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# A. 2019 Doubled-Up, Sheltered, and Unsheltered Homelessness Rates and Rank for U.S. States and D.C.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Point-in-Time Count of Sheltered and Unsheltered Homelessness | | ACS 1-Year Estimates of Doubled Up Homelessness | | | |
| STATE | Persons  per 10,000 | State  Rank | Persons  per 10,000 | Margin of Error  90% Confidence Level | | State Rank |
| Alabama | 7 | 3 | 137 | +/- | 21 | 42 |
| Alaska | 26 | 44 | 152 | +/- | 53 | 45 |
| Arizona | 14 | 37 | 136 | +/- | 16 | 41 |
| Arkansas | 9 | 19 | 104 | +/- | 19 | 32 |
| California | 38 | 48 | 195 | +/- | 8 | 48 |
| Colorado | 17 | 41 | 74 | +/- | 11 | 19 |
| Connecticut | 9 | 13 | 75 | +/- | 17 | 21 |
| Delaware | 9 | 21 | 81 | +/- | 39 | 24 |
| District of Columbia | 92 | 51 | 235 | +/- | 65 | 51 |
| Florida | 13 | 36 | 166 | +/- | 11 | 47 |
| Georgia | 10 | 23 | 139 | +/- | 14 | 44 |
| Hawaii | 45 | 49 | 134 | +/- | 36 | 39 |
| Idaho | 13 | 35 | 96 | +/- | 40 | 31 |
| Illinois | 8 | 9 | 84 | +/- | 8 | 25 |
| Indiana | 8 | 11 | 72 | +/- | 12 | 17 |
| Iowa | 7 | 6 | 41 | +/- | 10 | 4 |
| Kansas | 8 | 12 | 47 | +/- | 14 | 8 |
| Kentucky | 9 | 20 | 109 | +/- | 16 | 35 |
| Louisiana | 6 | 2 | 158 | +/- | 21 | 46 |
| Maine | 16 | 40 | 35 | +/- | 18 | 3 |
| Maryland | 11 | 30 | 114 | +/- | 20 | 36 |
| Massachusetts | 27 | 45 | 71 | +/- | 12 | 15 |
| Michigan | 9 | 14 | 77 | +/- | 11 | 22 |
| Minnesota | 14 | 38 | 74 | +/- | 19 | 18 |
| Mississippi | 4 | 1 | 199 | +/- | 26 | 49 |
| Missouri | 10 | 27 | 71 | +/- | 11 | 16 |
| Montana | 13 | 34 | 84 | +/- | 25 | 27 |
| Nebraska | 12 | 33 | 44 | +/- | 13 | 5 |
| Nevada | 23 | 43 | 107 | +/- | 23 | 34 |
| New Hampshire | 10 | 28 | 56 | +/- | 28 | 10 |
| New Jersey | 10 | 26 | 105 | +/- | 13 | 33 |
| New Mexico | 15 | 39 | 201 | +/- | 34 | 50 |
| New York | 47 | 50 | 135 | +/- | 9 | 40 |
| North Carolina | 9 | 17 | 89 | +/- | 9 | 28 |
| North Dakota | 7 | 5 | 33 | +/- | 16 | 2 |
| Ohio | 9 | 16 | 68 | +/- | 8 | 13 |
| Oklahoma | 10 | 25 | 96 | +/- | 18 | 30 |
| Oregon | 38 | 47 | 66 | +/- | 15 | 12 |
| Pennsylvania | 10 | 29 | 94 | +/- | 13 | 29 |
| Rhode Island | 10 | 24 | 75 | +/- | 33 | 20 |
| South Carolina | 8 | 10 | 129 | +/- | 17 | 38 |
| South Dakota | 11 | 32 | 79 | +/- | 27 | 23 |
| Tennessee | 11 | 31 | 121 | +/- | 13 | 37 |
| Texas | 9 | 18 | 137 | +/- | 7 | 43 |
| Utah | 9 | 15 | 45 | +/- | 13 | 7 |
| Vermont | 17 | 42 | 53 | +/- | 34 | 9 |
| Virginia | 7 | 4 | 69 | +/- | 10 | 14 |
| Washington | 28 | 46 | 65 | +/- | 12 | 11 |
| West Virginia | 8 | 8 | 84 | +/- | 19 | 26 |
| Wisconsin | 8 | 7 | 44 | +/- | 10 | 6 |
| Wyoming | 9 | 22 | 26 | +/- | 18 | 1 |
| TOTAL | 17 |  | 116 | +/- | 2 |  |
| State population estimates for calculating homelessness rates come from the Census Bureau’s Annual Estimates of the Resident Population for the United States (NST-EST2019-01) | | | | | | |

