Geography and the American Community Survey

What Data Users Need to Know

Issued February 2020

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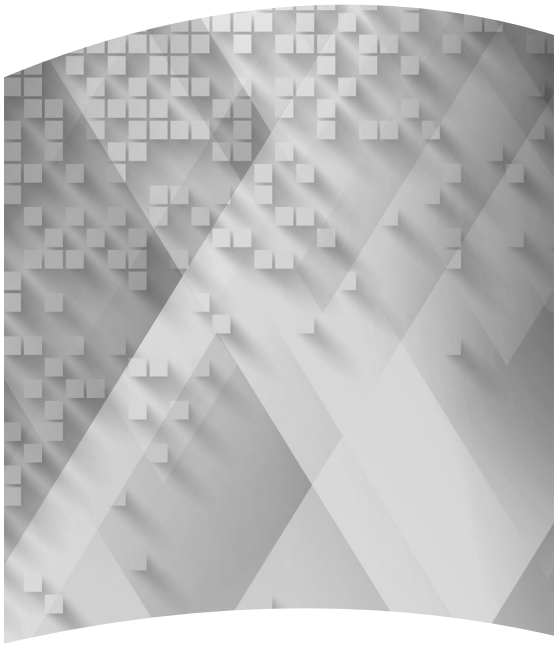

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GEOGRAPHY AND THE AMERICAN COMMUNITY SURVEY: WHAT DATA USERS NEED TO KNOW

Geography plays an important role in all U.S. Census Bureau activities by providing the framework used to collect and publish data, including American Community Survey (ACS) estimates. Data users employ ACS data that are tabulated for a variety of geographic areas to produce detailed portraits and maps of social, economic, housing, and demographic characteristics of America's communities.

This guide provides an overview of geographic areas for which ACS data are available, special considerations in working with spatial data, and links to tools and other resources that data users can use to map ACS data.

What Is the ACS?

The ACS is a nationwide survey designed to provide communities with reliable and timely social, economic, housing, and demographic data every year. A separate annual survey, called the Puerto Rico Community Survey (PRCS), collects similar data about the population and housing units in Puerto Rico. The Census Bureau uses data collected in the ACS and the PRCS to provide estimates on a broad range of population, housing unit, and household characteristics for states, counties, cities, school districts, congressional districts, census tracts, block groups, and many other geographic areas.

The ACS has an annual sample size of about 3.5 million addresses, with survey information collected nearly every day of the year. Data are pooled across a calendar year to produce estimates for that year. As a result, ACS estimates reflect data that have been collected over a period of time rather than for a single point in time as in the decennial census, which is conducted every 10 years and provides population counts as of April 1 of the census year.

ACS 1-year estimates are data that have been collected over a 12-month period and are available for geographic areas with at least 65,000 people. Starting with the 2014 ACS, the Census Bureau is also producing "1-year Supplemental Estimates"—simplified versions of popular ACS tables—for geographic areas with at least 20,000 people. The Census Bureau combines 5 consecutive years of ACS data to produce multiyear estimates for geographic areas with fewer than 65,000 residents. These 5-year estimates represent data collected over a period of 60 months.

For more detailed information about the ACS—how to judge the accuracy of ACS estimates, understanding multiyear estimates, knowing which geographic areas are covered in the ACS, and how to access ACS data on the Census Bureau's Web site—see the Census Bureau's handbook on *Understanding and Using American Community Survey Data: What All Data Users Need to Know.*[1]

[1] U.S. Census Bureau, American Community Survey (ACS), *Understanding and Using American Community Survey Data: What All Data Users Need to Know*, <www.census.gov/programs-surveys/acs/guidance/handbooks/general.html>.

