}}{\sum_h m_{i,h}},$$

and

$$(13) \quad \varepsilon_{2,i} = 100 \frac{\sum_h m_{i,h} \varepsilon_{2,i,h}}{\sum_h m_{i,h}},$$

where h indexes households in a state's SNAP QC sample; $m_{i,h}$ equals the number of people in

household h times the weight for household h; $\varepsilon_{1,i,h}$ is an indicator that household h is eligible to

receive SNAP benefits; and $\varepsilon_{2,i,h}$ is an indicator that household h is working poor and eligible to

receive SNAP benefits.

To calculate $\text{var}(\varepsilon_{1,i})$ and $\text{var}(\varepsilon_{2,i})$, we constructed 500 bootstrap replicate weights for the

SNAP QC sample. The estimate $\varepsilon_{1,i}$ is then replicated 500 times, each using a set of bootstrap

replicate weights. That is,

$$(14) \quad \varepsilon_{1,i(r)} = 100 \frac{\sum\limits_{h} m_{i,h(r)} \varepsilon_{1,i,h}}{\sum\limits_{h} m_{i,h(r)}}, (r = 1, 2, ..., 500),$$

where $m_{i,h(r)}$ is the number of people in household h times the rth replicate weight for household

h. Then:

$$(15) \quad \mathrm{var}(\varepsilon_{1,i}) = \frac{1}{499} \sum_{r=1}^{500} \left(\varepsilon_{1,i(r)} - \bar{\varepsilon}_{1,i}^{*} \right)^{2},$$

where

$$(16) \quad \bar{\varepsilon}_{1,i}^{*} = \frac{1}{500} \sum_{r=1}^{500} \varepsilon_{1,i(r)}.$$

Similarly, variances $\mathrm{var}_{\varepsilon_2|E_2}(Y_{2,i})$ pertaining to working poor people can be calculated in the

same manner, by substituting $\varepsilon_{2,i,h}$ for $\varepsilon_{1,i,h}$; $\varepsilon_{2,i(r)}$ for $\varepsilon_{1,i(r)}$; and $\mathrm{var}(\varepsilon_{2,i})$ for $\mathrm{var}(\varepsilon_{1,i})$ in

Equations (11) to (16), resulting in

$$(17) \quad \mathrm{var}_{\varepsilon_2|E_2}(Y_{2,i}) = \left(100 \frac{P_i}{T_i E_{2,i}} \right)^{2} \mathrm{var}(\varepsilon_{2,i}).$$

Summing the estimates from Equations (7) and (11)—as indicated by Equation (5)—and

taking the square root of the sum provides an estimated standard error of the participation rate for

all eligible people. Similarly, summing the estimates from Equations (10) and (17)—as indicated

by Equation (6)—and taking the square root of the sum provides an estimated standard error of

the participation rate for working poor people.

We estimated the covariance between the estimates of participation rates for all eligible

people and working poor people, for a given year, according to:[7]

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[7] We do not need to include additional terms because the CPS ASEC and SNAP QC samples are independent.

$$(18) \quad \mathrm{cov}(Y_{1,i}, Y_{2,i}) = \text{covariance due to } E_{1,i} \text{ and } E_{2,i} \text{ when } \varepsilon_{1,i} \text{ and } \varepsilon_{2,i} \text{ are fixed}$$

$$+ \text{ covariance due to } \varepsilon_{1,i} \text{ and } \varepsilon_{2,i} \text{ when } E_{1,i} \text{ and } E_{2,i} \text{ are fixed}$$

$$= \mathrm{cov}_{E_1 E_2 | \varepsilon_1 \varepsilon_2}(Y_{1,i}, Y_{2,i}) + \mathrm{cov}_{\varepsilon_1 \varepsilon_2 | E_1 E_2}(Y_{1,i}, Y_{2,i}).$$

To derive an estimate of the first term in this expression, we obtained an SDRM estimate of the covariance due to $E_{1,i}$ and $E_{2,i}$ according to:

$$(19) \quad \mathrm{cov}_{E_1 E_2 | \varepsilon_1 \varepsilon_2}(Y_{1,i}, Y_{2,i}) = \frac{4}{160} \sum_{r=1}^{160} (Y_{1,i(r)} - Y_{1,i})(Y_{2,i(r)} - Y_{2,i}).$$

For the second term, we estimated the covariance due to $\varepsilon_{1,i}$ and $\varepsilon_{2,i}$ according to:

$$(20) \quad \mathrm{cov}_{\varepsilon_1 \varepsilon_2 | E_1 E_2}(Y_{1,i}, Y_{2,i}) = \left(100 \frac{P_i}{T_i E_{1,i}}\right)\left(100 \frac{P_i}{T_i E_{2,i}}\right) \mathrm{cov}(\varepsilon_{1,i}, \varepsilon_{2,i})$$

where

$$(21) \quad \mathrm{cov}(\varepsilon_{1,i}, \varepsilon_{2,i}) = \frac{1}{\left(\sum_h m_{i,h}\right)^2} \left(\frac{n_i}{n_i - 1}\right) \sum_h m_{i,h}{}^2 \left(\varepsilon_{1,i,h} - \varepsilon_{1,i}\right)\left(\varepsilon_{2,i,h} - \varepsilon_{2,i}\right).$$

Because CPS ASEC samples from different years are not independent, participation rates for different years are correlated.[8] We derived a preliminary SDRM estimate of the correlation between $Y_{1,i,t}$ and $Y_{2,i,t-g}$, the sample estimate for all eligible people for one year (year t) and the sample estimate for working poor people for g years earlier, as follows:

$$(22) \quad \mathrm{cov}(Y_{1,i,t}, Y_{2,i,t-g}) = \frac{4}{160} \sum_{r=1}^{160} (Y_{1,i(r),t} - Y_{1,i,t})(Y_{2,i(r),t-g} - Y_{2,i,t-g}).$$

The correlation between $Y_{1,i,t}$ and $Y_{2,i,t-g}$ is:

$$(23) \quad \mathrm{corr}(Y_{1,i,t}, Y_{2,i,t-g}) = \frac{\mathrm{cov}(Y_{1,i,t}, Y_{2,i,t-g})}{\sqrt{\mathrm{var}(Y_{1,i,t}) \, \mathrm{var}(Y_{2,i,t-g})}}.$$

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[8] SNAP QC samples from different years are independent, so sampling variability in estimates from the CPS ASEC is the only source of intertemporal covariation between participation rates.

To improve the precision of estimated correlations (and covariances), we used a simple smoothing technique in which we "replaced" the state-specific correlation from Equation (23) by the average correlation between $Y_{1,i,t}$ and $Y_{2,i,t-g}$ across states:

$$(24) \quad \overline{\mathrm{corr}}(Y_{1,t}, Y_{2,t-g}) = \frac{\sum_{i=1}^{51} (n_{i,t} + n_{i,t-g})\, \mathrm{corr}(Y_{1,i,t}, Y_{2,i,t-g})}{\sum_{i=1}^{51} (n_{i,t} + n_{i,t-g})},$$

Where $n_{i,t}$ and $n_{i,t-g}$ are the (unweighted) number of households in the CPS ASEC samples for one year and g years earlier, respectively. Using this average correlation, we obtained as our final estimate of the covariance between $Y_{1,i,t}$ and $Y_{2,i,t-g}$:

$$(25) \quad \mathrm{cov}(Y_{1,i,t}, Y_{2,i,t-g}) = \overline{\mathrm{corr}}(Y_{1,t}, Y_{2,t-g}) \sqrt{\mathrm{var}(Y_{1,i,t})\, \mathrm{var}(Y_{2,i,t-g})} .$$

Other intertemporal covariances—such as the covariance between the participation rates for working poor people in two different years—are similarly estimated. As described under Step 3, the variances and covariances obtained in this step are the elements of a variance-covariance matrix used in deriving shrinkage estimates of participation rates.[9]

Table A.1 presents estimates of the number of people participating in SNAP (values of P_i); Table A.2 presents the percentages of all and working poor participants who are income eligible and correctly receiving SNAP benefits (values of $\varepsilon_{1,i}$ and $\varepsilon_{2,i}$); and Tables A.3 and A.4 show payment error-adjusted numbers of, respectively, all people and working poor people receiving SNAP benefits under normal program eligibility rules (values of $P_i(\varepsilon_{1,i}/100)$ and $P_i(\varepsilon_{2,i}/100)$). Tables A.5, A.6, A.7, and A.8 present CPS ASEC estimates of SNAP eligibility percentages for all eligible people and working poor people (values of $E_{1,i}$ and $E_{2,i}$), the number of eligible

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[9] All interstate covariances equal zero because state samples are independent in both the CPS ASEC and the SNAP QC.

people (values of $Z_{1,i}$), the number of eligible working poor people (values of $Z_{2,i}$), and the

population (values of N_i), respectively, and Table A.9 presents the population totals (values of

T_i). Table A.10 shows the percentage of working poor participants in Table A.4 that are in

households without reported earned income, but are identified as working poor through the other

indicators described in Figure A.1. Table A.11 displays direct estimates of participation rates for

all eligible people and working poor people (values of $Y_{1,i}$ and $Y_{2,i}$), and Table A.12 presents

standard errors for the direct estimates.

2. Using a regression model, predict state SNAP participation rates based on administrative, ACS, and other data

Our regression model consisted of six equations, with three predicting SNAP participation

rates for all eligible people in fiscal years 2012, 2013, and 2014, and three predicting SNAP

participation rates for working poor people in fiscal years 2012, 2013, and 2014. The six

equations were estimated jointly, and the values of the regression coefficients could vary from

equation to equation. The predictors used were (in addition to an intercept):

- the percentage of the population receiving SNAP benefits according to administrative data and population estimates
- the percentage of renter occupied housing units that spent 50 percent or more of household income on rent and utilities according to ACS one-year estimates
- the percentage of children under age 18 with household income under 50 percent of the federal poverty level according to ACS one-year estimates
- the percentage of occupied housing units that are owner occupied according to ACS one-year estimates
- the percentage of civilian employed people age 16 and older who were in service occupations according to ACS one-year estimates
- the percentage of people age 65 and older not claimed on tax returns or claimed on tax returns with adjusted gross income under the federal poverty level according to individual income tax data and population estimates
- the percentages of all people not claimed on tax returns according to individual income tax data and population estimates

For all the predictors, we used 2012 values in both equations for predicting FY 2012 rates, 2013 values in both equations for predicting FY 2013 rates, and 2014 values in both equations for predicting FY 2014 rates. Because prediction errors were allowed to be correlated and intergroup and intertemporal correlations among direct estimates were taken into account as specified in the next step, the shrinkage estimates for a group (all eligible people or working poor people) in any one year were determined by the predictions and sample estimates for all three years and both groups.

In addition to the predictors that we selected for our model, we considered many other potential predictors, including three used to produce the estimates in Cunnyngham et al. (2016): (1) the percentage of the population correctly receiving SNAP benefits under regular program rules according to administrative data and population estimates; (2) the percentage of civilian employed people age 16 and older who were employed in the private sector according to ACS one-year estimates; and (3) the percentage of children ages 5 to 17 approved to receive free lunches under the NSLP according to administrative data and population estimates. All of the predictors considered had three characteristics: (1) it is plausible that they are good indicators of differences among states in SNAP participation rates; (2) they could be defined and measured uniformly across states; and (3) they could be obtained from nonsample or highly precise sample data—such as the ACS or administrative records data—and, thus, measured with little or no sampling error. In addition, the third through sixth predictors listed above were used to produce the estimates in Cunnyngham et al. (2016).

As shown in the next step, where we describe the regression estimation procedure in more detail, we do not have to calculate regression estimates as a separate step, although we do have to select a best regression model before we can calculate shrinkage estimates. We selected our best

model on the basis of its strong relative performance in predicting participation rates, judging performance by examining functions of the regression residuals, such as mean squared error.[10] In addition to assessing the predictive fit of alternative specifications, we checked for potential biases as part of our extensive model evaluation. To check for biases, we looked for a persistent tendency to under- or overpredict the number of eligible people for certain types of states categorized by, for example, population size, region, and percentage of the population that is black or Hispanic. We found no strong evidence of correctable bias.

Predictors considered are listed in Table A.13 and definitions and data sources for the predictors in our chosen regression model are given in Table A.14. The values for the 2012, 2013, and 2014 predictors listed above are displayed in Tables A.15, A.16, and A.17, respectively.

3. Using shrinkage methods, average the direct estimates and regression predictions to obtain preliminary shrinkage estimates of state SNAP participation rates

To average the direct estimates and the regression predictions, we used an empirical Bayes shrinkage estimator.[11] The estimator does not have a closed-form expression from which we can calculate shrinkage estimates. Instead, we must numerically integrate over six scalar parameters—σ_1, σ_2, ρ, η_1, η_2, and $\eta_{1,2}$—that measure the lack of fit of the regression model and the correlations among regression prediction errors. To perform the numerical integration, we specified a grid of 6,870,864 equally-spaced points, starting with $\sigma_1 = 0.001$, $\sigma_2 = 0.001$,

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[10] The regression equations do not express causal relationships. Rather, they imply only statistical associations. For this reason, predictors are often called "symptomatic indicators." They are symptomatic of differences among states in conditions associated with having higher or lower participation rates.

[11] Although our shrinkage estimator averages direct and regression estimates, a state's shrinkage estimate for either all eligible people or working poor people in a given year does not have to be between the direct and regression estimates for the group and year in question. It may be above both of those estimates if, for example, they seem too low based on data from other years. In most cases, the shrinkage estimates presented in this report are between the direct and regression estimates. In the remaining cases, the shrinkage estimate is usually close to either the direct or regression estimate, and it is often close to both because the sample and regression estimates are close to each other.

$\rho = -0.999$, $\eta_1 = 0.000$, $\eta_2 = 0.000$, and $\eta_{1,2} = -0.776$ and incrementing σ_1, σ_2, ρ, η_1, η_2,

and $\eta_{1,2}$ by 0.250, 0.500, 0.666, 0.400, 0.600, and 0.071, respectively, up to $\sigma_1 = 3.001$,

$\sigma_2 = 5.001$, $\rho = 0.999$, $\eta_1 = 8.400$, $\eta_2 = 12.000$, and $\eta_{1,2} = 0.999$. For combination k of σ_1, σ_2,

ρ, η_1, η_2, and $\eta_{1,2}$ ($k = 1,\ldots,6870864$), we calculated a vector of shrinkage estimates:

$$(26) \quad \theta_k = (\Sigma_k^{-1} + V^{-1})^{-1} (\Sigma_k^{-1} X\hat{B}_k + V^{-1}Y),$$

a variance-covariance matrix:

$$(27) \quad U_k = (\Sigma_k^{-1} + V^{-1})^{-1} + (\Sigma_k^{-1} + V^{-1})^{-1} \Sigma_k^{-1} X (X'(\Sigma_k + V)^{-1} X)^{-1} X' \Sigma_k^{-1} (\Sigma_k^{-1} + V^{-1})^{-1},$$

and a probability:

$$(28) \quad p_k^* = |\Sigma_k + V|^{-1/2} |X'(\Sigma_k + V)^{-1} X|^{-1/2} \exp\left(-1/2(Y - X\hat{B}_k)'(\Sigma_k + V)^{-1} (Y - X\hat{B}_k)\right).$$

In these expressions, Y is a column vector of direct estimates (from Step 1) with 306 elements,

six sample estimates for each of the 51 states. The first six elements of Y pertain to the first state,

the next six to the second state, and so forth. For a given state, the first two elements are the FY

2012 sample estimates for all eligible people and working poor people, respectively; the second

two elements are the FY 2013 estimates; and the final two elements are the FY 2014 estimates.