# B. 2019 1-Year Estimates of Doubled Up Homelessness, 50 Public Use Micro-Areas (PUMAs) with Highest Rates

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| State | PUMA Name | Persons per 10,000 | Margin of Error  90% Confidence Level | |
| Pennsylvania | Philadelphia City (East) PUMA | 923 | +/- | 355 |
| California | Los Angeles County (South)--Long Beach City (Southwest & Port) PUMA | 823 | +/- | 373 |
| Texas | Houston City (North) & Aldine--Between Loop I-610 & Beltway TX-8 PUMA | 771 | +/- | 504 |
| California | Los Angeles County (South Central)--LA City (South Central/Watts) PUMA | 764 | +/- | 194 |
| Texas | Cameron County (East)--Brownsville City (North) PUMA | 743 | +/- | 360 |
| California | Los Angeles County (Central)--Bell Gardens, Bell, Maywood, Cudahy & Commerce Cities PUMA | 719 | +/- | 222 |
| New York | NYC-Bronx Community District 5--Morris Heights, Fordham South & Mount Hope PUMA | 689 | +/- | 224 |
| New Mexico | Northwest New Mexico--Navajo Nation PUMA | 678 | +/- | 261 |
| California | Los Angeles County--LA City (Central/Univ. of Southern California & Exposition Park) PUMA | 676 | +/- | 318 |
| California | Los Angeles County (North/Unincorporated)--Castaic PUMA | 629 | +/- | 359 |
| California | Los Angeles County (Central)--LA City (Southeast/East Vernon) PUMA | 626 | +/- | 218 |
| California | Los Angeles County (Central)--East Los Angeles PUMA | 593 | +/- | 256 |
| California | Los Angeles County (East Central)--La Puente & Industry Cities PUMA | 587 | +/- | 241 |
| California | Fresno County (Central)--Fresno City (East Central) PUMA | 586 | +/- | 307 |
| Florida | Miami-Dade County (Northeast)--Hialeah City (North Central) PUMA | 584 | +/- | 416 |
| California | Los Angeles County (Central)--El Monte & South El Monte Cities PUMA | 582 | +/- | 233 |
| Florida | Miami-Dade County (Northeast Central)--Miami City (North) PUMA | 564 | +/- | 373 |
| Texas | South Texas Development Council (North)--Webb County--Laredo City (Central) PUMA | 557 | +/- | 173 |
| California | Los Angeles County (Central)--Huntington Park City, Florence-Graham & Walnut Park PUMA | 556 | +/- | 204 |
| California | Contra Costa County (Northeast)--Antioch City PUMA | 551 | +/- | 287 |
| California | Kern County (Central)--Bakersfield City (Southeast) PUMA | 550 | +/- | 280 |
| New Jersey | Mercer County (West Central)--Trenton City PUMA | 550 | +/- | 326 |
| New Mexico | North Central New Mexico PUMA | 534 | +/- | 238 |