1. GEOGRAPHIC AREAS COVERED IN THE ACS

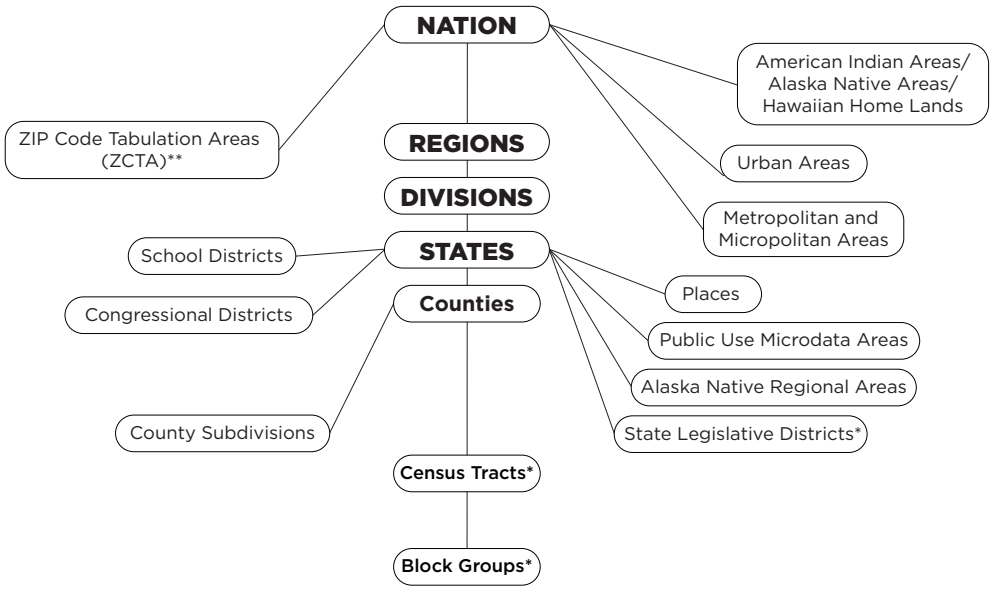
For reporting purposes, the U.S. Census Bureau divides the nation into two main types of geographic areas, legal and statistical. Legal areas are defined specifically by law, and include state, local, and tribal government units, and some specially defined administrative areas like congressional districts. Many, but not all of these areas, are represented by elected officials. An example of a legal area is New York State.

Statistical areas are defined directly by the Census Bureau and state, regional, or local authorities for the purpose of presenting data. Examples of statistical areas include census designated places, census tracts, urban areas, and metropolitan statistical areas (such as the Boston-Cambridge-Newton, MA-NH Metropolitan Statistical Area).

Geographic areas are organized in a hierarchy (see Figure 1.1). Larger units, such as states, include smaller units such as counties and census tracts. This structure is derived from the legal, administrative, or areal relationships of the entities. In the American Community Survey (ACS), block groups are the lowest (smallest) level of geography published. Block group data are only available in the ACS 5-year data products. The ACS does not produce data at the block level.

In Figure 1.1, the geographic types connected by lines are nested within each other. For example, a line extends from counties to census tracts because a county is completely comprised of census tracts, and a single census tract cannot cross a county boundary.

Figure 1.1. **Hierarchy of Select Geographic Entities in the ACS**



* Five-year estimates only.
** Five-year estimates only, first released in 2012 for the 2007–2011 ACS estimates.
Source: U.S. Census Bureau.

If there is no line joining two geographic types, then an absolute and predictable relationship does not exist between them. For example, although many places (cities and towns) are confined to one county, some places, such as New York City, extend over more than one county (see Figure 1.2). Therefore, an absolute hierarchical relationship does not exist between counties and places.