The vector of shrinkage estimates, θ_k, has the same structure as the vector of sample estimates,

Y. V is the (306×306) variance-covariance matrix for the sample estimates. Because state

samples are independent in the CPS ASEC, V is block-diagonal with 51 (6×6) blocks. We

described under Step 1 how we derived estimates for the elements of V. X is a (306×48) matrix

containing values for each of the seven predictors (plus an intercept) for every state, every fiscal

year (2012, 2013, and 2014), and both groups (all eligible people and working poor people). The

first six rows of X pertain to the first state, the next six rows pertain to the second state, and so

forth. The six rows for state i are given by:

$$(29) \quad X_i = \begin{pmatrix} x'_{i,1,1} & \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} \\ \underline{0} & x'_{i,1,2} & \underline{0} & \underline{0} & \underline{0} & \underline{0} \\ \underline{0} & \underline{0} & x'_{i,2,1} & \underline{0} & \underline{0} & \underline{0} \\ \underline{0} & \underline{0} & \underline{0} & x'_{i,2,2} & \underline{0} & \underline{0} \\ \underline{0} & \underline{0} & \underline{0} & \underline{0} & x'_{i,3,1} & \underline{0} \\ \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} & x'_{i,3,2} \end{pmatrix},$$

Where $x'_{i,t,1}$ is a row vector for fiscal year t ($t = 1$ for 2012, $t = 2$ for 2013, and $t = 3$ for 2014) with eight elements (an intercept plus the seven predictors listed under Step 2) to predict participation rates for all eligible people. $x'_{i,t,2}$ is a row vector for year t with eight elements to predict participation rates for working poor people. $\underline{0}$ is a row vector with eight zeros. In a given year, the values of the predictors are the same for the equations for all eligible people and for working poor people. Thus, $x'_{i,t,1} = x'_{i,t,2}$. $\hat{B}_k$ is a (48×1) vector of regression coefficients, and is given by:

$$(30) \quad \hat{B}_k = (X'(\Sigma_k + V)^{-1} X)^{-1} X'(\Sigma_k + V)^{-1} Y.$$

Finally, Σ_k is a block-diagonal matrix with 51 (6×6) blocks, and every block equals:

$$(31) \quad \Sigma_k^* = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \otimes \begin{pmatrix} \sigma_{1,k}^2 & \sigma_{1,k}\sigma_{2,k}\rho_k \\ \sigma_{1,k}\sigma_{2,k}\rho_k & \sigma_{2,k}^2 \end{pmatrix} + \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix} \otimes \begin{pmatrix} \eta_{1,k}^2 & \eta_{1,k}\eta_{2,k}\eta_{1,2,k} \\ \eta_{1,k}\eta_{2,k}\eta_{1,2,k} & \eta_{2,k}^2 \end{pmatrix}.$$

After calculating θ_k, U_k, and p_k^* 6,870,864 times (once for each combination of σ_1, σ_2, ρ, η_1, η_2, and $\eta_{1,2}$), we calculated the probability of ($\sigma_{1,k}, \sigma_{2,k}, \rho_k, \eta_{1,k}, \eta_{2,k}, \eta_{1,2,k}$):

$$(32) \quad p_k = \frac{p_k^*}{\sum\limits_{k=1}^{6,870,864} p_k^*},$$

which is also an estimate of the probability that the shrinkage estimates θ_k are the true values. As Equation (32) suggests, the p_k are obtained by normalizing the p_k^* to sum to one.

To complete the numerical integration over σ_1, σ_2, ρ, η_1, η_2, and $\eta_{1,2}$ and obtain a single set of shrinkage estimates, we calculated a weighted sum of the 6,870,864 sets of shrinkage estimates, weighting each set θ_k by its associated probability p_k. Thus, our shrinkage estimates are:

$$(33) \quad \theta = \sum_{k=1}^{6,870,864} p_k \theta_k .$$

We call these estimates "preliminary" because we make some fairly small adjustments to them in the next step to derive our "final" estimates. The variance-covariance matrix for our preliminary shrinkage estimates is:

$$(34) \quad U = \sum_{k=1}^{6,870,864} p_k U_k + \sum_{k=1}^{6,870,864} p_k (\theta_k - \theta)(\theta_k - \theta)' .$$

The first term on the right side of this expression reflects the error from sampling variability and the lack of fit of the regression model. The second term captures how the shrinkage estimates vary as σ_1, σ_2, ρ, η_1, η_2, and $\eta_{1,2}$ vary. Thus, the second term accounts for the variability from not knowing and, thus, having to estimate σ_1, σ_2, ρ, η_1, η_2, and $\eta_{1,2}$. As described later, standard errors of the final shrinkage estimates for states are calculated as functions of the square roots of the diagonal elements of U.

Regression estimates can be similarly obtained. They are:

$$(35) \quad R = \sum_{k=1}^{6,870,864} p_k R_k ,$$

where $R_k = X\hat{B}_k$ is the vector of regression estimates obtained when $\sigma_1 = \sigma_{1,k}$; $\sigma_2 = \sigma_{2,k}$; $\rho = \rho_k$; $\eta_1 = \eta_{1,k}$; $\eta_2 = \eta_{2,k}$; and $\eta_{1,2} = \eta_{1,2,k}$. The variance-covariance matrix is:

$$(36) \quad G = \sum_{k=1}^{6,870,864} p_k G_k + \sum_{k=1}^{6,870,864} p_k (R_k - R)(R_k - R)' ,$$

where $G_k = X(X'(\Sigma_k + V)^{-1}X)^{-1}X' + \Sigma_k$. We can estimate the regression coefficient vector by:

$$(37) \quad \hat{B} = \sum_{k=1}^{6,870,864} p_k \hat{B}_k.$$

Regression estimates of participation rates for all eligible people and working poor people are in Table A.18, and the standard errors for the regression estimates are in Table A.19. Preliminary shrinkage estimates of SNAP participation rates are displayed in Table A.20.

4. Adjust the preliminary shrinkage estimates to obtain final shrinkage estimates of state SNAP participation rates and numbers of eligible people

We adjusted the preliminary shrinkage estimates of participation rates in two ways. First, we adjusted the rates so that the number of eligible people implied by the rates sum to the national number of eligible people estimated directly from the CPS ASEC. Second, we adjusted the rates so that no state's estimated rate was greater than 100 percent. These adjustments were carried out separately for each year and for the two groups of eligible people (all eligible people and working poor people). The following description of the adjustments will focus on the FY 2014 estimates for all eligible people.

To implement the first adjustment, we calculated preliminary estimates of counts for all eligible people according to:

$$(38) \quad \psi_{1,i} = \frac{P_i(\varepsilon_{1,i}/100)}{(\theta_{1,i}/100)},$$

where $\psi_{1,i}$ is the preliminary count of all eligible people for state i, P_i and $\varepsilon_{1,i}$ are the participant count and correctly-eligible rate figures used in Equation (1), and $\theta_{1,i}$ is the preliminary participation rate derived in Equation (33). The state eligible people counts from Equation (38) summed to 51,993,244 for FY 2014, while the national total for FY 2014 estimated directly from the CPS ASEC was 51,025,996. To obtain estimated eligible people counts for states that sum

(aside from rounding error) to the direct estimate of the national total, we multiplied each of the eligible people counts from Equation (38) by $51,025,996/51,993,244 \ (\approx 0.9814)$.[12]

After carrying out this first adjustment, there were sixteen instances where a state had fewer estimated eligible people than participants, implying a participation rate over 100 percent (Figure A.2). To cap participation rates at 100 percent, we increased the number of eligible people in states with preliminary estimated participation rates of over 100 percent so that the number of eligible people in that state equaled the number of participants each year. We reduced the number of eligible people in the other states and the District of Columbia by an equivalent number and in proportion to their numbers of eligible people. These adjustments, which were carried out separately for the three years and two groups, moved small numbers of eligible people among states but did not change the national totals. Moreover, except for the states with participation rates initially over 100 percent, the adjustments did not change any state's participation rate by more than four tenths of a percentage point. The rounded participation rates for some states did increase by one percentage point, however.

Figure A.2. Preliminary estimated participation rates over 100 percent

	All eligible people			Eligible working poor
	FY 2012	**FY 2013**	**FY 2014**	**FY 2013**
Maine	108.5	107.2	100.8	
Michigan	104.2	107.7	103.0	101.2
Oregon	111.4	113.9	114.4	
Vermont	105.3	111.3	105.2	
Washington		103.6	104.1	
Wisconsin			101.1	

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[12] The adjustment factors for 2012 and 2013 for all eligible people were, respectively, 0.9837, and 0.9768. The direct estimates of the national totals for all eligibles for those years were 50,708,090 and 50,716,212. The adjustment factors for 2012, 2013, and 2014 for working poor eligibles were, respectively, 0.9751, 0.9815 and 0.9790. The direct estimates of the national totals for working poor eligibles for those years were 23,769,733, 23,978,839, and 24,681,803.

From the final shrinkage estimates of the numbers of eligible people, we calculated final

shrinkage estimates of participation rates according to:

$$(39) \quad \theta_{F,1,i} = 100 \frac{P_i(\varepsilon_{1,i}/100)}{\psi_{F,1,i}}$$

where $\theta_{F,1,i}$ is the final shrinkage estimate of the participation rate for all eligible people in state

i, and $\psi_{F,1,i}$ is the final shrinkage estimate of the number of all eligible people. P_i and $\varepsilon_{1,i}$ are

the participant count and correctly-eligible rate figures used in Equations (1) and (38). We

derived final participation rates for eligible working poor in the same way.

In Tables III.3 to III.8 of Chapter III, we reported approximate 90 percent confidence

intervals for our final shrinkage estimates for all eligible people and eligible working poor. The

upper and lower bounds of the confidence intervals were calculated according to:

$$(40) \quad \text{Upper Bound}_i = F_i + 1.645\, e_i$$

and:

$$(41) \quad \text{Lower Bound}_i = F_i - 1.645\, e_i,$$

where F_i is the final shrinkage estimate for state i and e_i is the standard error of that estimate.

For participation rates and eligible people counts, the standard errors are, respectively:

$$(42) \quad e_i = \frac{1}{r}\sqrt{U(6i-1,6i-1)}$$

and

$$(43) \quad e_i = \frac{\psi_{F,1,i}}{\theta_{F,1,i}}\, r \sqrt{U(6i-1,6i-1)},$$

where r is the ratio used to adjust preliminary estimates of state eligible people counts to the

direct estimate of the national total (≈ 0.9814) for all eligible people for FY 2014), and

$U(6i-1,6i-1)$ is the $(6i-1,6i-1)$ diagonal element of U, which was derived according to

Equation (34).[13] Our estimate of e_i does not take account of the correlation between r and our preliminary shrinkage estimates for states, which were summed to obtain the denominator of r. Instead, r is treated as a constant.

Table A.21 presents final shrinkage estimates of participation rates for all eligible people and working poor people (values of $\theta_{F,1,i}$ and $\theta_{F,2,i}$), and Table A.22 presents standard errors for the rates. Tables A.23 and A.24 display final shrinkage estimates of the numbers of all eligible people and eligible working poor people (values of $\psi_{F,1,i}$ and $\psi_{F,2,i}$), respectively, and Tables A.25 and A.26 present the standard errors for those estimated counts.[14]

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[13] The square root of $U(6i-1, 6i-1)$ is the standard error of the preliminary shrinkage estimate of the 2014 participation rate for all eligible people for state i. When deriving estimates for 2012 and 2013, we would use the $(6i-5, 6i-5)$ and $(6i-3, 6i-3)$ diagonal elements of U, respectively. When deriving estimates for working poor people for 2012, 2013, and 2014, we would use the $(6i-4, 6i-4)$, $(6i-2, 6i-2)$, and $(6i, 6i)$ diagonal elements of U, respectively.

[14] The rates in Table A.20 are the same as the rates in Table III.1 of Chapter III, except for the number of digits displayed. Likewise, the counts in Tables A.22 and A.23 are the same as the counts in Table III.2 of Chapter III, except for the number of digits displayed.

Table A.1. Number of people receiving SNAP benefits, monthly average

	2012	2013	2014
Alabama	910,244	915,322	902,073
Alaska	91,298	91,364	87,486
Arizona	1,123,974	1,111,105	1,044,310
Arkansas	502,125	504,621	491,918
California	3,964,221	4,159,031	4,349,634
Colorado	491,630	507,848	505,169
Connecticut	403,466	425,320	438,559
Delaware	148,257	153,137	150,232
District of Columbia	141,147	144,889	142,707
Florida	3,353,064	3,556,473	3,526,311
Georgia	1,912,839	1,948,189	1,815,871
Hawaii	176,823	189,350	194,264
Idaho	233,034	227,006	211,781
Illinois	1,869,713	2,031,217	2,015,283
Indiana	908,598	926,011	892,699
Iowa	408,050	420,344	408,070
Kansas	304,719	316,983	293,456
Kentucky	848,922	872,439	828,076
Louisiana	899,855	940,100	877,340
Maine	252,860	249,119	230,536
Maryland	716,379	770,922	787,597
Massachusetts	861,568	887,619	863,412
Michigan	1,828,384	1,775,646	1,679,421
Minnesota	538,869	552,928	533,743
Mississippi	654,286	668,624	656,770
Missouri	947,889	929,943	858,416
Montana	125,874	128,531	124,906
Nebraska	176,073	179,711	173,530
Nevada	354,900	360,953	383,622
New Hampshire	116,895	117,315	111,701
New Jersey	818,656	875,143	883,434
New Mexico	438,252	440,362	431,494
New York	3,076,423	3,168,831	3,122,879
North Carolina	1,668,588	1,703,700	1,575,676
North Dakota	58,796	56,523	53,753
Ohio	1,807,913	1,824,675	1,752,135
Oklahoma	614,947	621,672	608,492
Oregon	815,221	817,575	802,190
Pennsylvania	1,794,501	1,784,790	1,796,154
Rhode Island	172,846	179,925	178,518
South Carolina	869,801	875,866	834,511
South Dakota	103,846	104,052	100,938
Tennessee	1,316,800	1,342,089	1,312,505
Texas	4,038,386	4,041,891	3,852,675
Utah	276,890	251,626	229,911
Vermont	96,579	100,536	93,000
Virginia	913,878	940,932	918,902
Washington	1,108,090	1,113,441	1,095,551
West Virginia	346,833	350,485	362,501
Wisconsin	835,312	856,730	841,533
Wyoming	34,347	38,046	35,871
United States	46,472,861	47,550,950	46,461,516

Source: USDA, Food and Nutrition Service

Table A.2. Estimated percentage of participants who are correctly receiving benefits and eligible under federal SNAP rules