| Florida | Miami-Dade County (Northeast)--Hialeah City (South Central) PUMA | 529 | +/- | 201 |
| Florida | Miami-Dade County (North Central)--Miami Gardens City (North & West) PUMA | 516 | +/- | 272 |
| New York | NYC-Bronx Community District 4--Concourse, Highbridge & Mount Eden PUMA | 510 | +/- | 202 |
| Arizona | Pinal County (Central)--Florence Town, Eloy (Northeast) & Coolidge Cities PUMA | 504 | +/- | 350 |
| Tennessee | Memphis (East), Lakeland Cities & Arlington Town (South) PUMA | 504 | +/- | 421 |
| California | Imperial County--El Centro City PUMA | 499 | +/- | 247 |
| Connecticut | Waterbury Town PUMA | 493 | +/- | 365 |
| Maryland | Baltimore City--Inner Harbor, Canton & Bayview PUMA | 492 | +/- | 386 |
| Texas | Dallas County (Northeast)--Garland (Northwest) & Richardson (East) Cities PUMA | 484 | +/- | 432 |
| Pennsylvania | Allentown City PUMA | 483 | +/- | 287 |
| Texas | San Antonio City (Southwest)--Inside Loop I-410 PUMA | 479 | +/- | 256 |
| Maryland | Baltimore County--Randallstown (East), Owings Mills, Milford Mill & Reisterstown PUMA | 475 | +/- | 541 |
| Arizona | Phoenix City--Maryvale (West) PUMA | 474 | +/- | 240 |
| California | Los Angeles County (South Central)--LA City (South Central/Westmont) PUMA | 471 | +/- | 175 |
| California | Los Angeles County (South)--South Gate & Lynwood Cities PUMA | 467 | +/- | 209 |
| South Dakota | Lakota Region PUMA | 467 | +/- | 172 |
| Pennsylvania | Philadelphia City (Southwest) PUMA | 465 | +/- | 269 |
| New York | NYC-Bronx Community District 1 & 2--Hunts Point, Longwood & Melrose PUMA | 464 | +/- | 183 |
| South Carolina | Georgetown, Marion & Dillon Counties PUMA | 461 | +/- | 239 |
| Florida | Orange County (Central)--Orlando City (West Downtown) & Pine Hills (Southeast) PUMA | 460 | +/- | 362 |
| Arizona | Navajo & Apache Counties PUMA | 459 | +/- | 129 |
| California | Riverside County (Northwest)--Riverside City (East) PUMA | 457 | +/- | 282 |
| California | Orange County (Central)--Santa Ana City (East) PUMA | 453 | +/- | 162 |
| Texas | Fort Worth City (East Central)--South of I-30, East of I-35W & Inside Loop I-820 PUMA | 452 | +/- | 212 |
| Florida | Palm Beach County (West)--Glades & Western Communities PUMA | 451 | +/- | 302 |
| California | Los Angeles County--LA (North Central/Arleta & Pacoima) & San Fernando Cities PUMA | 450 | +/- | 165 |
| Mississippi | North Central Region PUMA | 450 | +/- | 195 |

