Using American community survey data for population estimates

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Colleagues conducting local or regional research frequently ask how to find county level or zip code-specific population data such as population size, mean income, or other demographic measures. In studies using patient data, where household income is typically not available, researchers may approximate socioeconomic status using median income for the county, zip code, or Census tract where the patient resides.[1,2,3] A variety of data aggregation websites may provide certain estimates of these data points, although for accuracy, it is far preferable to obtain these data from an original source such as the United States (U.S.) Census Bureau, where documentation about data collection methodology is provided along with the data.

The U.S. Census Bureau provides a variety of data estimates at data.census.gov, but it is important to understand the nature of the data one is seeking and determine if it is available. The U.S. Decennial Census is a count of every person living in the United States and its territories and is used to allocate congressional seats and other government resources.[4] Previous iterations of the Census included a short form and a long form, on which a subset of households answered a more detailed questionnaire to better understand the population. After the 2000 Census, the long form was phased out and from the 2010 Census forward has been limited to basic demographic characteristics via a short form.[5] Starting in 2005, the American Community Survey (ACS) has been conducted on a subset of U.S. households on a monthly basis to produce 1- and 5-year estimates of a variety of socioeconomic, demographic, and other characteristics of U.S. households.[5]

The Census Bureau produces a variety of educational videos and other documentation to guide users on how to best use the data tools, but it is advisable to gain familiarity with the data, including its strengths and limitations, before extracting data for publication purposes. Starting from data.census.gov, one can start with an initial search term and specify the topic of interest. For example, typing "Lubbock Texas median income" on the home page will provide a variety of options to examine the topic, although it remains important to understand of the limitations of the data.

After selecting "Income in the Past 12 Months," select "2023: ACS 5-Year Estimates Subject Tables." Smaller units of measure such as zip codes may not have 1-year estimates available, so one should rely on 5-year estimates. Next, click on "Filter" in the top left, and select "Zip Code Tabulation Area." Click "Texas" and use the search bar to include the zip codes to consider. After selecting the zip codes of interest, close out the zip code selection panel and a table of income categories will appear, as well as household median and mean income. Table 1 below provides 5-year estimates of median income, mean income, percent uninsured, and percent speaking a language other than English in the household for 13 zip codes associated with the city of Lubbock. Please note, selecting larger subsets of counties (e.g., all 254 Texas counties), zip codes, or census tracts may produce unwieldy tables due to their size.

Additional tools provide modest visualization of these data points with geographic parameters. Following from the above steps, click "Maps" near the top of the page. This will plot the data by zip code using the Lubbock, TX, zip codes selected earlier. Be cognizant of which measure is being mapped. Just above the title of the map, click the measure to select, for example, "Median income estimates." This will produce a map that looks something like the below Figure 1. Various options exist to edit and resize the map, although for additional map details, it may be necessary to import the data into mapping software. For example, the income categories and colors are generated by the Census data mapping tool, and notably, the income intervals are not uniform.

When dealing with smaller geographical units or identifying the size of small populations, one should use

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Table 1. Lubbock, TX 2023 Resident Characteristics by Zip Code

Zip Code	Median Income	Mean Income	% Uninsured	Language Other than English Spoken at Home
79401	$27,255	$48,135	14.6%	27.3%
79403	$45,343	$61,485	16.6%	25.8%
79404	$48,642	$62,626	19.6%	36.5%
79407	$64,778	$87,714	15.1%	16.7%
79410	$48,350	$74,688	17.1%	19.7%
79411	$44,866	$51,139	27.1%	35.7%
79412	$47,306	$56,669	18.5%	33.3%
79413	$67,062	$85,084	11.9%	11.9%
79414	$49,637	$60,842	16.8%	17.6%
79415	$37,101	$52,131	19.6%	42.9%
79416	$65,200	$89,760	9.0%	19.1%
79423	$82,906	$107,951	12.6%	16.0%
79424	$94,703	$128,444	9.9%	11.9%

Source: American Community Survey S1901, S2701, DP02.

caution with ACS estimates, paying particular attention to the provided margins of error. In a recent community health project, our research team worked in Deaf Smith and Parmer counties in the Texas Panhandle. These counties have a population of less than 30,000 total residents combined, as of 2023 estimates, but among our interests was to identify countries of origin for the residents who had moved to the area to work in the agriculture industry.[7] For reasons of public health education, migrants from Guatemala were known to speak primarily dialects of the K'iche' language, whereas Mexican and other Central American migrants predominantly spoke Spanish dialects. American Community Survey 5-year estimates provided some insight into the size of these subpopulations, although given their relatively small size, the margin of error was high. For example, the estimate of Central American residents of Deaf Smith County was 240 residents, with margin of error +/−200.[8] The high margin of error suggests that the actual population size could reasonably be as low as 40 or as high as 440. This 11-fold difference in the high and low ranges suggests that one must use caution when making policy decisions based on these estimates alone.

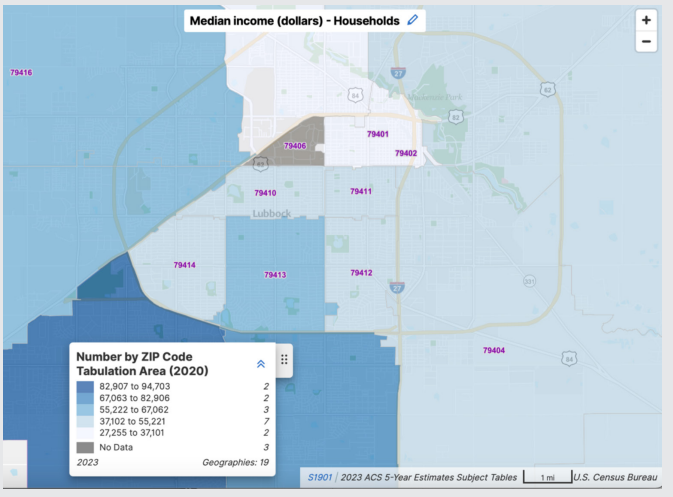

Figure 1. Median Income by Zip Code, Lubbock, TX. Source: American Community Survey S1901 Income in the Past 12 Months.[6]

American Community Survey data have a wide variety of applications for estimating population parameters for different geographic units and can provide contextual information on population size, income, poverty rates,

education, employment, and other social characteristics. Health data variables in the ACS are reasonably limited, but available markers include health insurance, disability, and fertility measures. Detailed nationally representative health information may be better obtained from large scale surveys such as the National Health Interview Survey and National Health and Nutrition Examination Survey.[9] However, for researchers wishing to contextualize health data that contain geographic identifiers, ACS provides a variety of demographic and economic parameters to produce more robust analysis.

Keywords: Population studies, surveys, zip codes, income

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