	All participants			Working poor participants		
	2012	**2013**	**2014**	**2012**	**2013**	**2014**
Alabama	95.437	96.371	96.082	34.225	36.031	34.540
Alaska	99.006	99.316	99.559	41.902	43.166	41.443
Arizona	84.645	85.294	85.232	40.038	43.408	41.920
Arkansas	97.945	98.118	96.860	41.851	39.955	39.694
California	94.637	93.643	91.059	39.975	40.430	40.356
Colorado	93.565	92.985	92.637	40.844	42.209	42.884
Connecticut	84.754	84.511	83.055	29.711	31.997	29.360
Delaware	82.330	82.383	81.654	32.774	33.857	34.547
District of Columbia	92.341	91.018	89.014	14.039	19.586	17.523
Florida	92.299	91.865	92.382	36.299	34.332	32.847
Georgia	94.113	92.154	93.226	38.325	37.380	38.186
Hawaii	88.041	89.556	87.769	39.066	43.588	40.884
Idaho	93.155	92.749	91.114	50.286	54.184	49.006
Illinois	92.001	91.495	89.749	33.261	34.734	34.685
Indiana	98.514	98.494	98.223	43.526	42.693	45.872
Iowa	84.452	84.112	85.746	41.245	47.122	41.857
Kansas	97.053	98.052	99.777	47.464	49.162	49.734
Kentucky	93.798	93.613	92.878	31.781	34.330	32.410
Louisiana	95.707	96.349	96.132	36.651	38.332	37.154
Maine	84.090	83.954	85.913	31.514	31.328	32.928
Maryland	87.851	86.866	86.156	31.525	33.154	30.980
Massachusetts	86.476	87.622	87.549	20.997	23.899	23.745
Michigan	85.868	87.237	89.512	35.280	35.689	38.794
Minnesota	81.126	82.390	82.402	36.908	36.754	41.784
Mississippi	95.885	96.211	95.964	37.916	37.635	33.802
Missouri	97.613	98.468	99.059	44.218	38.439	36.759
Montana	86.640	89.786	89.455	36.197	44.902	37.768
Nebraska	91.872	93.848	93.973	47.147	47.275	46.920
Nevada	82.302	84.112	85.472	32.085	34.913	37.528
New Hampshire	82.110	82.995	85.720	31.677	31.683	35.555
New Jersey	89.279	89.491	89.725	35.135	37.599	37.639
New Mexico	90.225	91.459	92.786	40.765	44.018	41.760
New York	90.793	90.836	90.256	35.635	35.488	36.879
North Carolina	88.273	88.549	90.106	35.375	40.360	32.071
North Dakota	78.124	79.412	78.485	33.288	37.166	37.730
Ohio	92.318	90.179	91.274	34.359	33.515	36.702
Oklahoma	94.718	95.415	93.729	41.566	39.949	35.469
Oregon	77.433	79.980	82.620	32.505	30.864	34.104
Pennsylvania	86.907	89.033	87.991	26.497	29.935	32.262
Rhode Island	82.184	85.021	86.234	24.683	25.729	31.148
South Carolina	93.738	94.132	95.097	35.103	36.071	37.930
South Dakota	97.840	98.565	97.651	48.048	52.410	46.830
Tennessee	98.391	99.323	99.307	37.342	33.333	35.758
Texas	88.694	90.101	91.887	45.939	44.797	46.715
Utah	99.016	98.396	98.462	51.318	48.530	51.861
Vermont	75.373	76.491	82.511	27.622	30.956	32.187
Virginia	99.325	99.641	99.300	42.414	41.441	44.614
Washington	75.585	76.732	79.558	26.725	26.534	29.607
West Virginia	90.396	90.198	92.401	31.501	29.181	30.222
Wisconsin	81.556	81.886	82.553	35.595	39.846	39.398
Wyoming	97.317	98.035	97.200	47.455	44.028	49.632

Source: SNAP QC database

Table A.3. Estimated number of participants who are correctly receiving benefits and income eligible under federal SNAP rules, monthly average

	2012	2013	2014
Alabama	868,710	882,105	866,730
Alaska	90,390	90,739	87,100
Arizona	951,388	947,706	890,086
Arkansas	491,806	495,124	476,472
California	3,751,620	3,894,641	3,960,733
Colorado	459,994	472,222	467,973
Connecticut	341,954	359,442	364,245
Delaware	122,060	126,159	122,670
District of Columbia	130,337	131,875	127,029
Florida	3,094,845	3,267,154	3,257,677
Georgia	1,800,230	1,795,334	1,692,864
Hawaii	155,677	169,574	170,504
Idaho	217,080	210,546	192,960
Illinois	1,720,155	1,858,462	1,808,696
Indiana	895,096	912,065	876,836
Iowa	344,602	353,560	349,904
Kansas	295,739	310,808	292,802
Kentucky	796,272	816,716	769,092
Louisiana	861,224	905,777	843,404
Maine	212,627	209,145	198,060
Maryland	629,346	669,669	678,562
Massachusetts	745,050	777,750	755,909
Michigan	1,569,997	1,549,020	1,503,283
Minnesota	437,163	455,557	439,815
Mississippi	627,362	643,290	630,263
Missouri	925,263	915,696	850,338
Montana	109,057	115,403	111,735
Nebraska	161,762	168,655	163,071
Nevada	292,090	303,605	327,889
New Hampshire	95,982	97,366	95,750
New Jersey	730,888	783,174	792,661
New Mexico	395,413	402,751	400,366
New York	2,793,177	2,878,439	2,818,586
North Carolina	1,472,913	1,508,609	1,419,779
North Dakota	45,934	44,885	42,188
Ohio	1,669,029	1,645,474	1,599,244
Oklahoma	582,466	593,168	570,333
Oregon	631,250	653,896	662,769
Pennsylvania	1,559,547	1,589,052	1,580,454
Rhode Island	142,052	152,974	153,943
South Carolina	815,334	824,470	793,595
South Dakota	101,602	102,559	98,567
Tennessee	1,295,613	1,333,003	1,303,409
Texas	3,581,806	3,641,784	3,540,107
Utah	274,165	247,590	226,375
Vermont	72,794	76,901	76,735
Virginia	907,709	937,554	912,470
Washington	837,550	854,366	871,598
West Virginia	313,523	316,130	334,955
Wisconsin	681,247	701,542	694,711
Wyoming	33,425	37,298	34,867
United States	42,132,313	43,230,788	42,300,166

Source: SNAP QC database

Table A.4. Estimated number of working poor participants who are correctly receiving benefits and eligible under federal SNAP rules, monthly average

	2012	2013	2014
Alabama	311,522	329,791	311,576
Alaska	38,256	39,438	36,257
Arizona	450,017	482,308	437,775
Arkansas	210,144	201,621	195,262
California	1,584,697	1,681,496	1,755,338
Colorado	200,801	214,358	216,637
Connecticut	119,870	136,090	128,757
Delaware	48,590	51,848	51,901
District of Columbia	19,816	28,378	25,007
Florida	1,217,129	1,221,008	1,158,287
Georgia	733,096	728,233	693,409
Hawaii	69,078	82,534	79,423
Idaho	117,183	123,001	103,785
Illinois	621,885	705,523	699,001
Indiana	395,476	395,342	409,499
Iowa	168,300	198,075	170,806
Kansas	144,632	155,835	145,947
Kentucky	269,796	299,508	268,379
Louisiana	329,806	360,359	325,967
Maine	79,686	78,044	75,911
Maryland	225,838	255,591	243,998
Massachusetts	180,903	212,132	205,017
Michigan	645,054	633,710	651,515
Minnesota	198,886	203,223	223,019
Mississippi	248,079	251,637	222,001
Missouri	419,138	357,461	315,545
Montana	45,561	57,713	47,174
Nebraska	83,013	84,958	81,420
Nevada	113,870	126,020	143,966
New Hampshire	37,029	37,169	39,715
New Jersey	287,635	329,045	332,516
New Mexico	178,653	193,839	180,192
New York	1,096,283	1,124,555	1,151,687
North Carolina	590,263	687,613	505,335
North Dakota	19,572	21,007	20,281
Ohio	621,181	611,540	643,069
Oklahoma	255,609	248,352	215,826
Oregon	264,988	252,336	273,579
Pennsylvania	475,489	534,277	579,475
Rhode Island	42,664	46,293	55,605
South Carolina	305,326	315,934	316,530
South Dakota	49,895	54,534	47,269
Tennessee	491,719	447,359	469,326
Texas	1,855,194	1,810,605	1,799,739
Utah	142,094	122,114	119,234
Vermont	26,677	31,122	29,934
Virginia	387,612	389,932	409,959
Washington	296,137	295,440	324,360
West Virginia	109,252	102,275	109,551
Wisconsin	297,329	341,373	331,547
Wyoming	16,299	16,751	17,803
United States	17,137,024	17,708,698	17,395,109

Source: SNAP QC database

Table A.5. Estimated percentage of people eligible for SNAP

	All eligible people			Working poor people		
	2012	2013	2014	2012	2013	2014
Alabama	21.145	20.588	20.441	8.656	8.558	8.814
Alaska	15.098	14.842	14.988	7.301	7.846	6.896
Arizona	18.272	19.243	20.108	8.786	9.618	11.217
Arkansas	23.583	22.328	22.671	10.844	9.371	10.285
California	15.651	15.332	15.779	8.480	8.478	9.200
Colorado	12.533	10.704	11.494	6.172	5.176	5.880
Connecticut	11.008	10.735	10.161	4.666	4.610	4.327
Delaware	15.037	14.764	13.840	6.893	6.648	6.758
District of Columbia	21.571	21.381	20.390	6.933	7.072	7.383
Florida	17.953	18.231	18.776	8.776	8.763	8.370
Georgia	19.739	19.524	18.727	9.557	9.449	9.099
Hawaii	18.705	17.471	15.496	10.356	9.325	8.867
Idaho	16.911	15.336	12.668	9.797	8.497	6.758
Illinois	14.449	14.695	14.568	6.940	6.895	7.201
Indiana	16.335	14.958	15.723	7.142	6.309	7.596
Iowa	10.897	11.667	11.067	5.223	5.869	5.495
Kansas	15.809	14.835	13.586	8.579	7.994	7.029
Kentucky	20.545	22.723	21.577	8.754	10.161	8.724
Louisiana	23.580	23.041	25.128	11.049	9.748	11.313
Maine	13.791	14.250	14.844	5.493	5.693	6.005
Maryland	11.897	12.347	11.839	5.234	5.321	5.031
Massachusetts	12.508	13.266	14.016	4.376	5.110	5.366
Michigan	15.302	14.532	15.017	6.632	6.438	6.784
Minnesota	10.189	10.200	9.121	4.583	5.412	5.190
Mississippi	24.511	26.829	26.895	9.396	9.796	10.993
Missouri	15.739	15.555	14.426	7.200	7.470	6.726
Montana	15.589	14.781	13.811	7.317	6.868	6.035
Nebraska	10.708	10.834	11.546	6.327	5.764	5.674
Nevada	16.554	17.485	18.363	8.473	9.148	9.086
New Hampshire	8.010	9.143	8.843	2.974	3.643	3.977
New Jersey	11.386	12.548	12.634	4.871	5.619	5.567
New Mexico	21.065	22.754	21.521	9.908	11.286	10.251
New York	18.171	17.333	16.090	7.824	7.558	6.768
North Carolina	19.578	19.253	18.625	8.874	9.036	8.390
North Dakota	9.712	10.015	9.136	4.303	4.127	4.625
Ohio	16.662	15.981	16.417	7.013	6.654	7.555
Oklahoma	19.379	19.977	19.295	9.315	9.529	10.587
Oregon	14.697	14.825	14.280	7.103	6.327	7.252
Pennsylvania	14.397	14.291	14.319	5.199	5.482	5.768
Rhode Island	14.932	14.053	12.854	5.714	5.262	4.184
South Carolina	20.373	20.826	21.005	7.533	8.473	9.736
South Dakota	12.947	11.308	12.914	6.234	5.230	5.902
Tennessee	20.209	20.920	20.315	9.753	9.776	9.541
Texas	18.900	18.383	18.631	10.169	10.367	10.540
Utah	11.580	11.287	11.787	6.948	6.748	7.026
Vermont	11.172	10.766	10.470	5.194	5.046	4.141
Virginia	12.833	12.701	11.885	5.525	5.171	4.868
Washington	12.097	12.005	12.159	5.672	5.581	6.216
West Virginia	20.121	21.790	22.578	6.667	7.260	7.584
Wisconsin	12.313	11.988	12.149	5.837	5.383	5.513
Wyoming	10.340	11.518	9.902	5.187	5.754	4.940

Source: CPS ASEC

Table A.6. Directly estimated number of people eligible for SNAP

	2012	2013	2014
Alabama	1,015,729	983,508	974,428
Alaska	106,659	104,263	104,503
Arizona	1,210,233	1,272,584	1,335,894
Arkansas	686,909	649,079	657,038
California	5,931,296	5,845,734	6,085,933
Colorado	642,599	563,415	615,796
Connecticut	387,485	382,636	363,588
Delaware	135,638	133,970	127,939
District of Columbia	135,823	138,405	133,691
Florida	3,436,372	3,530,928	3,690,432
Georgia	1,909,689	1,908,989	1,859,037
Hawaii	252,900	236,858	211,200
Idaho	268,168	245,044	203,677
Illinois	1,839,359	1,875,308	1,863,328
Indiana	1,037,147	963,346	1,018,241
Iowa	328,895	357,171	340,845
Kansas	447,356	418,642	386,413
Kentucky	892,228	997,173	935,757
Louisiana	1,055,526	1,040,485	1,143,460
Maine	183,600	188,149	193,551
Maryland	699,271	732,257	703,171
Massachusetts	820,741	879,468	932,855
Michigan	1,489,101	1,432,064	1,487,151
Minnesota	543,963	548,272	493,347
Mississippi	712,048	778,457	793,385
Missouri	935,977	928,326	860,279
Montana	155,435	147,080	138,810
Nebraska	197,455	200,591	216,340
Nevada	451,218	482,628	515,887
New Hampshire	104,753	120,355	116,670
New Jersey	991,328	1,102,538	1,125,179
New Mexico	434,005	472,782	440,485
New York	3,512,735	3,368,678	3,158,088
North Carolina	1,882,729	1,858,463	1,823,413
North Dakota	66,903	71,034	66,572
Ohio	1,897,534	1,823,867	1,888,737
Oklahoma	722,351	741,258	720,418
Oregon	569,083	584,025	565,750
Pennsylvania	1,828,171	1,822,525	1,813,223
Rhode Island	154,748	146,452	134,613
South Carolina	948,267	975,407	996,758
South Dakota	106,338	93,996	108,922
Tennessee	1,294,464	1,340,380	1,315,711
Texas	4,910,797	4,837,486	4,957,965
Utah	329,279	325,466	344,226
Vermont	68,762	66,733	64,712
Virginia	1,026,908	1,035,884	979,924
Washington	829,701	824,453	854,793
West Virginia	364,376	396,144	411,969
Wisconsin	696,626	676,511	695,007
Wyoming	59,408	66,943	56,886
United States	50,708,087	50,716,210	51,025,994

Source: CPS ASEC

Table A.7. Directly estimated number of working poor people eligible for SNAP

	2012	2013	2014
Alabama	415,812	408,832	420,147
Alaska	51,574	55,122	48,085
Arizona	581,928	636,069	745,199
Arkansas	315,848	272,410	298,083
California	3,213,516	3,232,588	3,548,324
Colorado	316,431	272,458	315,047
Connecticut	164,261	164,301	154,813
Delaware	62,177	60,326	62,475
District of Columbia	43,651	45,778	48,411
Florida	1,679,745	1,697,198	1,645,248
Georgia	924,600	923,917	903,221
Hawaii	140,012	126,420	120,848
Idaho	155,358	135,761	108,656
Illinois	883,537	879,937	921,020
Indiana	453,427	406,317	491,920
Iowa	157,643	179,675	169,241
Kansas	242,763	225,599	199,910
Kentucky	380,144	445,896	378,356
Louisiana	494,574	440,223	514,813
Maine	73,124	75,172	78,298
Maryland	307,606	315,556	298,826
Massachusetts	287,180	338,758	357,138
Michigan	645,373	634,466	671,815
Minnesota	244,685	290,915	280,734
Mississippi	272,952	284,226	324,271
Missouri	428,169	445,801	401,076
Montana	72,959	68,343	60,660
Nebraska	116,666	106,723	106,311
Nevada	230,953	252,515	255,258
New Hampshire	38,900	47,956	52,474
New Jersey	424,089	493,743	495,801
New Mexico	204,124	234,500	209,817
New York	1,512,477	1,468,908	1,328,434
North Carolina	853,320	872,207	821,359
North Dakota	29,646	29,270	33,704
Ohio	798,671	759,366	869,254
Oklahoma	347,191	353,589	395,286
Oregon	275,010	249,243	287,307
Pennsylvania	660,183	699,124	730,426
Rhode Island	59,214	54,837	43,812
South Carolina	350,638	396,857	462,029
South Dakota	51,203	43,472	49,778
Tennessee	624,740	626,335	617,924
Texas	2,642,196	2,728,024	2,804,903
Utah	197,570	194,582	205,175
Vermont	31,969	31,280	25,593
Virginia	442,101	421,711	401,382
Washington	389,036	383,295	437,007
West Virginia	120,729	131,995	138,385
Wisconsin	330,253	303,801	315,369
Wyoming	29,798	33,443	28,382
United States	23,769,732	23,978,838	24,681,802