**NOTE: The SAS and R codes in this appendix can be used with 5-Year ACS data samples**—larger samples that describe the average characteristics of an area over a five-year period and offer more reliability for smaller areas and subpopulations. Using 5-yeaer data will result in smaller margins of error. Alternatively, more reliable 1-year data can be found for metro areas and counties.

# C. Using IPUMS USA to Download ACS Data to Measure Doubling Up

First, head to <https://usa.ipums.org/usa/>

1. **Variables Required to Construct Doubling Up Measure:**
2. [AGE](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#AGE) (Age)
3. [BEDROOMS](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#BEDROOMS) (Number of bedrooms)
4. [CLUSTER](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#CLUSTER) (Household cluster for variance estimation)
5. [GCRESPON](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#GCRESPON) (Responsible for grandchildren)
6. [GQ](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#GQ) (Group quarters status)
7. [HHWT](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#HHWT) (Household weight)
8. [KITCHEN](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#KITCHEN) (Kitchen or cooking facilities)
9. [MOMLOC](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#MOMLOC) (Mother's location in the household)
10. [MORTGAGE](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#MORTGAGE) (Mortgage status)
11. [NCHILD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#NCHILD) (Number of own children in the household)
12. [NUMPREC](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#NUMPREC) (Number of person records following)
13. [OWNERSHP](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#OWNERSHP) (Ownership of dwelling (tenure) [general version])
14. [OWNERSHPD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#OWNERSHPD) (Ownership of dwelling (tenure) [detailed version])
15. [PERNUM](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#PERNUM) (Person number in sample unit)
16. [PERWT](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#PERWT) (Person weight)
17. [PLUMBING](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#PLUMBING) (Plumbing facilities)
18. [POPLOC](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#POPLOC) (Father's location in the household)
19. [POVERTY](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#POVERTY) (Poverty status)
20. [PUMA](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#PUMA) (Public Use Microdata Area)
21. [RELATE](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#RELATE) (Relationship to household head [general version])
22. [RELATED](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#RELATED) (Relationship to household head [detailed version])
23. [RENTGRS](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#RENTGRS) (Monthly gross rent)
24. [REPWT](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#REPWT) (Household replicate weights [80 variables])[[1]](#footnote-1)
25. [REPWTP](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#REPWTP) (Person replicate weights [80 variables])1
26. [SAMPLE](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SAMPLE) (IPUMS sample identifier)
27. [SERIAL](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SERIAL) (Household serial number)
28. [SFRELATE](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SFRELATE) (Relationship within subfamily)
29. [SFTYPE](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SFTYPE) (Subfamily type)
30. [SPLOC](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SPLOC) (Spouse's location in household)
31. [STATEFIP](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#STATEFIP) (State (FIPS code))
32. [STRATA](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#STRATA) (Household strata for variance estimation)
33. [SUBFAM](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SUBFAM) (Subfamily membership)
34. [YEAR](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#YEAR) (Census year)
35. **Variables Recommended to Describe Sample**
36. [COUNTYFIP](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#COUNTYFIP) (County (FIPS code))
37. [EDUC](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#EDUC) (Educational attainment [general version])
38. [EDUCD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#EDUCD) (Educational attainment [detailed version])
39. [EMPSTAT](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#EMPSTAT) (Employment status [general version])
40. [EMPSTATD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#EMPSTATD) (Employment status [detailed version])
41. [HISPAN](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#HISPAN) (Hispanic origin [general version])
42. [HISPAND](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#HISPAND) (Hispanic origin [detailed version])
43. [INCTOT](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#INCTOT) (Total personal income)
44. [MARST](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#MARST) (Marital status)
45. [MET2013](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#MET2013) (Metropolitan area (2013 OMB delineations))
46. [METRO](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#METRO) (Metropolitan status)
47. [RACE](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#RACE) (Race [general version])
48. [RACED](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#RACED) (Race [detailed version])
49. [REGION](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#REGION) (Census region and division)
50. [SCHOOL](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SCHOOL) (School attendance)
51. [SEX](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SEX) (Sex)
52. **Creating Extract Request**
53. After adding the above variables, you are ready view your cart and “Create Data Extract.”

