Supplemental Nutrition Assistance Program (SNAP) Imputation

Current Population Survey (CPS) provides Supplemental Nutrition Assistance Program (SNAP) micro-data on a household level, but total number of household recipients, as well as their overall weighted-sum benefit, falls below official data provided by United States Department of Agriculture (USDA). We augmented total number of household recipients and their dollar amount of benefits from CPS 2014 March Supplement to match the 2014 SNAP reports provided on USDA website.

Since CPS provides SNAP data on a household base, our imputation follows the same train of thoughts. In addition to match household recipients number and total benefits, we tried to maintain CPS original micro-data distribution by utilizing USDA current distribution and SNAP rules. However, CPS data is insufficient in many ways. In order to augment data, a number of assumptions are made. This report illustrates details those assumptions and explains imputation procedure.

**CPS micro-data and SNAP targets**

CPS data on SNAP

SNAP, previously Food Stamp, is reported on a household level, rather than an individual level, on CPS March Supplement. According to 2014 CPS March Supplement, all members from same household report same recipient status, same benefit amounts and same length of receiving benefits. In other words, if one of the member reports as a SNAP recipient who receives $1,000 for 4 months, all other members from his or her household will report exactly same, saying $1,000 for 4 months.

Targets for imputation

The targets for imputation come from SNAP official data. In Fiscal Year 2014, an average of 22.74 million of household claims roughly 70 billion benefits. The monthly average benefits for each household is 256.41. Furthermore, data across states is available. So, for our imputation, CPS March Supplement data is sub-grouped by state for a better measurement.

CPS does not include residents living in Guam and Virgin Island. [[1]](#footnote-1)

Here is the summary of dollar benefit targets for each state:

|  |  |  |
| --- | --- | --- |
| State | CPS total benefits  (in million, monthly) | Admin total benefits  (in million, monthly) |
| Alabama | 72.3154 | 109.8445 |
| Alaska | 7.9036 | 14.5202 |
| Arizona | 119.9596 | 123.0635 |
| Arkansas | 39.7310 | 55.3099 |
| California | 322.9665 | 617.6236 |
| Colorado | 46.3731 | 63.8114 |
| Connecticut | 41.3462 | 58.1196 |
| Delaware | 13.5626 | 18.3627 |
| District of Columbia | 10.0727 | 18.5503 |
| Florida | 238.6994 | 456.0695 |
| Georgia | 110.8866 | 235.6545 |
| Hawaii | 21.6736 | 43.7832 |
| Idaho | 13.5493 | 24.6386 |
| Illinois | 138.2676 | 266.8758 |
| Indiana | 75.9690 | 109.2890 |
| Iowa | 30.6504 | 44.3404 |
| Kansas | 25.1812 | 32.9342 |
| Kentucky | 75.1375 | 97.5825 |
| Louisiana | 58.0122 | 107.3597 |
| Maine | 20.2867 | 26.7959 |
| Maryland | 55.9049 | 94.4280 |
| Massachusetts | 69.5713 | 106.0815 |
| Michigan | 161.9309 | 214.6804 |
| Minnesota | 39.7863 | 55.8502 |
| Mississippi | 62.1454 | 76.0821 |
| Missouri | 53.0618 | 103.0371 |
| Montana | 9.2086 | 14.6808 |
| Nebraska | 13.3359 | 19.9087 |
| Nevada | 23.5846 | 44.7259 |
| New Hampshire | 7.3558 | 11.7266 |
| New Jersey | 61.4274 | 107.5574 |
| New Mexico | 29.3099 | 52.4300 |
| New York | 261.7214 | 433.3965 |
| North Carolina | 125.1930 | 198.6310 |
| North Dakota | 6.8089 | 6.3138 |
| Ohio | 151.2553 | 215.2298 |
| Oklahoma | 42.8957 | 72.0875 |
| Oregon | 59.2938 | 96.8226 |
| Pennsylvania | 136.9388 | 214.4715 |
| Rhode Island | 17.4587 | 23.3203 |
| South Carolina | 63.3067 | 102.9747 |
| South Dakota | 7.4918 | 12.4115 |
| Tennessee | 118.8067 | 162.6599 |
| Texas | 317.4155 | 444.2209 |
| Utah | 19.9953 | 26.3893 |
| Vermont | 7.1864 | 10.8604 |
| Virginia | 57.1865 | 108.6068 |
| Washington | 77.5723 | 128.9622 |
| West Virginia | 23.4764 | 39.6778 |
| Wisconsin | 61.0965 | 92.7484 |
| Wyoming | 3.9771 | 4.1060 |