Source: CPS ASEC

Table A.8. CPS ASEC population estimate

	2012	2013	2014
Alabama	4,803,704	4,777,017	4,766,973
Alaska	706,440	702,507	697,249
Arizona	6,623,412	6,613,354	6,643,658
Arkansas	2,912,757	2,907,079	2,898,172
California	37,897,121	38,128,514	38,570,108
Colorado	5,127,162	5,263,441	5,357,535
Connecticut	3,520,103	3,564,415	3,578,118
Delaware	902,019	907,398	924,411
District of Columbia	629,643	647,319	655,676
Florida	19,140,853	19,367,703	19,655,571
Georgia	9,674,777	9,777,816	9,927,098
Hawaii	1,352,026	1,355,709	1,362,970
Idaho	1,585,753	1,597,851	1,607,764
Illinois	12,730,385	12,761,371	12,790,827
Indiana	6,349,080	6,440,439	6,475,980
Iowa	3,018,182	3,061,345	3,079,947
Kansas	2,829,856	2,821,986	2,844,118
Kentucky	4,342,748	4,388,459	4,336,830
Louisiana	4,476,383	4,515,835	4,550,462
Maine	1,331,299	1,320,351	1,303,867
Maryland	5,877,520	5,930,569	5,939,391
Massachusetts	6,561,957	6,629,472	6,655,516
Michigan	9,731,575	9,854,616	9,902,914
Minnesota	5,338,997	5,375,214	5,409,212
Mississippi	2,904,980	2,901,561	2,949,887
Missouri	5,947,005	5,967,901	5,963,321
Montana	997,070	995,033	1,005,093
Nebraska	1,843,997	1,851,573	1,873,772
Nevada	2,725,819	2,760,252	2,809,353
New Hampshire	1,307,824	1,316,376	1,319,380
New Jersey	8,706,905	8,786,870	8,906,333
New Mexico	2,060,285	2,077,848	2,046,733
New York	19,331,573	19,435,425	19,627,344
North Carolina	9,616,386	9,652,668	9,789,985
North Dakota	688,902	709,265	728,680
Ohio	11,388,338	11,412,994	11,505,058
Oklahoma	3,727,413	3,710,579	3,733,659
Oregon	3,872,014	3,939,598	3,961,837
Pennsylvania	12,698,214	12,752,570	12,663,467
Rhode Island	1,036,322	1,042,174	1,047,213
South Carolina	4,654,445	4,683,702	4,745,424
South Dakota	821,318	831,216	843,475
Tennessee	6,405,350	6,407,193	6,476,527
Texas	25,982,437	26,315,752	26,611,406
Utah	2,843,603	2,883,498	2,920,442
Vermont	615,485	619,860	618,104
Virginia	8,002,173	8,155,798	8,245,129
Washington	6,858,989	6,867,718	7,030,210
West Virginia	1,810,929	1,818,023	1,824,653
Wisconsin	5,657,860	5,643,489	5,720,889
Wyoming	574,542	581,205	574,509
United States	310,543,926	312,829,918	315,476,246

Source: CPS ASEC

Table A.9. Population on July 1

	2012	2013	2014
Alabama	4,817,528	4,833,996	4,846,411
Alaska	730,307	737,259	737,046
Arizona	6,551,149	6,634,997	6,728,783
Arkansas	2,949,828	2,958,765	2,966,835
California	37,999,878	38,431,393	38,792,291
Colorado	5,189,458	5,272,086	5,355,588
Connecticut	3,591,765	3,599,341	3,594,762
Delaware	917,053	925,240	935,968
District of Columbia	633,427	649,111	659,836
Florida	19,320,749	19,600,311	19,905,569
Georgia	9,915,646	9,994,759	10,097,132
Hawaii	1,390,090	1,408,987	1,420,257
Idaho	1,595,590	1,612,843	1,634,806
Illinois	12,868,192	12,890,552	12,882,189
Indiana	6,537,782	6,570,713	6,597,880
Iowa	3,075,039	3,092,341	3,109,481
Kansas	2,885,398	2,895,801	2,902,507
Kentucky	4,379,730	4,399,583	4,412,617
Louisiana	4,602,134	4,629,284	4,648,990
Maine	1,328,501	1,328,702	1,330,256
Maryland	5,884,868	5,938,737	5,975,346
Massachusetts	6,645,303	6,708,874	6,755,124
Michigan	9,882,519	9,898,193	9,916,306
Minnesota	5,379,646	5,422,060	5,457,125
Mississippi	2,986,450	2,992,206	2,993,443
Missouri	6,024,522	6,044,917	6,063,827
Montana	1,005,494	1,014,864	1,023,252
Nebraska	1,855,350	1,868,969	1,882,980
Nevada	2,754,354	2,791,494	2,838,281
New Hampshire	1,321,617	1,322,616	1,327,996
New Jersey	8,867,749	8,911,502	8,938,844
New Mexico	2,083,540	2,086,895	2,085,567
New York	19,576,125	19,695,680	19,748,858
North Carolina	9,748,364	9,848,917	9,940,387
North Dakota	701,345	723,857	740,040
Ohio	11,553,031	11,572,005	11,596,998
Oklahoma	3,815,780	3,853,118	3,879,610
Oregon	3,899,801	3,928,068	3,971,202
Pennsylvania	12,764,475	12,781,296	12,793,767
Rhode Island	1,050,304	1,053,354	1,054,907
South Carolina	4,723,417	4,771,929	4,829,160
South Dakota	834,047	845,510	853,304
Tennessee	6,454,914	6,497,269	6,547,779
Texas	26,060,796	26,505,637	26,979,078
Utah	2,854,871	2,902,787	2,944,498
Vermont	625,953	626,855	626,767
Virginia	8,186,628	8,270,345	8,328,098
Washington	6,895,318	6,973,742	7,063,166
West Virginia	1,856,680	1,853,595	1,848,751
Wisconsin	5,724,554	5,742,953	5,759,432
Wyoming	576,626	583,223	584,304
United States	313,873,685	316,497,531	318,907,401

Source: U.S. Census Bureau, Population Division

Table A.10. Percentage of working poor participants without reported earned income but with other indicators of earnings

	2012	2013	2014
Alabama	0.0	0.0	0.0
Alaska	0.0	0.0	0.0
Arizona	0.0	0.1	0.0
Arkansas	2.0	1.7	0.4
California	0.3	0.0	0.0
Colorado	0.0	0.0	0.0
Connecticut	1.4	2.1	2.3
Delaware	0.0	0.0	0.0
District of Columbia	0.0	3.4	1.0
Florida	0.8	0.0	0.0
Georgia	0.0	0.0	0.0
Hawaii	0.0	0.0	0.2
Idaho	0.0	0.0	0.0
Illinois	0.0	0.0	0.0
Indiana	0.0	0.0	0.0
Iowa	0.0	0.0	0.3
Kansas	0.0	0.0	0.0
Kentucky	0.0	0.0	0.0
Louisiana	0.0	0.0	0.0
Maine	0.0	0.0	0.0
Maryland	0.3	0.0	0.4
Massachusetts	0.0	1.0	0.0
Michigan	0.0	0.0	0.9
Minnesota	1.5	1.5	4.7
Mississippi	0.1	0.0	0.0
Missouri	0.4	0.9	0.3
Montana	0.0	0.0	0.2
Nebraska	0.0	0.3	0.0
Nevada	0.0	0.0	0.0
New Hampshire	0.8	0.0	0.0
New Jersey	0.0	0.0	0.0
New Mexico	0.2	0.2	0.0
New York	0.0	0.0	0.0
North Carolina	0.0	0.0	0.0
North Dakota	0.0	0.0	0.0
Ohio	0.0	0.0	0.0
Oklahoma	0.0	0.0	0.0
Oregon	0.0	0.0	0.2
Pennsylvania	1.9	1.5	0.8
Rhode Island	0.8	1.1	1.4
South Carolina	0.0	0.3	0.0
South Dakota	0.0	0.4	0.0
Tennessee	0.0	0.0	0.0
Texas	0.0	0.0	0.0
Utah	0.0	0.0	0.3
Vermont	0.0	0.6	0.0
Virginia	0.0	0.0	0.0
Washington	0.0	0.0	0.0
West Virginia	0.0	0.0	0.0
Wisconsin	0.0	0.3	0.4
Wyoming	0.0	0.0	0.0

Source: SNAP QC database

Table A.11. Direct estimates of SNAP participation rates

	All eligible people			Working poor		
	2012	2013	2014	2012	2013	2014
Alabama	85.280	88.633	87.490	74.705	79.717	72.943
Alaska	81.978	82.927	78.847	71.753	68.175	71.330
Arizona	79.479	74.228	65.786	78.185	75.580	58.003
Arkansas	70.697	74.948	70.840	65.697	72.721	63.989
California	63.080	66.098	64.707	49.180	51.607	49.186
Colorado	70.724	83.677	76.023	62.696	78.546	68.788
Connecticut	86.488	93.027	99.717	71.520	82.026	82.785
Delaware	88.514	92.353	94.698	76.867	84.288	82.048
District of Columbia	95.387	95.018	94.418	45.124	61.820	51.328
Florida	89.223	91.431	87.164	71.784	71.088	69.518
Georgia	91.978	92.005	89.528	77.362	77.109	75.477
Hawaii	59.871	68.886	77.475	47.985	62.817	63.071
Idaho	80.451	85.123	93.172	74.963	89.759	93.937
Illinois	92.518	98.109	96.380	69.632	79.375	75.355
Indiana	83.813	92.799	84.522	84.701	95.370	81.707
Iowa	102.839	97.997	101.682	104.786	109.135	99.966
Kansas	64.835	72.350	74.250	58.431	67.315	71.538
Kentucky	88.492	81.696	80.778	70.373	67.000	69.715
Louisiana	79.362	84.920	72.196	64.862	79.853	61.975
Maine	116.055	110.461	100.299	109.203	103.168	95.027
Maryland	89.888	91.327	95.919	73.327	80.885	81.162
Massachusetts	89.639	87.387	79.837	62.203	61.880	56.558
Michigan	103.822	107.690	100.948	98.423	99.442	96.848
Minnesota	79.759	82.371	88.366	80.668	69.253	78.744
Mississippi	85.703	80.133	78.284	88.407	85.852	67.466
Missouri	97.583	97.383	97.206	96.631	79.162	77.371
Montana	69.575	76.930	79.066	61.925	82.796	76.388
Nebraska	81.422	83.296	75.009	70.719	78.866	76.212
Nevada	64.063	62.203	62.911	48.793	49.347	55.825
New Hampshire	90.672	80.517	81.537	94.196	77.140	75.194
New Jersey	72.391	70.040	70.191	66.594	65.712	66.823
New Mexico	90.091	84.818	89.199	86.544	82.302	84.282
New York	78.522	84.318	88.701	71.577	75.545	86.161
North Carolina	77.173	79.558	76.686	68.236	77.265	60.593
North Dakota	67.439	61.915	62.399	64.847	70.325	59.249
Ohio	86.704	88.979	84.002	76.669	79.425	73.392
Oklahoma	78.768	77.062	76.189	71.916	67.638	52.546
Oregon	110.134	112.292	116.873	95.669	101.538	94.998
Pennsylvania	84.864	86.994	86.275	71.650	76.249	78.525
Rhode Island	90.574	103.344	113.525	71.090	83.522	125.992
South Carolina	84.726	82.963	78.237	85.805	78.137	67.320
South Dakota	94.089	107.266	89.450	95.960	123.324	93.867
Tennessee	99.320	98.071	97.987	78.104	70.434	75.125
Texas	72.718	74.743	70.429	70.003	65.896	63.290
Utah	82.934	75.567	65.226	71.637	62.341	57.639
Vermont	104.094	113.951	116.940	82.053	98.384	115.348
Virginia	86.400	89.254	92.189	85.700	91.183	101.120
Washington	100.415	102.052	101.491	75.721	75.907	73.878
West Virginia	83.924	78.270	80.246	88.266	75.997	78.133
Wisconsin	96.653	101.904	99.288	88.983	110.420	104.427
Wyoming	56.061	55.524	60.264	54.501	49.915	61.677

Table A.12. Standard errors of direct estimates of SNAP participation rates

	All eligible people			Working poor		
	2012	2013	2014	2012	2013	2014
Alabama	6.179	4.160	3.949	10.934	7.037	6.782
Alaska	6.043	5.794	5.065	7.987	7.454	9.181
Arizona	4.805	6.961	3.266	8.070	12.857	4.643
Arkansas	5.396	5.702	3.780	6.157	8.006	5.853
California	1.551	1.598	1.666	2.701	2.771	2.722
Colorado	5.065	6.993	6.169	6.935	9.410	8.257
Connecticut	5.562	5.347	8.756	8.029	8.434	10.482
Delaware	5.798	5.188	5.578	8.634	9.208	8.588
District of Columbia	5.084	4.827	4.840	7.064	8.696	6.740
Florida	2.830	2.995	2.601	5.273	5.592	4.968
Georgia	4.322	3.703	4.082	6.637	6.601	6.470
Hawaii	3.707	4.017	5.240	4.596	5.996	6.377
Idaho	7.868	8.051	6.988	8.175	9.044	9.407
Illinois	4.043	4.250	4.167	5.463	6.101	5.978
Indiana	4.655	5.364	5.891	7.918	7.940	8.081
Iowa	8.834	5.195	7.252	10.331	10.236	11.345
Kansas	4.090	3.685	4.628	4.358	5.238	8.076
Kentucky	4.754	3.614	4.485	6.143	5.003	7.009
Louisiana	4.951	5.749	3.330	6.793	7.161	4.688
Maine	7.483	6.612	6.815	12.435	11.466	11.847
Maryland	5.343	4.647	5.684	7.317	7.968	9.709
Massachusetts	6.329	7.236	5.341	8.729	9.493	7.620
Michigan	5.169	5.948	5.052	9.210	9.462	8.545
Minnesota	4.941	4.355	6.160	7.770	6.610	7.984
Mississippi	4.951	4.307	2.975	7.379	10.548	5.666
Missouri	6.604	5.926	6.008	10.234	8.380	8.198
Montana	7.139	7.579	6.917	8.441	9.733	8.696
Nebraska	7.265	6.970	5.946	7.807	9.227	9.102
Nevada	3.452	3.240	3.715	4.817	4.829	5.331
New Hampshire	6.199	5.868	6.834	13.083	10.202	10.332
New Jersey	4.532	3.959	3.931	8.112	7.713	6.870
New Mexico	6.250	7.000	6.398	9.722	8.427	7.181
New York	2.555	2.537	3.070	5.468	5.416	6.226
North Carolina	4.823	3.377	3.515	5.858	6.776	5.188
North Dakota	6.048	4.607	5.666	10.430	8.991	9.501
Ohio	4.851	4.623	3.782	6.939	6.885	6.376
Oklahoma	4.594	5.001	4.458	7.170	6.986	4.511
Oregon	6.208	6.041	8.361	11.268	11.351	9.866
Pennsylvania	3.854	4.658	3.838	6.868	8.013	7.259
Rhode Island	5.887	6.178	8.938	8.521	9.935	18.455
South Carolina	4.676	3.839	4.063	8.560	7.100	5.961
South Dakota	9.697	14.039	10.354	9.840	13.973	13.741
Tennessee	8.408	6.047	5.082	10.471	7.127	6.869
Texas	2.264	2.213	1.859	3.643	3.491	3.242
Utah	7.499	6.559	6.187	9.138	9.071	7.551
Vermont	7.271	7.957	9.076	10.774	12.259	16.460
Virginia	5.558	5.712	5.550	8.630	8.654	10.959
Washington	5.788	5.684	6.212	7.151	7.703	8.160
West Virginia	8.053	5.219	5.028	14.857	9.252	8.626
Wisconsin	5.657	5.458	6.189	9.606	11.576	11.378
Wyoming	5.168	3.790	4.570	5.903	6.471	7.301