A picture containing graphical user interface

Description automatically generated

1. Select “**Attach Characteristics”** to include linked variables. (e.g., “Age *of Mom*”):

**Graphical user interface

Description automatically generated**

1. **Include the following “Linked Variables” (REQUIRED)**
2. [MOMLOC\_HEAD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#MOMLOC_HEAD) (Mother's location in the household [of head])
3. [POPLOC\_HEAD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#POPLOC_HEAD) (Father's location in the household [of head])
4. [SPLOC\_HEAD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#SPLOC_HEAD) (Spouse's location in household [of head])
5. [NCHILD\_HEAD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#NCHILD_HEAD) (Number of own children in the household [of head])
6. [RELATE\_HEAD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#RELATE_HEAD) (Relationship to household head [of head; general version])
7. [RELATED\_MOM](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#RELATED_MOM) (Relationship to household head [of mother; detailed version])
8. [RELATED\_POP](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#RELATED_POP) (Relationship to household head [of father; detailed version])
9. [AGE\_HEAD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#AGE_HEAD) (Age [of head])
10. [AGE\_MOM](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#AGE_MOM) (Age [of mother])
11. [AGE\_POP](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#AGE_POP) (Age [of father])
12. [POVERTY\_HEAD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#POVERTY_HEAD) (Poverty status [of head])
13. [GCRESPON\_HEAD](https://usa.ipums.org/usa-action/downloads/extract_files/usa_00092.xml#GCRESPON_HEAD) (Responsible for grandchildren [of head])
14. Select “**Select Cases**” to download household records only:

**Graphical user interface

Description automatically generated**

1. Select “GQ” to indicate that you only want to include households (to exclude people in institutions and group quarters). Select only **GQ=1, 2, or 5** (screenshot below)
2. You may also choose to select a geography to limit your sample.

**Graphical user interface, text, application

Description automatically generated**

# D. SAS Code for Doubling Up Measure

Authors: Molly Richard, Gracie Rule, and Zach Glendening

**#First, read in the data using your preferred method. The easiest way to do this is to download the data from IPUMS as a SAS file and open it directly.**

**# Next, we use the concatenate function to join the STATEFIP with PUMA to create unique GEOIDs.**

data acsdata;

set tmp4.usa\_000001;

COUNTYFIP1 = put(COUNTYFIP, z3.);

STATEFIP1 = put (STATEFIP, z2.);

PUMA1 = put (PUMA, z5.);

run;

Data cat;

Set acsdata;

GEOID = cats(STATEFIP1,PUMA1);

Run;

Proc sort data=cat; by GEOID; run;

**#Then, we create adjusted poverty variables. In this sample code (for 1-year ACS data), 1086 represents the national median gross rent for 2019 for a 2 bedroom, but this should be updated to match the year of the sample being analyzed. Use Census TableID: B25031 available at:** [**https://data.census.gov/cedsci/table?q=B25063%3A%20GROSS%20RENT&t=Housing&tid=ACSDT1Y2019.B25031&hidePreview=false**](https://data.census.gov/cedsci/table?q=B25063%3A%20GROSS%20RENT&t=Housing&tid=ACSDT1Y2019.B25031&hidePreview=false) **;**

Proc means data=cat;

weight HHWT;

OUTPUT MEDIAN(RENTGRS)=AMGR OUT=temp;

WHERE pernum=1 and ownershp=2 and bedrooms=03 and KITCHEN=4 and PLUMBING=20;

By GEOID;

run;

data merged;

merge cat temp;

by GEOID;

run;

data merged;

set merged;

If OWNERSHP=1 and MORTGAGE= 1 then adjustment = .402 \* (AMGR/1086) + .598;

If OWNERSHP=1 and MORTGAGE in(2,3,4) then adjustment = .504 \* (AMGR/1086) + .496;

If OWNERSHP=2 and MORTGAGE= 0 then adjustment = .514 \* (AMGR/1086) + .486;

run;

data merged;

set merged;

adjustedpoverty\_head=POVERTY\_head \*(1/adjustment);

Adjustedpoverty = POVERTY \*(1/adjustment);

run;

data merged;

set merged;

roundedadjustedpoverty = ROUND(adjustedpoverty);

roundedadjustedpoverty\_head = ROUND(adjustedpoverty\_head);

run;

data merged;

set merged;

if (numprec/2)>(bedrooms-1) then overcrowded=1;

else if (numprec/2)<=(bedrooms-1) then overcrowded=0;

run;