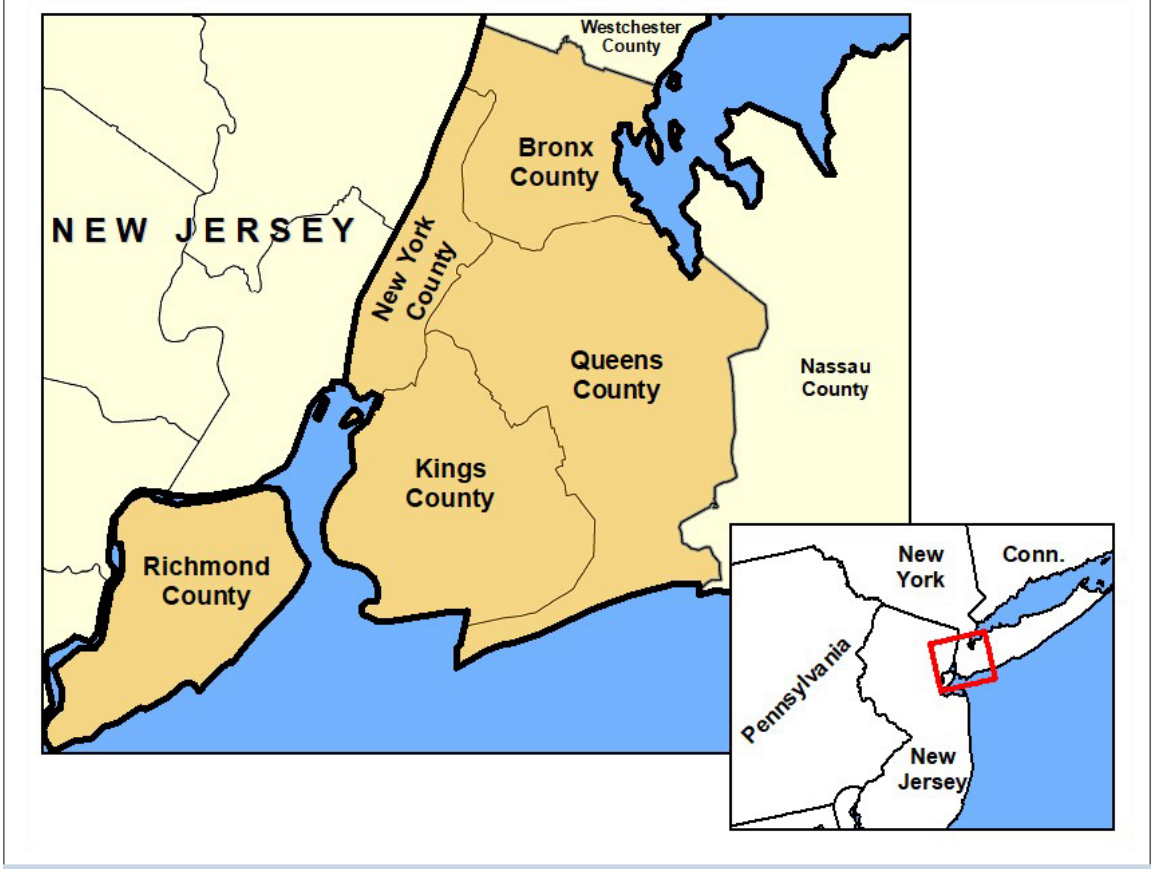
Geographic Summary Levels and Codes

There are two main types of identifiers that the Census Bureau uses for geographic areas: summary levels and geographic identifiers (GEOIDs).

Summary levels represent a geographic type, while GEOIDs are used to identify individual geographic areas. For example, State-County (summary level 050), represents the concept of a county within a state, while the GEOID for Madison County, Texas, is 48313 (state code '48' combined with county code '313'). These codes can be used to identify geographic areas in the ACS and many other public data sources.

Summary levels range from very large reporting units, such as "State," to much smaller reporting units such as "Census Tract." Each summary level has an assigned three-digit, summary-level code to help programmers link each summary level to its appropriate use in a

Figure 1.2. **Counties in New York City**



Source: U.S. Census Bureau, County Cartographic Boundary Shapefiles, <www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html>.

table, map, or other data summarization format. Here are some common summary levels used to identify types of geographic areas:

- 010 Nation
- 020 Region
- 030 Division[2]
- 040 State
- 050 State-County
- 140 State-County-Census Tract
- 155 State-Place-County
- 160 State-Place
- 250 American Indian Area/Alaska Native Area/ Hawaiian Home Land
- 310 Metropolitan Statistical Area/Micropolitan Statistical Area
- 500 State-Congressional District

Summary levels may cross between two or more geographic hierarchies to produce units that are only portions of geographic areas. For example, summary level "State-Place-County" crosses the "State-Place" hierarchy with the "State-County" hierarchy and may create units that cover only a portion of one county.