Table A.13. Potential predictors

Predictor	Data source(s)
Number of people who received SNAP benefits	Administrative data
Estimated population on July 1; Change in July 1 estimated population	Census Bureau
Percentages of population that 1) received SNAP benefits, 2) correctly received regular SNAP benefits, 3) correctly received regular SNAP benefits under federal eligibility rules Percentage of children ages 5 to 17 approved to receive free lunches under the National School Lunch Program Percentage of elderly people that received Supplemental Security Income Percentage of population that received unemployment	Administrative data; population estimates
Per capita personal income	Commerce Bureau; population estimates
Mean adjusted gross income (AGI); Median AGI Percentages of exemptions for (1) people, (2) elderly people, and (3) children claimed on tax returns with AGI below the federal poverty level (FPL)	Individual income tax data
Percentages of (1) people, (2) elderly people, and (3) nonelderly people not claimed on tax returns Percentages of (1) people, (2) elderly people, and (3) nonelderly people, not claimed on tax returns or claimed on returns with AGI below the FPL	Individual income tax data; population estimates
Four measures of state eligibility policy expansiveness; Four measures of state eligibility policy expansiveness in the previous year	State SNAP eligibility policies
Percentages of population that were (1) foreign-born and entered the U.S. in 2000 or later, and (2) noncitizens Percentage of foreign-born people who entered the U.S. in 2000 or later Percentages of households that (1) were married-couple families, (2) were nonfamily households, and (3) had one or more children under age 18 Percentages of households and families that had a female householder, no husband present, and related children under age18 Percentages of adults age 25 and older who had (1) completed high school or equivalent and (2) completed a bachelor's degree Employment/population ratio for the civilian population ages 16 to 64 Percentages of civilian employed population age 16 and older who were (1) in service occupations and (2) private wage and salary workers Percentage of households that had earnings Percentage of occupied housing units that were owner occupied Percentages of renter occupied housing units that spent (1) 30 percent or more and (2) 50 percent or more of household income on rent and utilities Lower rent quartile among renter occupied housing units paying cash rent Median monthly housing costs among occupied housing units with cost Median household income; Median family income Percentages of population with income under (1) 100 percent and (2) 200 percent of the FPL Percentages of children with income under (1) 50 percent and (2) 100 percent of the FPL Percentages of adults ages 18 to 64 under (1) 100 percent and (2) 125 percent of the FPL Percentage of adults age 65 and older under (1) 125 percent and 200 percent of the FPL Percentage of families with income under 130 percent of the FPL	American Community Survey one-year estimates

Table A.14. Predictors in current model

Predictor	Rate numerator	Rate denominator
SNAP prevalence rate	People receiving SNAP benefits according to SNAP Program Operations data	Resident population[a]
Elderly combined poverty and tax non-filer rate	People age 65 and older not claimed on tax returns or claimed on tax returns with adjusted gross income under the federal poverty level[b]	Resident population age 65 and older[a]
Tax non-filer rate	People not claimed on tax returns[b]	Resident population[a]
Service occupation employment rate	People age 16 and over employed in service occupations according to ACS one-year estimates [c]	Total civilian employed people age 16 and older according to ACS one-year estimates [c]
Owner occupied housing rate	Owner occupied housing units according to ACS one-year estimates [c]	Total occupied housing units according to ACS one-year estimates [c]
Very high rent rate	Renter occupied housing units that spent 50 percent or more of household income on rent and utilities according to ACS one-year estimates [c]	Total renter occupied housing units according to ACS one-year estimates [c]
Rate of children with income under 50 percent of poverty	Children under age 18 with income under 50 percent of the poverty level according to ACS one-year estimates [c]	Total children under age 18 according to ACS one-year estimates [c]

[a] Estimates of the resident population are from the July 1 population estimates released in June 2016, available at http://www.census.gov/popest/.

[b] Counts of people claimed on tax returns are from individual income tax data provided by the Census Bureau Small Area Estimates Branch

[c] ACS one-year estimates available at http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml.

Note: All rates expressed as percentages.

Table A.15. Values for 2012 predictors

	SNAP prevalence rate	Tax non-filer rate	Elderly combined poverty and non-filer rate	Service sector employment rate	Owner occupied housing rate	Very high rent rate	Child 50 percent of poverty rate
Alabama	18.894	20.019	52.119	16.9	68.8	22.8	13.7
Alaska	12.501	11.957	28.834	19.2	63.4	19.3	5.3
Arizona	17.157	20.267	48.096	20.2	62.6	24.1	12.5
Arkansas	17.022	20.315	52.293	17.3	66.2	21.9	12.6
California	10.432	16.993	46.536	19.0	54.0	28.9	10.2
Colorado	9.474	13.477	37.449	17.6	64.0	24.3	8.2
Connecticut	11.233	14.346	38.128	18.1	66.9	26.7	6.9
Delaware	16.167	15.853	36.481	18.8	70.8	22.9	7.9
District of Columbia	22.283	25.272	44.456	15.4	41.5	24.2	15.8
Florida	17.355	17.671	48.418	20.5	65.6	28.8	11.1
Georgia	19.291	17.352	48.793	17.2	63.7	24.7	12.8
Hawaii	12.720	14.013	40.658	23.1	56.9	25.9	8.2
Idaho	14.605	13.374	43.653	18.5	68.4	21.5	7.6
Illinois	14.530	13.344	41.050	17.6	66.6	25.2	8.8
Indiana	13.898	13.137	42.355	17.2	69.4	24.0	10.5
Iowa	13.270	12.592	37.422	16.3	71.9	22.0	6.3
Kansas	10.561	12.272	37.854	17.3	66.4	19.8	6.9
Kentucky	19.383	18.902	51.931	16.7	67.0	22.1	12.2
Louisiana	19.553	20.625	51.615	19.6	65.7	24.4	13.2
Maine	19.033	16.887	46.204	18.7	71.4	23.3	7.6
Maryland	12.173	14.278	37.532	17.0	66.5	23.7	6.8
Massachusetts	12.965	15.163	40.319	17.4	62.2	24.5	7.3
Michigan	18.501	14.891	40.656	19.0	71.1	27.6	11.7
Minnesota	10.017	10.715	35.728	16.3	71.4	22.0	6.2
Mississippi	21.908	21.225	55.655	18.1	68.2	23.4	16.2
Missouri	15.734	16.207	44.696	18.2	67.5	23.7	10.6
Montana	12.519	13.977	41.162	19.2	67.1	20.8	7.6
Nebraska	9.490	10.907	38.699	17.1	66.3	18.8	7.0
Nevada	12.885	16.853	41.196	28.1	54.9	24.8	10.0
New Hampshire	8.845	10.387	34.565	16.2	70.9	23.4	6.1
New Jersey	9.232	12.322	40.162	16.8	65.1	27.2	7.6
New Mexico	21.034	19.099	47.983	20.6	67.7	24.2	14.0
New York	15.715	16.597	47.078	20.3	53.7	27.8	10.5
North Carolina	17.117	18.090	48.176	18.0	65.4	22.7	11.9
North Dakota	8.383	9.874	35.863	17.2	65.0	16.2	6.2
Ohio	15.649	15.118	42.723	18.0	66.3	23.9	11.8
Oklahoma	16.116	18.570	47.285	18.2	66.4	20.9	10.4
Oregon	20.904	17.739	42.121	19.2	61.6	27.2	10.1
Pennsylvania	14.059	14.748	44.331	17.7	68.9	24.1	9.0
Rhode Island	16.457	16.575	45.265	20.6	60.0	23.4	9.4
South Carolina	18.415	19.592	47.517	18.4	68.1	24.1	12.8
South Dakota	12.451	9.234	29.216	17.4	67.1	14.7	9.0
Tennessee	20.400	17.076	50.189	16.9	66.7	22.6	11.6
Texas	15.496	14.918	47.176	18.1	62.3	21.9	10.9
Utah	9.699	11.018	36.688	15.6	69.6	22.7	6.3
Vermont	15.429	11.786	40.156	17.1	71.0	24.5	7.0
Virginia	11.163	14.295	39.435	16.9	66.2	22.4	6.8
Washington	16.070	13.307	36.099	18.0	62.3	23.0	8.5
West Virginia	18.680	20.531	53.547	18.7	72.0	20.6	13.3
Wisconsin	14.592	11.413	39.311	16.8	67.3	23.4	7.9
Wyoming	5.957	7.188	21.482	18.3	69.0	17.0	7.9

Table A.16. Values for 2013 predictors

	SNAP prevalence rate	Tax non-filer rate	Elderly combined poverty and non-filer rate	Service sector employment rate	Owner occupied housing rate	Very high rent rate	Child 50 percent of poverty rate
Alabama	18.935	20.515	51.593	17.1	68.0	22.3	13.2
Alaska	12.392	13.600	32.625	16.2	63.5	17.2	5.7
Arizona	16.746	20.527	48.051	20.2	62.1	23.2	12.7
Arkansas	17.055	20.732	52.290	17.1	65.7	20.9	12.7
California	10.822	17.101	46.504	18.9	53.8	28.4	9.8
Colorado	9.633	13.642	37.320	17.8	64.5	24.4	6.5
Connecticut	11.817	14.646	37.470	18.7	66.3	25.4	6.5
Delaware	16.551	16.042	36.362	19.4	71.7	22.1	9.2
District of Columbia	22.321	25.974	44.506	15.5	40.7	25.0	16.2
Florida	18.145	18.041	49.287	20.8	64.8	27.6	11.0
Georgia	19.492	17.653	48.853	17.7	62.7	23.8	12.4
Hawaii	13.439	14.563	40.538	22.4	56.2	24.5	6.4
Idaho	14.075	13.315	43.173	17.3	69.4	21.1	7.0
Illinois	15.757	13.699	40.631	17.5	65.9	24.2	9.2
Indiana	14.093	13.514	41.819	17.3	68.5	23.2	10.1
Iowa	13.593	12.863	36.950	17.1	70.8	20.7	7.2
Kansas	10.946	12.786	37.605	16.4	66.1	20.0	7.1
Kentucky	19.830	19.294	51.350	16.6	67.4	20.3	11.4
Louisiana	20.308	21.100	51.367	19.4	66.0	25.3	13.5
Maine	18.749	16.690	45.235	19.1	70.2	24.6	7.1
Maryland	12.981	14.077	37.363	17.3	66.5	24.3	6.8
Massachusetts	13.231	15.342	39.450	18.0	61.5	24.3	8.0
Michigan	17.939	15.131	40.159	18.2	70.6	26.2	11.6
Minnesota	10.198	10.742	35.083	17.0	71.6	22.1	5.7
Mississippi	22.346	21.564	55.278	18.4	67.2	23.0	16.9
Missouri	15.384	16.404	44.240	18.2	67.0	22.4	9.8
Montana	12.665	14.374	40.730	19.8	66.9	23.6	8.9
Nebraska	9.615	10.980	37.903	16.5	66.0	20.5	7.7
Nevada	12.930	17.087	43.690	27.7	54.3	22.4	9.6
New Hampshire	8.870	10.694	35.566	15.8	70.2	22.1	5.1
New Jersey	9.820	12.632	39.885	17.3	64.0	28.0	7.6
New Mexico	21.101	19.624	47.716	20.9	67.9	23.8	15.1
New York	16.089	16.797	46.516	20.5	53.7	27.8	10.4
North Carolina	17.298	18.367	47.932	18.4	64.3	21.8	11.6
North Dakota	7.809	10.708	35.238	17.0	64.8	18.4	5.3
Ohio	15.768	15.217	41.996	17.9	66.1	23.2	11.0
Oklahoma	16.134	19.121	47.268	18.0	65.5	19.9	10.9
Oregon	20.814	17.669	41.482	18.6	60.8	25.9	9.4
Pennsylvania	13.964	14.910	43.445	17.6	68.9	24.8	8.8
Rhode Island	17.081	16.657	44.723	20.2	60.4	24.8	9.2
South Carolina	18.355	19.715	47.044	19.2	68.2	22.6	13.1
South Dakota	12.306	10.645	32.611	17.8	67.2	15.8	7.9
Tennessee	20.656	17.219	49.884	17.0	66.4	22.2	12.1
Texas	15.249	15.127	47.666	17.8	61.8	21.2	10.5
Utah	8.668	11.331	36.238	15.7	69.2	20.5	5.6
Vermont	16.038	12.090	39.263	17.9	71.0	25.9	7.0
Virginia	11.377	14.874	38.996	17.4	65.6	22.5	6.9
Washington	15.966	13.481	36.450	17.5	61.9	22.9	7.9
West Virginia	18.908	20.957	53.344	18.9	72.3	21.9	13.2
Wisconsin	14.918	11.626	38.634	17.2	67.2	22.3	7.3
Wyoming	6.523	11.388	35.460	18.3	69.1	15.6	6.0