**#New household member variables for creating doubled up measure/;**

data merged;

set merged;

if relate in(5:8,10) and age<65 then durelative=1;

else if relate notin (5:8,10,.) or age>=65 then durelative=0;

if relate in(5:8,10) and age>=65 and overcrowded=1 then duolderrelative=1;

else if relate notin (5:8,10,.) or age<65 or overcrowded=0 then duolderrelative=0;

if relate in(3,4) and sftype in(3,4) and age=>18 then DUmiddlegen=1;

else if relate notin(3,4,.) or sftype notin(3,4,.) or age<18 then DUmiddlegen=0;

if relate in(3,4) and sftype in(1,2) then DUmarriedchild=1;

else if relate notin(3,4,.) or sftype notin(1,2,.) then DUmarriedchild=0;

if relate=9 then dugrandchild=1;

else if relate notin(9,.) then dugrandchild=0;

if relate in(3,4) and sftype=0 and age>17 and overcrowded=1 then DUsingadcrowd=1;

else if relate notin(3,4,.) or sftype notin(0,.) or age<=17 or overcrowded notin(1,.) then DUsingadcrowd=0;

if related=1260 then DUnonrelative=1;

else if related notin(1260,.) then DUnonrelative=0;

run;

**#Excluding special cases of these subgroups not considered doubled up by the definition;**

data merged;

set merged;

if relate=7 and age<18 and momloc=0 and poploc=0

then special1=1;

else special1=0;

if relate=7 and age>17 and momloc=0 and poploc=0 and momloc\_head=0

and poploc\_head=0 and sploc=0 and sploc\_head=0 and nchild=0 and nchild\_head=0

then special2=1;

else special2=0;

If relate=9 and gcrespon\_head=2 and age<18 then special3=1;

else special3=0;

If relate=9 and sftype=3 and age\_pop<18 then special4=1;

else special4=0;

If relate=9 and sftype=4 and age\_mom<18 then special5=1;

else special5=0;

if related=1260 and (related\_mom=1114 OR related\_pop=1114) and ((age<18)

OR (age>=18 and overcrowded=0))

then special6=1;

else special6=0;

run;

data merged;

set merged;

if special3=1 or special4=1 or special5=1 then dugrandchild=0;

if special1=1 or special2=1 then durelative=0;

if special6=1 then dunonrelative=0;

run;

**#Setting poverty level to at or below 125% of the adjusted poverty variable;**

data merged;

set merged;

if roundedadjustedpoverty\_head<=125 and roundedadjustedpoverty<=125 then povertylev=1;

else if roundedadjustedpoverty\_head>125 or roundedadjustedpoverty>125 then povertylev=0;

run;

**#Integrating poverty level with doubled-up subgroups;**

data merged;

set merged;

if povertylev=1 and DUmiddlegen=1 then DU1=1;

else if povertylev notin(1) or DUmiddlegen notin(1) then DU1=0;

if povertylev=1 and DUrelative=1 then DU2=1;

else if povertylev notin(1) or DUrelative notin(1) then DU2=0;

if povertylev=1 and DUgrandchild=1 then DU3=1;

else if povertylev notin(1) or DUgrandchild notin(1) then DU3=0;

if povertylev=1 and DUmarriedchild=1 then DU4=1;

else if povertylev notin(1) or DUmarriedchild notin(1) then DU4=0;

if povertylev=1 and DUnonrelative=1 then DU5=1;

else if povertylev notin(1) or DUnonrelative notin(1) then DU5=0;

if povertylev=1 and DUsingadcrowd=1 then DU6=1;

else if povertylev notin(1) or DUsingadcrowd notin(1) then DU6=0;

if povertylev=1 and duolderrelative =1 then DU7=1;

else if povertylev notin(1) or duolderrelative notin(1) then DU7=0;

run;

**#Aggregating the different doubled up subgroups (that map onto the types of individuals) into one binary variable;**

data merged;

set merged;

if DU1=1 or DU2=1 or DU3=1 or DU4=1 or DU5=1 or DU6=1 or DU7=1 then doubledup=1;

else if DU1 notin(1) and DU2 notin(1) and DU3 notin(1) and DU4 notin(1) and

DU5 notin(1) and DU6 notin(1) and DU7 notin(1) then doubledup=0;

else doubledup=.;

run;