**Imputation Procedure**

We follow a similar two-step procedure as SSI imputation. First, we add up the household weight in the recipient pool to reach the administrative level for each state. Second, we impute and get the adjust ratio for benefits amount to match the dollar benefit total.

Step Ⅰ: impute recipient

A basic linear regression model is built up for analyzing the likelihood of being a recipient. Following SNAP rules, only net income is used as independent variable.

Net income estimation is also consistent with program rule:

1. We get the gross income for each household by summing up all members earned and unearned incomes;
2. A 20% deduction of earned income;
3. According to household size, do the following deduction:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Household Size | Less or equal to 3 | 4 | 5 | More or equal to 6 |
| Deduction Amount | 155 | 168 | 197 | 226 |

1. For household with member age over 60 or disabled, a deduction of Medical Expenses over $35 if they are not paid by insurance or someone else;
2. A deduction of legally child support;
3. Deductions of dependent cares and shelter costs: we use the average official number $10 and $290 per month.

Some of the variables we choose may not be the same as what SNAP officially uses, but they are good proxies as estimation. For dependent cares and shelter costs, CPS does not cover relative variables. So the average official number from USDA is used.

We run the model on a subset of CPS dataset. Because household with higher income are not eligible for joining SNAP, those with monthly income higher than $5,490 are dropped. The drop line comes from SNAP rule: the highest net income test line for a household with 14 members is $5,490. We use this as our drop line.

Then we rank all recipients by their fitted probability. For each state’s sub-group, we sum-up their weights until the weights reach administrative level.

Step Ⅱ:

For each imputed household recipient, we assign the average benefit amount for correspondent state. Then we calculate the total dollar benefits again for each state, and compare the new dollar benefits with SNAP administrative data. Conditions vary among states, and we can get the adjustment ratios by dividing administrative benefits to imputed benefits. Most adjustment ratios nearly equal to 1. We use the adjustment ratios to augment or shrink each household’s benefits.