Table A.17. Values for 2014 predictors

	SNAP prevalence rate	Tax non-filer rate	Elderly combined poverty and non-filer rate	Service sector employment rate	Owner occupied housing rate	Very high rent rate	Child 50 percent of poverty rate
Alabama	18.613	21.007	51.126	17.1	67.7	23.4	13.1
Alaska	11.870	14.225	31.576	18.6	62.5	19.7	5.7
Arizona	15.520	21.028	47.724	20.0	61.1	22.7	12.1
Arkansas	16.581	20.999	51.681	17.9	65.8	19.6	11.1
California	11.213	17.285	46.018	18.7	53.7	28.0	9.3
Colorado	9.433	13.623	36.657	17.7	63.9	23.1	6.7
Connecticut	12.200	15.107	36.689	17.5	66.4	26.7	6.9
Delaware	16.051	16.503	35.927	18.0	70.3	22.9	7.8
District of Columbia	21.628	26.041	44.391	15.5	40.6	24.3	12.4
Florida	17.715	18.299	49.064	20.8	64.1	27.7	10.3
Georgia	17.984	18.257	48.613	17.0	62.2	23.9	11.9
Hawaii	13.678	14.989	39.975	23.0	56.7	27.4	6.0
Idaho	12.954	13.537	42.226	18.4	68.0	19.8	7.1
Illinois	15.644	13.977	39.943	17.3	65.5	24.0	9.0
Indiana	13.530	13.753	41.122	17.0	68.6	22.5	9.2
Iowa	13.123	13.121	36.123	16.2	70.9	20.0	6.6
Kansas	10.110	13.034	36.910	16.7	66.6	21.0	7.6
Kentucky	18.766	19.655	50.874	17.2	66.1	22.3	11.9
Louisiana	18.872	21.334	50.607	19.6	64.4	23.9	14.2
Maine	17.330	16.882	44.487	18.6	71.3	24.8	9.1
Maryland	13.181	14.614	37.074	17.3	65.9	23.7	5.8
Massachusetts	12.782	15.541	38.659	17.8	61.6	23.3	7.3
Michigan	16.936	15.510	39.556	17.9	70.2	25.7	10.6
Minnesota	9.781	10.809	33.991	16.5	71.7	23.2	6.2
Mississippi	21.940	21.960	54.843	17.7	67.7	22.1	15.4
Missouri	14.156	16.709	43.532	17.7	66.9	21.8	9.7
Montana	12.207	14.533	39.704	18.8	66.4	19.8	8.4
Nebraska	9.216	11.130	36.802	17.1	65.9	19.0	6.7
Nevada	13.516	17.502	44.116	27.6	53.6	22.1	10.2
New Hampshire	8.411	11.143	35.048	16.0	70.2	22.2	4.8
New Jersey	9.883	13.100	39.382	16.9	63.3	26.0	7.0
New Mexico	20.690	19.764	47.132	21.0	66.9	22.9	13.9
New York	15.813	16.958	45.684	20.4	53.0	28.0	10.2
North Carolina	15.851	18.610	47.456	17.7	64.2	23.1	10.5
North Dakota	7.264	10.685	34.028	17.1	63.8	17.6	7.9
Ohio	15.109	15.608	41.233	17.3	65.3	22.6	11.1
Oklahoma	15.684	19.443	46.430	17.1	65.1	19.6	10.2
Oregon	20.200	17.586	40.712	19.0	60.7	26.1	8.9
Pennsylvania	14.039	15.204	42.435	17.7	68.8	24.3	9.1
Rhode Island	16.923	16.868	43.878	20.8	58.8	24.2	9.1
South Carolina	17.281	20.082	46.582	18.6	68.0	22.9	13.5
South Dakota	11.829	11.478	31.452	16.4	68.2	17.2	7.0
Tennessee	20.045	17.501	49.293	17.3	66.1	23.1	11.8
Texas	14.280	15.327	47.094	17.8	61.2	21.9	10.3
Utah	7.808	11.421	35.285	15.3	69.2	19.2	5.2
Vermont	14.838	12.313	38.280	17.0	70.0	23.4	7.6
Virginia	11.034	15.174	38.452	17.0	65.3	22.6	7.2
Washington	15.511	13.489	35.751	17.6	61.7	22.3	7.7
West Virginia	19.608	21.218	52.663	19.9	72.2	19.3	11.5
Wisconsin	14.611	12.012	37.500	17.3	66.6	22.2	7.5
Wyoming	6.139	11.970	34.998	18.3	66.9	17.2	5.8

Table A.18. Regression estimates of SNAP participation rates

	All eligible people			Working poor		
	2012	2013	2014	2012	2013	2014
Alabama	84.467	82.915	80.874	78.309	74.646	67.007
Alaska	88.199	86.017	87.583	71.122	75.004	75.635
Arizona	76.789	74.039	66.445	66.427	66.006	54.396
Arkansas	76.177	71.845	69.027	68.632	63.863	56.253
California	62.016	64.818	64.307	47.080	50.975	48.991
Colorado	71.076	76.879	74.497	62.780	69.105	66.429
Connecticut	84.351	85.650	89.716	73.454	77.117	77.239
Delaware	98.351	98.019	101.187	86.640	93.302	88.517
District of Columbia	91.501	93.427	92.845	48.493	61.401	48.068
Florida	88.836	89.655	88.185	79.377	79.568	76.699
Georgia	91.996	92.254	86.398	78.982	79.453	70.834
Hawaii	71.998	80.055	87.724	58.804	67.008	75.988
Idaho	85.709	85.787	81.046	77.845	78.660	76.038
Illinois	90.346	95.964	97.192	79.800	85.938	86.102
Indiana	82.699	86.354	85.231	79.545	81.250	78.995
Iowa	94.170	91.303	93.290	84.751	85.768	84.862
Kansas	74.274	78.081	75.961	66.602	71.466	69.930
Kentucky	89.487	87.899	84.492	78.819	76.829	70.156
Louisiana	84.944	88.826	77.210	75.849	79.032	65.658
Maine	104.315	102.314	96.551	91.238	90.532	86.595
Maryland	86.678	91.115	93.585	73.424	81.050	79.870
Massachusetts	85.089	84.564	83.773	67.977	72.589	69.863
Michigan	102.128	104.758	100.702	95.432	98.079	91.519
Minnesota	82.553	85.718	87.349	77.752	82.309	84.001
Mississippi	86.315	86.599	84.710	81.621	79.524	71.430
Missouri	84.380	83.441	78.330	76.847	76.128	69.283
Montana	75.955	79.080	75.501	69.406	75.048	70.711
Nebraska	68.338	73.983	73.610	63.665	69.802	70.578
Nevada	55.837	57.503	59.277	48.101	53.243	57.917
New Hampshire	80.781	81.434	80.983	76.164	76.477	75.749
New Jersey	75.684	80.228	77.757	67.657	71.536	68.269
New Mexico	91.247	92.582	90.491	84.550	87.706	81.926
New York	79.302	83.561	83.251	59.603	66.945	66.987
North Carolina	81.819	80.997	78.544	72.696	71.978	65.251
North Dakota	63.980	68.556	63.737	58.766	63.951	63.296
Ohio	83.118	88.776	85.241	76.505	81.468	75.953
Oklahoma	79.400	74.996	75.216	70.034	67.342	61.271
Oregon	109.498	111.170	112.164	85.863	91.894	91.086
Pennsylvania	84.069	86.044	85.525	77.513	79.096	77.744
Rhode Island	82.381	89.395	89.446	67.009	75.989	75.841
South Carolina	87.233	84.589	78.045	79.299	79.072	68.814
South Dakota	77.804	83.357	90.019	72.908	80.758	84.002
Tennessee	97.453	96.432	96.427	84.703	84.791	82.865
Texas	76.970	76.627	74.640	67.516	67.213	65.416
Utah	81.619	76.018	73.919	74.747	71.579	68.845
Vermont	101.407	106.591	101.021	91.080	97.358	93.137
Virginia	79.274	78.507	77.386	68.149	70.281	66.754
Washington	95.980	100.306	101.282	77.838	86.184	87.098
West Virginia	78.372	78.782	80.211	77.938	75.543	71.945
Wisconsin	94.058	97.230	99.019	82.879	87.756	90.256
Wyoming	62.194	56.959	58.454	65.141	59.892	59.036

Table A.19. Standard errors of regression estimates of SNAP participation rates

	All eligible people			Working poor		
	2012	2013	2014	2012	2013	2014
Alabama	4.350	4.257	4.222	6.700	6.629	6.538
Alaska	4.861	4.690	4.604	7.365	7.337	7.117
Arizona	4.251	4.236	4.308	6.560	6.610	6.643
Arkansas	4.436	4.415	4.504	6.822	6.891	6.967
California	4.630	4.615	4.602	7.202	7.252	7.168
Colorado	4.222	4.216	4.150	6.507	6.563	6.420
Connecticut	4.431	4.360	4.522	6.843	6.811	7.008
Delaware	4.727	4.715	4.662	7.298	7.388	7.215
District of Columbia	6.613	6.443	6.460	9.909	10.464	9.704
Florida	4.293	4.278	4.363	6.656	6.674	6.784
Georgia	4.250	4.191	4.149	6.568	6.520	6.435
Hawaii	4.464	4.543	4.774	6.856	7.124	7.366
Idaho	4.261	4.208	4.322	6.519	6.568	6.698
Illinois	4.091	4.136	4.191	6.342	6.423	6.476
Indiana	4.239	4.192	4.073	6.549	6.531	6.301
Iowa	4.312	4.122	4.251	6.615	6.392	6.564
Kansas	4.187	4.103	4.116	6.411	6.348	6.368
Kentucky	4.250	4.384	4.158	6.517	6.836	6.448
Louisiana	4.211	4.232	4.258	6.503	6.592	6.586
Maine	4.829	4.848	4.317	7.337	7.714	6.711
Maryland	4.284	4.165	4.295	6.581	6.488	6.644
Massachusetts	4.213	4.040	4.052	6.470	6.277	6.254
Michigan	4.802	4.638	4.541	7.524	7.294	7.023
Minnesota	4.224	4.210	4.354	6.483	6.550	6.720
Mississippi	4.636	4.577	4.424	7.138	7.224	6.857
Missouri	3.959	3.936	3.958	6.126	6.100	6.118
Montana	4.147	4.063	4.065	6.365	6.315	6.283
Nebraska	4.420	4.371	4.319	6.757	6.797	6.676
Nevada	5.471	5.427	5.573	8.285	8.423	8.517
New Hampshire	4.328	4.271	4.367	6.662	6.646	6.725
New Jersey	4.403	4.437	4.283	6.850	6.980	6.645
New Mexico	4.432	4.631	4.542	6.878	7.294	6.992
New York	4.459	4.389	4.439	6.917	6.874	6.892
North Carolina	4.033	3.991	3.999	6.221	6.197	6.188
North Dakota	4.786	4.354	4.806	7.282	6.755	7.508
Ohio	4.150	4.104	4.186	6.398	6.388	6.503
Oklahoma	4.291	4.209	4.242	6.610	6.560	6.541
Oregon	4.787	4.650	4.693	7.396	7.359	7.200
Pennsylvania	4.020	4.068	4.048	6.205	6.327	6.266
Rhode Island	4.207	4.130	4.247	6.470	6.444	6.560
South Carolina	4.266	4.259	4.432	6.609	6.664	6.866
South Dakota	5.245	4.951	4.653	7.700	7.680	7.209
Tennessee	4.406	4.387	4.420	6.762	6.822	6.860
Texas	4.353	4.394	4.377	6.701	6.842	6.801
Utah	4.256	4.253	4.414	6.543	6.604	6.784
Vermont	4.491	4.516	4.330	6.915	7.094	6.678
Virginia	4.259	4.168	4.144	6.540	6.477	6.401
Washington	4.396	4.367	4.483	6.750	6.808	6.901
West Virginia	4.736	4.572	4.772	7.310	7.162	7.469
Wisconsin	4.366	4.330	4.389	6.730	6.726	6.772
Wyoming	5.729	4.732	4.637	8.251	7.414	7.152

Table A.20. Preliminary shrinkage estimates of SNAP participation rates

	All eligible people			Working poor		
	2012	2013	2014	2012	2013	2014
Alabama	87.268	85.789	83.764	80.046	76.500	68.847
Alaska	84.667	82.644	83.988	69.372	72.915	73.788
Arizona	76.802	74.009	66.419	70.228	69.703	58.050
Arkansas	75.561	71.365	68.488	70.675	66.145	58.556
California	62.765	65.658	64.991	48.110	51.799	49.773
Colorado	71.214	77.117	74.654	63.435	69.903	67.113
Connecticut	86.412	87.782	91.817	73.634	77.406	77.489
Delaware	95.115	94.891	97.988	83.193	89.831	85.098
District of Columbia	92.749	94.602	94.043	48.388	61.423	48.193
Florida	88.748	89.710	88.000	73.571	73.749	70.927
Georgia	92.635	92.845	87.091	79.188	79.601	71.195
Hawaii	65.103	73.156	80.942	52.640	61.360	69.710
Idaho	86.933	86.958	82.398	81.516	82.707	79.924
Illinois	90.799	96.424	97.571	72.905	79.261	79.275
Indiana	83.143	86.933	85.656	82.730	84.630	82.140
Iowa	96.161	93.255	95.309	91.784	92.855	91.771
Kansas	70.493	74.368	72.327	63.351	68.394	66.925
Kentucky	87.089	85.298	81.999	74.012	71.983	65.725
Louisiana	81.968	85.866	74.167	72.478	76.128	62.537
Maine	106.708	104.684	98.884	95.230	94.487	90.547
Maryland	87.610	91.942	94.500	73.294	80.964	79.789
Massachusetts	84.902	84.389	83.483	62.194	66.744	63.994
Michigan	102.526	105.197	101.060	96.758	99.337	92.927
Minnesota	81.455	84.669	86.353	74.771	78.718	80.730
Mississippi	82.691	82.788	80.974	81.748	79.674	71.305
Missouri	90.208	89.290	84.286	79.903	78.761	72.064
Montana	75.419	78.520	75.035	69.810	75.831	71.288
Nebraska	70.422	76.039	75.564	65.467	71.697	72.541
Nevada	59.798	61.333	63.085	46.458	51.391	56.284
New Hampshire	82.224	82.696	82.352	78.081	78.287	77.544
New Jersey	71.739	76.029	73.692	66.901	70.773	67.616
New Mexico	90.588	91.832	89.839	85.477	88.508	82.895
New York	79.903	84.217	84.126	68.324	75.402	75.798
North Carolina	79.837	79.047	76.622	70.768	70.414	63.205
North Dakota	62.748	66.974	62.496	59.613	64.999	64.002
Ohio	83.449	89.037	85.472	75.397	80.348	74.856
Oklahoma	78.674	74.352	74.573	66.310	63.540	56.915
Oregon	109.582	111.236	112.298	88.219	94.240	93.311
Pennsylvania	84.574	86.536	85.994	75.741	77.421	76.169
Rhode Island	86.467	93.508	93.542	69.748	78.652	78.770
South Carolina	86.222	83.628	77.158	79.703	79.250	68.933
South Dakota	79.740	85.291	91.885	79.967	87.970	90.952
Tennessee	97.769	96.778	96.753	78.614	78.397	76.729
Texas	73.451	73.482	71.133	67.217	66.463	64.647
Utah	80.354	74.824	72.548	70.996	67.674	65.065
Vermont	103.594	108.759	103.239	90.306	96.690	92.588
Virginia	83.336	82.565	81.519	77.909	79.988	76.605
Washington	96.846	101.145	102.120	73.029	81.199	82.063
West Virginia	78.555	78.900	80.345	79.885	77.402	73.967
Wisconsin	94.288	97.462	99.182	87.148	92.241	94.660
Wyoming	61.305	56.179	57.648	61.092	55.748	55.314