**#Calculate weighted estimate of doubled up/not doubled up in the population;**

proc surveyfreq data=merged;

weight perwt;

tables doubledup;

run;

**#remove negative REPWTP for replicate weight variables to function in SAS;**

data merged;

set merged;

array temp(\*) REPWTP1-REPWTP80;

do i = 1 to dim(temp);

if temp(i) < 0 then temp(i)=0;

end; run;

**#Export a CSV file with standard errors and confidence intervals generated from replicate weights. Multiply standard errors by 1.645 for 90 percent confidence margins of error;**

ods csv file="C:\Users\USERNAME\Documents\results.csv";

PROC surveyfreq DATA=merged VARMETHOD=JACKKNIFE;

WEIGHT perwt;

REPWEIGHT repwtp1-repwtp80/JKCOEFS=0.05;

tables doubledup / row col chisq CLWT CL ALPHA = 0.1;

RUN;

ods csv close;

# E. R Code for Doubling Up Measure

Author: Rachel G. McKane

**First, we install the necessary library packages. library(ipumsr) is also helpful, though not necessary.**

```{r setup, include=FALSE, echo=FALSE}

library(srvyr)

library(dplyr)

library(tidyverse)

library(robsurvey)

```

**Second, we read in the data downloaded from IPUMS and check that the variables and number of observations are as expected.**

```{r read data}

data1 <- read.csv("~/Downloads/usa\_00102.csv", blank.lines.skip = TRUE)

names(data1) #names of variables

length(data1$YEAR) #number of observations

```

**Next, we unite the STATEFIP with PUMA to create unique IDs (this is more important when we have more than one state in the sample or we are planning to join with other data sets).**

```{r create unique IDs}

data1$STATEFIP <- as.character(data1$STATEFIP)

data1$PUMA <- as.character(data1$PUMA)

data0 <- data1 %>% unite("GEOID", c(STATEFIP,PUMA), remove = FALSE, sep = "")

**```**

**Next, we use the robsurvey pacakge to apply the household weights to the variables. This is to create the median rent index to adjust the poverty variables. You will see the message "summarise()` ungrouping output (override with `.groups` argument)" which can be ignored. Next, join the original dataset with the area\_data frame that only has GEOID and the area median gross rent.**

```{r area median gross rent}

area\_data <- data0 %>%

dplyr::filter(OWNERSHP== 2, BEDROOMS == 3, KITCHEN == 4, PLUMBING == 20,PERNUM == 1) %>%

group\_by(GEOID) %>%

summarise(AMGR = weighted\_median(RENTGRS, HHWT))

data2 <- left\_join(data0,area\_data, by = "GEOID")

```

**Next, we construct new variables needed for the doubling up measure. In this sample code, 1086 represents the national median gross rent for 2019 for a 2 bedroom, but this should be updated for future or past years (Use Census TableID: B25031)**

```{r defining doubled up based on relationship, crowding, and adjusted poverty level}

data3 <- data2 %>% mutate(adjustment = ifelse(OWNERSHP == 1 & MORTGAGE == 1, .402\*(AMGR/1086) + .598,

ifelse(OWNERSHP == 1 & MORTGAGE == 2 | MORTGAGE == 3 | MORTGAGE == 4, .504\*(AMGR/1086) +.496,

ifelse(OWNERSHP == 2 & MORTGAGE == 0, .514\*(AMGR/1086) + .486, NA))),

adjustedpoverty\_head = POVERTY\_HEAD\*(1/adjustment),

adjustedpoverty = POVERTY\*(1/adjustment),

roundedadjustedpoverty = round(adjustedpoverty, 0),

roundedadjustedpoverty\_head = round(adjustedpoverty\_head,0),

overcrowded = ifelse((NUMPREC/2)>(BEDROOMS-1), 1, 0),

DUrelative = ifelse(RELATE %in% c(5,6,7,8,10) & AGE < 65, 1,0),

special1 = ifelse(RELATE == 7 & AGE < 18 & MOMLOC== 0 & POPLOC == 0, 1, 0),

special2 = ifelse(RELATE == 7 & AGE > 17 & MOMLOC== 0 & POPLOC == 0 & MOMLOC\_HEAD == 0 &