**Appendix**

Table 1: household recipients’ numbers by state

|  |  |  |
| --- | --- | --- |
| State | CPS total household recipient (monthly, in thousand) | Admin total household recipient (monthly, in thousand) |
| Alabama | 225.5801 | 419.552 |
| Alaska | 20.04386 | 36.99717 |
| Arizona | 327.8051 | 449.6398 |
| Arkansas | 151.8973 | 221.4462 |
| California | 964.3651 | 2019.272 |
| Colorado | 142.9684 | 234.0977 |
| Connecticut | 131.2968 | 242.9821 |
| Delaware | 39.86342 | 71.408 |
| District of Columbia | 38.23836 | 80.36025 |
| Florida | 814.854 | 1920.697 |
| Georgia | 403.7458 | 882.1148 |
| Hawaii | 46.64413 | 98.82992 |
| Idaho | 47.83857 | 90.16117 |
| Illinois | 432.2913 | 1021.15 |
| Indiana | 222.8906 | 404.5751 |
| Iowa | 113.0834 | 193.3723 |
| Kansas | 86.9585 | 132.8254 |
| Kentucky | 240.9178 | 399.2068 |
| Louisiana | 200.1865 | 396.4278 |
| Maine | 84.13729 | 122.6904 |
| Maryland | 195.4621 | 403.7813 |
| Massachusetts | 281.2241 | 489.0394 |
| Michigan | 529.4268 | 872.5383 |
| Minnesota | 169.3773 | 260.437 |
| Mississippi | 227.0717 | 302.2018 |
| Missouri | 272.7559 | 403.9128 |
| Montana | 35.37365 | 59.097 |
| Nebraska | 47.10482 | 76.91858 |
| Nevada | 108.6703 | 188.739 |
| New Hampshire | 31.98414 | 53.559 |
| New Jersey | 226.9598 | 439.6945 |
| New Mexico | 81.49545 | 195.2583 |
| New York | 970.2162 | 1698.559 |
| North Carolina | 438.166 | 761.1046 |
| North Dakota | 25.66999 | 25.01117 |
| Ohio | 633.9179 | 851.9723 |
| Oklahoma | 132.0333 | 279.6055 |
| Oregon | 214.2253 | 448.8554 |
| Pennsylvania | 489.16 | 889.7252 |
| Rhode Island | 66.24414 | 101.0023 |
| South Carolina | 262.7989 | 395.2085 |
| South Dakota | 25.46916 | 44.03892 |
| Tennessee | 404.0362 | 650.2508 |
| Texas | 969.9927 | 1607.669 |
| Utah | 62.61077 | 90.57008 |
| Vermont | 25.44948 | 48.57467 |
| Virginia | 202.7035 | 443.6066 |
| Washington | 259.1494 | 585.1045 |
| West Virginia | 94.36081 | 176.0287 |
| Wisconsin | 228.8431 | 420.8331 |
| Wyoming | 12.80358 | 15.24942 |

Table 2: Average household benefits by state

|  |  |
| --- | --- |
| State | Average household benefit |
| Alabama | 261.81 |
| Alaska | 392.47 |
| Arizona | 273.69 |
| Arkansas | 249.77 |
| California | 305.86 |
| Colorado | 272.58 |
| Connecticut | 239.19 |
| Delaware | 257.15 |
| District of Columbia | 230.84 |
| Florida | 237.45 |
| Georgia | 267.15 |
| Hawaii | 443.02 |
| Idaho | 273.27 |
| Illinois | 261.35 |
| Indiana | 270.13 |
| Iowa | 229.3 |
| Kansas | 247.95 |
| Kentucky | 244.44 |
| Louisiana | 270.82 |
| Maine | 218.4 |
| Maryland | 233.86 |
| Massachusetts | 216.92 |
| Michigan | 246.04 |
| Minnesota | 214.45 |
| Mississippi | 251.76 |
| Missouri | 255.1 |
| Montana | 248.42 |
| Nebraska | 258.83 |
| Nevada | 236.97 |
| New Hampshire | 218.95 |
| New Jersey | 244.62 |
| New Mexico | 268.52 |
| New York | 255.16 |
| North Carolina | 260.98 |
| North Dakota | 252.44 |
| Ohio | 252.63 |
| Oklahoma | 257.82 |
| Oregon | 215.71 |
| Pennsylvania | 241.05 |
| Rhode Island | 230.89 |
| South Carolina | 260.56 |
| South Dakota | 281.83 |
| Tennessee | 250.15 |
| Texas | 276.31 |
| Utah | 291.37 |
| Vermont | 223.58 |
| Virginia | 244.83 |
| Washington | 220.41 |
| West Virginia | 225.41 |
| Wisconsin | 220.39 |
| Wyoming | 269.26 |