Table A.21. Final shrinkage estimates of SNAP participation rates

	All eligible people			Working poor		
	2012	2013	2014	2012	2013	2014
Alabama	88.990	88.276	85.667	82.094	77.964	70.323
Alaska	86.339	85.041	85.896	71.146	74.311	75.370
Arizona	78.318	76.155	67.928	72.024	71.037	59.294
Arkansas	77.052	73.434	70.044	72.483	67.412	59.811
California	64.004	67.562	66.467	49.341	52.790	50.839
Colorado	72.620	79.353	76.350	65.058	71.241	68.551
Connecticut	88.118	90.328	93.903	75.518	78.888	79.150
Delaware	96.993	97.643	100.214	85.322	91.550	86.921
District of Columbia	94.580	97.346	96.180	49.626	62.599	49.225
Florida	90.500	92.311	90.000	75.453	75.161	72.447
Georgia	94.463	95.537	89.070	81.213	81.124	72.720
Hawaii	66.388	75.277	82.781	53.987	62.535	71.204
Idaho	88.650	89.479	84.269	83.602	84.290	81.637
Illinois	92.591	99.219	99.787	74.769	80.779	80.974
Indiana	84.784	89.454	87.602	84.846	86.250	83.900
Iowa	98.060	95.959	97.474	94.132	94.633	93.737
Kansas	71.884	76.525	73.970	64.972	69.703	68.359
Kentucky	88.808	87.771	83.862	75.905	73.361	67.133
Louisiana	83.586	88.356	75.852	74.332	77.585	63.877
Maine	100.000	100.000	100.000	97.667	96.296	92.486
Maryland	89.340	94.608	96.647	75.169	82.513	81.498
Massachusetts	86.577	86.836	85.380	63.785	68.021	65.365
Michigan	100.000	100.000	100.000	99.234	100.000	94.918
Minnesota	83.063	87.124	88.315	76.683	80.225	82.460
Mississippi	84.323	85.188	82.814	83.839	81.199	72.832
Missouri	91.989	91.879	86.201	81.947	80.269	73.608
Montana	76.908	80.797	76.740	71.596	77.282	72.815
Nebraska	71.812	78.244	77.280	67.142	73.069	74.095
Nevada	60.979	63.112	64.518	47.646	52.375	57.490
New Hampshire	83.847	85.093	84.223	80.078	79.786	79.206
New Jersey	73.155	78.234	75.366	68.613	72.128	69.064
New Mexico	92.376	94.495	91.879	87.663	90.202	84.671
New York	81.481	86.659	86.037	70.072	76.846	77.422
North Carolina	81.413	81.339	78.363	72.578	71.762	64.559
North Dakota	63.987	68.916	63.916	61.138	66.242	65.372
Ohio	85.096	91.619	87.414	77.326	81.886	76.460
Oklahoma	80.227	76.507	76.267	68.006	64.757	58.134
Oregon	100.000	100.000	100.000	90.476	96.044	95.310
Pennsylvania	86.244	89.045	87.948	77.679	78.903	77.801
Rhode Island	88.174	96.219	95.667	71.532	80.158	80.458
South Carolina	87.924	86.053	78.911	81.742	80.767	70.410
South Dakota	81.314	87.764	93.973	82.013	89.654	92.902
Tennessee	99.698	99.584	98.951	80.625	79.897	78.373
Texas	74.901	75.613	72.749	68.936	67.735	66.032
Utah	81.940	76.994	74.196	72.812	68.969	66.459
Vermont	100.000	100.000	100.000	92.616	98.540	94.572
Virginia	84.981	84.960	83.371	79.902	81.519	78.247
Washington	98.758	100.000	100.000	74.898	82.753	83.821
West Virginia	80.106	81.188	82.171	81.928	78.884	75.551
Wisconsin	96.149	100.288	100.000	89.377	94.007	96.688
Wyoming	62.515	57.807	58.957	62.654	56.815	56.499

Table A.22. Standard errors of final shrinkage estimates of SNAP participation rates

	All eligible people			Working poor		
	2012	2013	2014	2012	2013	2014
Alabama	3.049	2.860	2.779	4.829	4.511	4.399
Alaska	3.692	3.571	3.377	5.203	5.105	5.141
Arizona	2.649	2.688	2.421	4.203	4.327	3.636
Arkansas	3.033	3.021	2.799	4.152	4.462	4.226
California	1.480	1.527	1.563	2.525	2.562	2.520
Colorado	2.997	3.127	3.012	4.301	4.524	4.324
Connecticut	3.310	3.276	3.550	4.839	4.845	5.139
Delaware	3.539	3.517	3.458	5.321	5.477	5.226
District of Columbia	4.619	4.422	4.413	6.588	7.558	6.263
Florida	2.166	2.218	2.121	3.675	3.721	3.665
Georgia	2.640	2.571	2.550	4.062	4.024	3.936
Hawaii	2.994	3.208	3.601	3.836	4.470	4.675
Idaho	3.526	3.533	3.562	4.682	4.830	4.977
Illinois	2.607	2.700	2.682	3.689	3.801	3.811
Indiana	2.928	3.015	2.902	4.565	4.563	4.352
Iowa	3.571	3.300	3.494	5.454	5.305	5.500
Kansas	2.676	2.598	2.684	3.378	3.544	3.885
Kentucky	2.803	2.807	2.688	3.930	3.919	3.930
Louisiana	2.742	2.856	2.507	3.931	4.041	3.591
Maine	3.981	4.018	3.523	6.213	6.544	5.650
Maryland	3.035	2.919	3.089	4.492	4.466	4.752
Massachusetts	3.212	3.110	3.039	4.697	4.519	4.421
Michigan	3.411	3.441	3.203	5.655	5.445	5.089
Minnesota	2.930	2.898	3.132	4.389	4.306	4.543
Mississippi	3.002	2.855	2.409	4.722	5.085	4.164
Missouri	3.412	3.422	3.432	4.781	4.678	4.691
Montana	3.309	3.318	3.234	4.539	4.628	4.470
Nebraska	3.535	3.536	3.364	4.744	4.962	4.811
Nevada	3.154	3.050	3.363	4.421	4.493	4.838
New Hampshire	3.274	3.267	3.369	5.374	5.240	5.306
New Jersey	2.840	2.859	2.689	4.696	4.816	4.402
New Mexico	3.353	3.651	3.462	4.942	5.186	4.693
New York	2.096	2.097	2.277	3.973	3.929	4.112
North Carolina	2.447	2.348	2.349	3.530	3.626	3.441
North Dakota	3.539	3.073	3.543	5.614	5.071	5.744
Ohio	2.722	2.689	2.616	4.061	4.021	4.053
Oklahoma	2.838	2.836	2.788	4.129	3.978	3.511
Oregon	3.679	3.591	3.758	5.890	5.841	5.573
Pennsylvania	2.410	2.539	2.428	3.964	4.112	4.019
Rhode Island	3.446	3.409	3.551	5.094	5.119	5.415
South Carolina	2.745	2.678	2.804	4.456	4.343	4.272
South Dakota	4.791	4.646	4.279	6.292	6.600	6.183
Tennessee	3.490	3.411	3.314	4.876	4.607	4.592
Texas	1.876	1.896	1.672	2.932	2.900	2.757
Utah	3.374	3.352	3.453	4.703	4.732	4.721
Vermont	3.749	3.835	3.683	5.662	5.872	5.617
Virginia	3.356	3.333	3.257	5.346	5.308	5.325
Washington	3.308	3.316	3.408	4.512	4.588	4.711
West Virginia	3.653	3.362	3.454	5.880	5.469	5.644
Wisconsin	3.204	3.192	3.286	5.328	5.437	5.496
Wyoming	4.176	3.002	3.110	5.178	4.794	4.834

Table A.23. Final shrinkage estimates of number of people eligible for SNAP

	2012	2013	2014
Alabama	976,186	999,254	1,011,739
Alaska	104,693	106,701	101,402
Arizona	1,214,772	1,244,449	1,310,332
Arkansas	638,276	674,240	680,245
California	5,861,556	5,764,584	5,958,916
Colorado	633,424	595,090	612,933
Connecticut	388,064	397,932	387,897
Delaware	125,844	129,204	122,409
District of Columbia	137,806	135,471	132,075
Florida	3,419,705	3,539,298	3,619,657
Georgia	1,905,742	1,879,194	1,900,604
Hawaii	234,495	225,267	205,969
Idaho	244,875	235,302	228,980
Illinois	1,857,798	1,873,083	1,812,555
Indiana	1,055,735	1,019,595	1,000,928
Iowa	351,421	368,447	358,971
Kansas	411,409	406,155	395,839
Kentucky	896,619	930,503	917,089
Louisiana	1,030,345	1,025,144	1,111,906
Maine	212,627	209,145	198,060
Maryland	704,442	707,833	702,107
Massachusetts	860,558	895,653	885,349
Michigan	1,569,997	1,549,020	1,503,283
Minnesota	526,305	522,886	498,006
Mississippi	743,998	755,141	761,059
Missouri	1,005,843	996,628	986,465
Montana	141,802	142,831	145,602
Nebraska	225,258	215,550	211,013
Nevada	479,002	481,060	508,214
New Hampshire	114,473	114,422	113,687
New Jersey	999,096	1,001,070	1,051,754
New Mexico	428,047	426,213	435,752
New York	3,428,026	3,321,554	3,276,000
North Carolina	1,809,181	1,854,720	1,811,804
North Dakota	71,786	65,131	66,005
Ohio	1,961,343	1,796,002	1,829,506
Oklahoma	726,019	775,308	747,811
Oregon	631,250	653,896	662,769
Pennsylvania	1,808,301	1,784,551	1,797,033
Rhode Island	161,104	158,985	160,915
South Carolina	927,318	958,094	1,005,687
South Dakota	124,950	116,857	104,889
Tennessee	1,299,531	1,338,576	1,317,232
Texas	4,782,079	4,816,367	4,866,164
Utah	334,591	321,572	305,105
Vermont	72,794	76,901	76,735
Virginia	1,068,131	1,103,529	1,094,463
Washington	848,086	854,366	871,598
West Virginia	391,386	389,383	407,633
Wisconsin	708,529	699,526	694,711
Wyoming	53,467	64,522	59,139

Table A.24. Final shrinkage estimates of number of working poor eligible for SNAP

	2012	2013	2014
Alabama	379,470	423,003	443,067
Alaska	53,771	53,072	48,105
Arizona	624,811	678,951	738,318
Arkansas	289,922	299,090	326,467
California	3,211,751	3,185,233	3,452,726
Colorado	308,652	300,892	316,024
Connecticut	158,731	172,510	162,675
Delaware	56,949	56,633	59,710
District of Columbia	39,930	45,333	50,800
Florida	1,613,093	1,624,532	1,598,804
Georgia	902,677	897,676	953,532
Hawaii	127,952	131,981	111,543
Idaho	140,169	145,926	127,131
Illinois	831,737	873,404	863,245
Indiana	466,109	458,367	488,081
Iowa	178,792	209,309	182,218
Kansas	222,607	223,569	213,501
Kentucky	355,438	408,266	399,771
Louisiana	443,690	464,471	510,308
Maine	81,590	81,046	82,078
Maryland	300,441	309,758	299,390
Massachusetts	283,613	311,862	313,648
Michigan	650,036	633,710	686,399
Minnesota	259,360	253,317	270,458
Mississippi	295,899	309,900	304,811
Missouri	511,476	445,329	428,681
Montana	63,637	74,678	64,787
Nebraska	123,638	116,271	109,886
Nevada	238,991	240,612	250,417
New Hampshire	46,241	46,586	50,142
New Jersey	419,214	456,196	481,457
New Mexico	203,795	214,894	212,815
New York	1,564,508	1,463,394	1,487,546
North Carolina	813,276	958,186	782,750
North Dakota	32,013	31,713	31,024
Ohio	803,332	746,816	841,048
Oklahoma	375,862	383,516	371,255
Oregon	292,882	262,730	287,040
Pennsylvania	612,124	677,132	744,819
Rhode Island	59,643	57,752	69,110
South Carolina	373,523	391,165	449,555
South Dakota	60,838	60,827	50,881
Tennessee	609,881	559,917	598,835
Texas	2,691,179	2,673,060	2,725,568
Utah	195,153	177,056	179,410
Vermont	28,804	31,583	31,652
Virginia	485,108	478,332	523,930
Washington	395,389	357,014	386,966
West Virginia	133,351	129,653	145,003
Wisconsin	332,669	363,135	342,905
Wyoming	26,015	29,483	31,511

Table A.25. Standard errors of final shrinkage estimates of number of people eligible for SNAP

	2012	2013	2014
Alabama	33,657	32,705	33,058
Alaska	4,504	4,527	4,016
Arizona	41,339	44,373	47,047
Arkansas	25,278	28,019	27,383
California	136,337	131,642	141,156
Colorado	26,299	23,689	24,357
Connecticut	14,665	14,580	14,771
Delaware	4,619	4,702	4,255
District of Columbia	6,771	6,217	6,104
Florida	82,333	85,895	85,925
Georgia	53,597	51,087	54,818
Hawaii	10,642	9,698	9,025
Idaho	9,801	9,385	9,750
Illinois	52,636	51,486	49,071
Indiana	36,678	34,719	33,408
Iowa	12,877	12,800	12,961
Kansas	15,408	13,932	14,471
Kentucky	28,471	30,057	29,607
Louisiana	34,009	33,475	37,025
Maine	7,193	7,316	6,873
Maryland	24,080	22,059	22,604
Massachusetts	32,120	32,400	31,741
Michigan	49,299	45,950	45,412
Minnesota	18,682	17,568	17,794
Mississippi	26,654	25,570	22,303
Missouri	37,535	37,495	39,564
Montana	6,139	5,926	6,181
Nebraska	11,156	9,840	9,254
Nevada	24,931	23,489	26,686
New Hampshire	4,498	4,437	4,581
New Jersey	39,020	36,956	37,803
New Mexico	15,630	16,637	16,542
New York	88,734	81,206	87,344
North Carolina	54,715	54,095	54,702
North Dakota	3,995	2,934	3,686
Ohio	63,120	53,246	55,151
Oklahoma	25,844	29,033	27,534
Oregon	18,712	18,108	19,022
Pennsylvania	50,833	51,393	49,981
Rhode Island	6,336	5,690	6,018
South Carolina	29,132	30,117	35,999
South Dakota	7,408	6,249	4,811
Tennessee	45,775	46,321	44,447
Texas	120,490	122,016	112,657
Utah	13,864	14,141	14,305
Vermont	2,460	2,379	2,554
Virginia	42,442	43,738	43,066
Washington	28,586	26,421	27,430
West Virginia	17,960	16,289	17,260
Wisconsin	23,756	22,494	22,353
Wyoming	3,593	3,385	3,142

Table A.26. Standard errors of final shrinkage estimates of number of working poor eligible for SNAP

	2012	2013	2014
Alabama	22,320	24,491	27,717
Alaska	3,932	3,648	3,281
Arizona	36,460	41,387	45,276
Arkansas	16,607	19,807	23,068
California	164,370	154,656	171,113
Colorado	20,403	19,121	19,935
Connecticut	10,172	10,602	10,562
Delaware	3,551	3,390	3,590
District of Columbia	5,301	5,477	6,463
Florida	78,558	80,485	80,882
Georgia	45,152	44,551	51,609
Hawaii	9,092	9,439	7,324
Idaho	7,851	8,367	7,750
Illinois	41,041	41,127	40,630
Indiana	25,079	24,264	25,315
Iowa	10,360	11,741	10,692
Kansas	11,572	11,375	12,135
Kentucky	18,401	21,825	23,402
Louisiana	23,465	24,205	28,687
Maine	5,191	5,511	5,014
Maryland	17,954	16,776	17,456
Massachusetts	20,884	20,732	21,214
Michigan	37,045	33,687	36,802
Minnesota	14,844	13,604	14,902
Mississippi	16,665	19,419	17,426
Missouri	29,841	25,971	27,318
Montana	4,035	4,475	3,977
Nebraska	8,736	7,901	7,134
Nevada	22,177	20,655	21,072
New Hampshire	3,103	3,061	3,359
New Jersey	28,691	30,478	30,685
New Mexico	11,489	12,363	11,796
New York	88,702	74,865	79,003
North Carolina	39,560	48,446	41,720
North Dakota	2,939	2,429	2,726
Ohio	42,189	36,694	44,587
Oklahoma	22,821	23,575	22,420
Oregon	19,067	15,988	16,782
Pennsylvania	31,235	35,313	38,472
Rhode Island	4,247	3,691	4,651
South Carolina	20,361	21,045	27,278
South Dakota	4,667	4,481	3,387
Tennessee	36,881	32,308	35,087
Texas	114,466	114,518	113,788
Utah	12,605	12,157	12,745
Vermont	1,761	1,883	1,880
Virginia	32,455	31,169	35,652
Washington	23,817	19,808	21,747
West Virginia	9,570	8,994	10,833
Wisconsin	19,833	21,015	19,493
Wyoming	2,150	2,489	2,696

APPENDIX B

DATA FOR FIGURES IN CUNNYNGHAM (2017)

Table B.1. How many were eligible in 2014? What percentage participated?