POPLOC\_HEAD == 0 & SPLOC == 0 & SPLOC\_HEAD == 0 &

NCHILD == 0 & NCHILD\_HEAD == 0, 1, 0),

DUrelative = ifelse(special1 == 1 | special2 == 1, 0, DUrelative),

DUolderrelative = ifelse(RELATE %in% c(5,6,7,8,10) & AGE >= 65 & overcrowded == 1, 1,0),

DUmiddlegen = ifelse(RELATE %in% c(3,4) & SFTYPE %in% c(3,4) & AGE >=18, 1,0),

DUmarriedchild = ifelse(RELATE %in% c(3,4) & SFTYPE %in% c(1,2), 1,0),

DUgrandchild = ifelse(RELATE != 9, 0,

ifelse(RELATE == 9 & GCRESPON\_HEAD == 2 & AGE < 18, 0,

ifelse(RELATE == 9 & SFTYPE == 4 & AGE\_MOM<18, 0,

ifelse(RELATE == 9 & SFTYPE == 3 & AGE\_POP<18, 0, 1)))),

DUsingadcrowd = ifelse(RELATE %in% c(3,4) & SFTYPE == 0 & AGE >17 & overcrowded == 1, 1, 0),

DUnonrelative = ifelse(RELATED == 1260, 1, 0),

special6 = ifelse(RELATED == 1260 & (RELATED\_MOM %in% 1114 | RELATED\_POP %in% 1114) &

(AGE<18 | (AGE>=18 & overcrowded==0)),1,0),

DUnonrelative = ifelse(special6 == 1, 0, DUnonrelative),

povertylev = ifelse(roundedadjustedpoverty\_head <= 125 & roundedadjustedpoverty <= 125, 1, 0),

DU1 = ifelse( povertylev == 1 & DUmiddlegen == 1, 1, 0),

DU2 = ifelse( povertylev == 1 & DUrelative == 1, 1, 0),

DU3 = ifelse( povertylev == 1 & DUgrandchild == 1, 1, 0),

DU4 = ifelse( povertylev == 1 & DUmarriedchild == 1, 1, 0),

DU5 = ifelse( povertylev == 1 & DUnonrelative == 1, 1, 0),

DU6 = ifelse( povertylev == 1 & DUsingadcrowd == 1, 1, 0),

DU7 = ifelse( povertylev == 1 & DUolderrelative == 1, 1, 0),

doubledup = ifelse(DU1 == 1 | DU2 == 1 | DU3 == 1 |DU4 == 1 | DU5 == 1 |

DU6 == 1 | DU7 == 1, 1,0 ))

**Finally, we enter the survey design information to compute weighted frequencies and**

**standard errors using ACS person weights (PERWT) and Replicate Weights (REPWTP).**

```

person\_weighted <- data3 %>% as\_survey\_design(weights = PERWT, repweights = matches("REPWTP[0-9]+"),

type = "JK1", scale = 4/ 80 , rscales = rep(1, 80 ), mse = TRUE)

person\_weighted %>% summarise(survey\_total(doubledup))

```

1. If users find the extract too large, or analysis time too slow, they can consider removing the 160 replicate weight variables. Standard errors calculated using replicate weights are the most accurate, but the STRATA and CLUSTER variables can also be used to approximate accurate standard errors that account for sampling design. See more at:

   <https://usa.ipums.org/usa/complex_survey_vars/userNotes_variance.shtml>

   <https://usa.ipums.org/usa/repwt.shtml>

   <https://international.ipums.org/international/resources/misc_docs/user_note_variance.pdf> [↑](#footnote-ref-1)