Table 3: Adjustment ratios by state

|  |  |  |  |
| --- | --- | --- | --- |
| State | Imputed | Admin | adjust ratio |
| Alabama | 1,425,149,656 | 1,318,133,562 | 0.9249 |
| Alaska | 161,454,452 | 174,241,813 | 1.0792 |
| Arizona | 1,479,852,442 | 1,476,761,898 | 0.9979 |
| Arkansas | 625,016,716 | 663,719,268 | 1.0619 |
| California | 7,419,933,905 | 7,411,483,685 | 0.9989 |
| Colorado | 794,713,531 | 765,737,085 | 0.9635 |
| Connecticut | 764,969,737 | 697,435,672 | 0.9117 |
| Delaware | 241,375,742 | 220,352,805 | 0.9129 |
| District of Columbia | 229,546,428 | 222,604,041 | 0.9698 |
| Florida | 5,723,679,545 | 5,472,834,001 | 0.9562 |
| Georgia | 2,781,306,141 | 2,827,853,876 | 1.0167 |
| Hawaii | 518,732,768 | 525,397,960 | 1.0128 |
| Idaho | 274,819,919 | 295,662,973 | 1.0758 |
| Illinois | 3,320,032,907 | 3,202,509,863 | 0.9646 |
| Indiana | 1,340,698,786 | 1,311,468,403 | 0.9782 |
| Iowa | 540,620,837 | 532,085,213 | 0.9842 |
| Kansas | 381,734,596 | 395,209,994 | 1.0353 |
| Kentucky | 1,265,282,677 | 1,170,989,948 | 0.9255 |
| Louisiana | 1,273,525,632 | 1,288,316,273 | 1.0116 |
| Maine | 328,836,510 | 321,550,513 | 0.9778 |
| Maryland | 1,161,700,112 | 1,133,135,874 | 0.9754 |
| Massachusetts | 1,327,133,222 | 1,272,977,488 | 0.9592 |
| Michigan | 2,762,960,732 | 2,576,165,148 | 0.9324 |
| Minnesota | 659,091,906 | 670,202,668 | 1.0169 |
| Mississippi | 942,818,173 | 912,985,504 | 0.9684 |
| Missouri | 1,004,121,446 | 1,236,444,630 | 1.2314 |
| Montana | 167,276,786 | 176,169,543 | 1.0532 |
| Nebraska | 227,506,805 | 238,904,358 | 1.0501 |
| Nevada | 493,328,129 | 536,711,313 | 1.0879 |
| New Hampshire | 138,771,498 | 140,718,624 | 1.0140 |
| New Jersey | 1,322,551,002 | 1,290,688,313 | 0.9759 |
| New Mexico | 678,996,846 | 629,160,453 | 0.9266 |
| New York | 5,192,489,470 | 5,200,758,093 | 1.0016 |
| North Carolina | 2,374,933,109 | 2,383,571,501 | 1.0036 |
| North Dakota | 72,117,160 | 75,765,024 | 1.0506 |
| Ohio | 2,279,556,331 | 2,582,757,967 | 1.1330 |
| Oklahoma | 890,064,248 | 865,049,765 | 0.9719 |
| Oregon | 1,246,552,766 | 1,161,871,005 | 0.9321 |
| Pennsylvania | 2,625,737,176 | 2,573,657,445 | 0.9802 |
| Rhode Island | 277,084,628 | 279,843,287 | 1.0100 |
| South Carolina | 1,118,130,707 | 1,235,696,260 | 1.1051 |
| South Dakota | 140,853,462 | 148,938,276 | 1.0574 |
| Tennessee | 1,996,527,802 | 1,951,918,832 | 0.9777 |
| Texas | 5,504,226,863 | 5,330,650,619 | 0.9685 |
| Utah | 298,240,057 | 316,671,764 | 1.0618 |
| Vermont | 142,389,516 | 130,324,476 | 0.9153 |
| Virginia | 1,288,139,285 | 1,303,281,631 | 1.0118 |
| Washington | 1,667,108,440 | 1,547,545,882 | 0.9283 |
| West Virginia | 498,881,213 | 476,134,200 | 0.9544 |
| Wisconsin | 1,176,769,076 | 1,112,980,884 | 0.9458 |
| Wyoming | 49,749,532 | 49,272,569 | 0.9904 |

1. For Guam, administrative data: 15,480 household and 108,433,869 benefits; for Virgin Island, administrative data: 12,478 household and 55,099,458 benefits. [↑](#footnote-ref-1)