Eligible people (thousands)	State	Lower bound of confidence interval	2014 participation rate	Upper bound of confidence interval
663	Oregon	94	100	100
77	Vermont	94	100	100
872	Washington	94	100	100
1,503	Michigan	95	100	100
695	Wisconsin	95	100	100
198	Maine	94	100	100
122	Delaware	95	100	100
1,813	Illinois	95	100	100
1,317	Tennessee	93	99	100
359	Iowa	92	97	100
702	Maryland	92	97	100
132	District of Columbia	89	96	100
161	Rhode Island	90	96	100
105	South Dakota	87	94	100
388	Connecticut	88	94	100
436	New Mexico	86	92	98
3,620	Florida	87	90	93
1,901	Georgia	85	89	93
498	Minnesota	83	88	93
1,797	Pennsylvania	84	88	92
1,001	Indiana	83	88	92
1,830	Ohio	83	87	92
986	Missouri	81	86	92
3,276	New York	82	86	90
101	Alaska	80	86	91
1,012	Alabama	81	86	90
885	Massachusetts	80	85	90
229	Idaho	78	84	90
114	New Hampshire	79	84	90
917	Kentucky	79	84	88
1,094	Virginia	78	83	89
761	Mississippi	79	83	87
206	Hawaii	77	83	89
408	West Virginia	76	82	88
1,006	South Carolina	74	79	84
1,812	North Carolina	75	78	82
211	Nebraska	72	77	83
146	Montana	71	77	82
613	Colorado	71	76	81
748	Oklahoma	72	76	81
1,112	Louisiana	72	76	80
1,052	New Jersey	71	75	80
305	Utah	69	74	80
396	Kansas	70	74	78
4,866	Texas	70	73	75
680	Arkansas	65	70	75
1,310	Arizona	64	68	72
5,959	California	64	66	69
508	Nevada	59	65	70
66	North Dakota	58	64	70
59	Wyoming	54	59	64
7,339	Midwest Region	92	94	97
5,099	Northeast Region	85	88	90
12,345	Southeast Region	85	87	89
5,307	Mid-Atlantic Region	83	86	88
3,246	Mountain Plains Region	79	81	84
7,842	Southwest Region	72	74	76
9,848	Western Region	71	73	75
51,026	United States	82	83	84

Table B.2. How many working poor people were eligible in 2014? What percentage participated?

Eligible people (thousands)	State	Lower bound of confidence interval	2014 participation rate	Upper bound of confidence interval
663	Oregon	94	100	100
77	Vermont	94	100	100
872	Washington	94	100	100
1,503	Michigan	95	100	100
695	Wisconsin	95	100	100
198	Maine	94	100	100
122	Delaware	95	100	100
1,813	Illinois	95	100	100
1,317	Tennessee	93	99	100
359	Iowa	92	97	100
702	Maryland	92	97	100
132	District of Columbia	89	96	100
161	Rhode Island	90	96	100
105	South Dakota	87	94	100
388	Connecticut	88	94	100
436	New Mexico	86	92	98
3,620	Florida	87	90	93
1,901	Georgia	85	89	93
498	Minnesota	83	88	93
1,797	Pennsylvania	84	88	92
1,001	Indiana	83	88	92
1,830	Ohio	83	87	92
986	Missouri	81	86	92
3,276	New York	82	86	90
101	Alaska	80	86	91
1,012	Alabama	81	86	90
885	Massachusetts	80	85	90
229	Idaho	78	84	90
114	New Hampshire	79	84	90
917	Kentucky	79	84	88
1,094	Virginia	78	83	89
761	Mississippi	79	83	87
206	Hawaii	77	83	89
408	West Virginia	76	82	88
1,006	South Carolina	74	79	84
1,812	North Carolina	75	78	82
211	Nebraska	72	77	83
146	Montana	71	77	82
613	Colorado	71	76	81
748	Oklahoma	72	76	81
1,112	Louisiana	72	76	80
1,052	New Jersey	71	75	80
305	Utah	69	74	80
396	Kansas	70	74	78
4,866	Texas	70	73	75
680	Arkansas	65	70	75
1,310	Arizona	64	68	72
5,959	California	64	66	69
508	Nevada	59	65	70
66	North Dakota	58	64	70
59	Wyoming	54	59	64
7,339	Midwest Region	92	94	97
5,099	Northeast Region	85	88	90
12,345	Southeast Region	85	87	89
5,307	Mid-Atlantic Region	83	86	88
3,246	Mountain Plains Region	79	81	84
7,842	Southwest Region	72	74	76
9,848	Western Region	71	73	75
51,026	United States	82	83	84

Table B.3. Estimates of participation rates (percent)

	All Eligible People			Working Poor		
	2012	2013	2014	2012	2013	2014
Alabama	89	88	86	82	78	70
Alaska	86	85	86	71	74	75
Arizona	78	76	68	72	71	59
Arkansas	77	73	70	72	67	60
California	64	68	66	49	53	51
Colorado	73	79	76	65	71	69
Connecticut	88	90	94	76	79	79
Delaware	97	98	100	85	92	87
District of Columbia	95	97	96	50	63	49
Florida	91	92	90	75	75	72
Georgia	94	96	89	81	81	73
Hawaii	66	75	83	54	63	71
Idaho	89	89	84	84	84	82
Illinois	93	99	100	75	81	81
Indiana	85	89	88	85	86	84
Iowa	98	96	97	94	95	94
Kansas	72	77	74	65	70	68
Kentucky	89	88	84	76	73	67
Louisiana	84	88	76	74	78	64
Maine	100	100	100	98	96	92
Maryland	89	95	97	75	83	81
Massachusetts	87	87	85	64	68	65
Michigan	100	100	100	99	100	95
Minnesota	83	87	88	77	80	82
Mississippi	84	85	83	84	81	73
Missouri	92	92	86	82	80	74
Montana	77	81	77	72	77	73
Nebraska	72	78	77	67	73	74
Nevada	61	63	65	48	52	57
New Hampshire	84	85	84	80	80	79
New Jersey	73	78	75	69	72	69
New Mexico	92	94	92	88	90	85
New York	81	87	86	70	77	77
North Carolina	81	81	78	73	72	65
North Dakota	64	69	64	61	66	65
Ohio	85	92	87	77	82	76
Oklahoma	80	77	76	68	65	58
Oregon	100	100	100	90	96	95
Pennsylvania	86	89	88	78	79	78
Rhode Island	88	96	96	72	80	80
South Carolina	88	86	79	82	81	70
South Dakota	81	88	94	82	90	93
Tennessee	100	100	99	81	80	78
Texas	75	76	73	69	68	66
Utah	82	77	74	73	69	66
Vermont	100	100	100	93	99	95
Virginia	85	85	83	80	82	78
Washington	99	100	100	75	83	84
West Virginia	80	81	82	82	79	76
Wisconsin	96	100	100	89	94	97
Wyoming	63	58	59	63	57	56
Mid-Atlantic Region	84	87	86	76	79	76
Midwest Region	91	95	94	83	87	85
Mountain Plains Region	82	84	81	75	77	74
Northeast Region	84	88	88	71	77	77
Southeast Region	90	90	87	78	77	71
Southwest Region	78	78	74	71	70	66
Western Region	72	74	73	58	61	58
United States	83	85	83	72	74	70

Table B.4. How did your state rank in 2014?

2014 participation rate	State	Upper bound of confidence interval	2014 rank	Lower bound of confidence interval
100	Oregon	1	1	1
100	Vermont	2	2	8
100	Washington	2	3	8
100	Michigan	2	4	10
100	Wisconsin	3	5	12
100	Maine	2	6	12
100	Delaware	3	7	13
100	Illinois	4	8	13
99	Tennessee	4	9	14
97	Iowa	5	10	16
97	Maryland	6	11	16
96	District of Columbia	4	12	20
96	Rhode Island	6	13	18
94	South Dakota	7	14	23
94	Connecticut	8	15	21
92	New Mexico	10	16	25
90	Florida	14	17	24
89	Georgia	14	18	27
88	Minnesota	14	19	30
88	Pennsylvania	16	20	29
88	Indiana	15	21	31
87	Ohio	16	22	31
86	Missouri	16	23	34
86	New York	18	24	32
86	Alaska	16	25	34
86	Alabama	18	26	33
85	Massachusetts	18	27	34
84	Idaho	18	28	36
84	New Hampshire	19	29	36
84	Kentucky	21	30	35
83	Virginia	20	31	37
83	Mississippi	23	32	36
83	Hawaii	20	33	39
82	West Virginia	22	34	39
79	South Carolina	30	35	42
78	North Carolina	32	36	42
77	Nebraska	31	37	45
77	Montana	32	38	45
76	Colorado	33	39	45
76	Oklahoma	34	40	45
76	Louisiana	35	41	45
75	New Jersey	35	42	45
74	Utah	35	43	47
74	Kansas	37	44	46
73	Texas	40	45	46
70	Arkansas	42	46	49
68	Arizona	45	47	49
66	California	46	48	50
65	Nevada	46	49	51
64	North Dakota	46	50	51
59	Wyoming	50	51	51

Table B.5a. How did your state compare with other states in 2014 for all eligibles? (Oregon – Florida)

	OR	VT	WA	MI	WI	ME	DE	IL	TN	IA	MD	DC	RI	SD	CT	NM	FL
OR	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
VT	H	-	-	-	-	-	-	L	L	L	L	L	L	L	L	L	L
WA	H	-	-	-	-	-	-	-	-	L	L	L	L	L	L	L	L
MI	H	-	-	-	-	-	-	-	-	L	L	L	L	L	L	L	L
WI	H	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L
ME	H	-	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L
DE	H	-	-	-	-	-	-	-	-	-	-	-	-	-	L	L	L
IL	H	H	-	-	-	-	-	-	-	-	-	-	-	-	L	L	L
TN	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	L	L
IA	H	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-	L
MD	H	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-	L
DC	H	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
RI	H	H	H	H	H	-	-	-	-	-	-	-	-	-	-	-	L
SD	H	H	H	H	H	H	-	-	-	-	-	-	-	-	-	-	-
CT	H	H	H	H	H	H	H	H	-	-	-	-	-	-	-	-	-
NM	H	H	H	H	H	H	H	H	H	-	-	-	-	-	-	-	-
FL	H	H	H	H	H	H	H	H	H	H	H	-	H	-	-	-	-
GA	H	H	H	H	H	H	H	H	H	H	H	H	H	-	-	-	-
MN	H	H	H	H	H	H	H	H	H	H	H	H	H	-	H	-	-
PA	H	H	H	H	H	H	H	H	H	H	H	H	H	-	H	-	-
IN	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	-
OH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	-
MO	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	-
NY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
AK	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	-
AL	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
MA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
ID	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
NH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
KY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
VA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
MS	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
HI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
WV	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
SC	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
NC	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
NE	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
MT	H	H	H	H	H	H	DE	IL	TN	IA	MD	DC	RI	SD	CT	NM	FL
CO	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
OK	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
LA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
NJ	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
UT	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
KS	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
TX	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
AR	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
AZ	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
CA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
NV	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
ND	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
WY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Note: An "H" indicates that there is at least a 90 percent chance the state identified at the top of the column has a higher true participation rate than the state identified at the left of the row. An "L" indicates that there is at least a 90 percent chance that the row state has a higher true participation rate than the column state.

Table B.5b. How did your state compare with other states in 2014 for all eligibles? (Georgia – West Virginia)

	GA	MN	PA	IN	OH	MO	NY	AK	AL	MA	ID	NH	KY	VA	MS	HI	WV
OR	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
VT	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
WA	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
MI	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
WI	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
ME	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
DE	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
IL	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
TN	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
IA	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
MD	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
DC	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
RI	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
SD	-	-	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L
CT	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
NM	-	-	-	-	-	-	L	-	L	L	L	L	L	L	L	L	L
FL	-	-	-	-	-	-	L	-	-	-	L	L	L	L	L	L	L
GA	-	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L
MN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-
PA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	L
IN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-
OH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-
MO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KY	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VA	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MS	H	H	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-
HI	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV	H	-	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SC	H	H	H	H	H	H	H	H	H	H	-	-	-	-	-	-	-
NC	H	H	H	H	H	H	H	H	H	H	H	H	H	-	H	-	-
NE	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	-
MT	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	-
CO	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
OK	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
LA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
NJ	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
UT	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
KS	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
TX	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
AR	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
AZ	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
CA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
NV	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
ND	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
WY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Note: An "H" indicates that there is at least a 90 percent chance the state identified at the top of the column has a higher true participation rate than the state identified at the left of the row. An "L" indicates that there is at least a 90 percent chance that the row state has a higher true participation rate than the column state.

Table B.5c. How did your state compare with other states in 2014 for all eligibles? (South Carolina – Wyoming)

	SC	NC	NE	MT	CO	OK	LA	NJ	UT	KS	TX	AR	AZ	CA	NV	ND	WY
OR	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
VT	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
WA	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
MI	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
WI	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
ME	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
DE	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
IL	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
TN	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
IA	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
MD	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
DC	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
RI	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
SD	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
CT	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
NM	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
FL	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
GA	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
MN	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
PA	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
IN	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
OH	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
MO	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
NY	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AK	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
AL	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
MA	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
ID	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
NH	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
KY	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
VA	-	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
MS	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
HI	-	-	-	-	L	L	L	L	L	L	L	L	L	L	L	L	L
WV	-	-	-	-	-	L	L	L	L	L	L	L	L	L	L	L	L
SC	-	-	-	-	-	-	-	-	-	L	L	L	L	L	L	L	L
NC	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L	L	L
NE	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L	L
MT	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L	L
CO	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L	L
OK	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L	L
LA	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L	L
NJ	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L	L
UT	-	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L
KS	H	-	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L
TX	H	H	-	-	-	-	-	-	-	-	-	-	L	L	L	L	L
AR	H	H	H	H	H	H	H	H	-	-	-	-	-	-	-	L	L
AZ	H	H	H	H	H	H	H	H	H	H	H	-	-	-	-	-	L
CA	H	H	H	H	H	H	H	H	H	H	H	-	-	-	-	-	L
NV	H	H	H	H	H	H	H	H	H	H	H	-	-	-	-	-	L
ND	H	H	H	H	H	H	H	H	H	H	H	H	-	-	-	-	-
WY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	-

Note: An "H" indicates that there is at least a 90 percent chance the state identified at the top of the column has a higher true participation rate than the state identified at the left of the row. An "L" indicates that there is at least a 90 percent chance that the row state has a higher true participation rate than the column state.

Table B.6. Estimates of participation rates varied widely

2014 participation rate for all eligible people		
Above 94 percent (top quarter)	**Between 77 and 94 percent**	**Below 77 percent (bottom quarter)**
Delaware	Alabama	Arizona
District of Columbia	Alaska	Arkansas
Illinois	Connecticut	California
Iowa	Florida	Colorado
Maine	Georgia	Kansas
Maryland	Hawaii	Louisiana
Michigan	Idaho	Nevada
Oregon	Indiana	New Jersey
Rhode Island	Kentucky	North Dakota
Tennessee	Massachusetts	Oklahoma
Vermont	Minnesota	Texas
Washington	Mississippi	Utah
Wisconsin	Missouri	Wyoming
	Montana	
	Nebraska	
	New Hampshire	
	New Mexico	
	New York	
	North Carolina	
	Ohio	
	Pennsylvania	
	South Carolina	
	South Dakota	
	Virginia	
	West Virginia	

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