A list of Cartographic Boundary File Summary Level Codes is available on the Census Bureau's Web site.[3]

Geographic Codes

The Census Bureau and other state and federal agencies are responsible for assigning codes, or GEOIDs, to geographic areas. GEOIDs are numeric codes that uniquely identify each legal or statistical geographic area for which the Census Bureau tabulates data.

GEOIDS are useful for sorting names of geographic areas for presentation purposes or analysis, merging ACS data with data from other sources, identifying areas as legally or statistically defined entities, and describing the classification category of the area.

The Census Bureau uses several different code sets to identify geographic areas depending on area type and purpose. The most frequently used code systems are Federal Information Processing Series and American National Standards Institute codes.[4]

To identify a geographic area that is nested within a larger area, such as a state or the nation, one or more higher-level codes may be required. Census tract codes are unique within counties, and county codes are unique within states. Therefore, a complete set of state, county, and tract codes is needed to uniquely identify a particular census tract.

For example:

- The unique GEOID for census tract 201 in Autauga County, Alabama, is 01001020100.
- The unique GEOID for census tract 201 in La Paz County, Arizona, is 04012020100.

As shown in Table 1.1, a tract's unique GEOID is created by combining its state, county, and census tract codes.

Some GEOIDs display additional information. For example, if you use the data.census.gov Web site to download ACS estimates for census tract 201 in Autauga County, Alabama, the GEOID is displayed as 1400000US01001020100, where "140" represents the summary level of the data, "0000" represents the two-digit geographic variant and the two-digit geographic component, "US" represents the United States, "01" represents the state of Alabama, "001" represents Autauga County, and "020100" represents the census tract.

For more information, visit the Census Bureau's Web page on "Understanding Geographic Identifiers."[5]

Table 1.1. **GEOID Structure**

Name of census tract	State code	County code	Tract code
Census Tract 201, Autauga County, Alabama	01	001	020100
Census Tract 201, La Paz County, Arizona	04	012	020100

Source: U.S. Census Bureau.

[2] Divisions represent regional subdivisions such as "Middle Atlantic Division."

[3] U.S. Census Bureau, Geography Program, Cartographic Boundary File Summary Level Codes, <www.census.gov/programs-surveys/geography/technical-documentation/naming-convention/cartographic-boundary-file/carto-boundary-summary-level.html>.

[4] U.S. Census Bureau, Census Bureau Code Lists, American National Standards Institute (ANSI), <www.census.gov/library/reference/code-lists/ansi.html>.

[5] U.S. Census Bureau, Geography Program, *Understanding Geographic Identifiers (GEOIDs)*, <www.census.gov/programs-surveys/geography/guidance/geo-identifiers.html>.

Population Thresholds for Geographic Areas

Each year, the Census Bureau publishes ACS 1-year estimates for geographic areas with populations of 65,000 or more. The 65,000-population threshold ensures that 1-year data are available for all regions, divisions, states, the District of Columbia, Puerto Rico, congressional districts, Public Use Microdata Areas (PUMAs), many large counties and county equivalents, metropolitan and micropolitan statistical areas, cities, school districts, and American Indian areas.[6] The 1-year Supplemental Estimates—simplified versions of popular ACS tables—are also available for geographic areas with at least 20,000 people. These annual data provide policymakers, planners, business leaders, and others with a critical source of up-to-date information to plan for services such as transportation, medical care, housing, and schools.

For geographic areas with smaller populations, the ACS samples too few housing units to provide reliable single-year estimates. For these areas, several years of data are pooled together to create more precise multiyear estimates. Since 2010, the ACS has published 5-year data (beginning with 2005–2009 estimates) for geographic areas down to the census tract and block group levels.[7]

Table 1.2 shows the type and number of geographic areas included in the ACS 1-year and 5-year products for 2017. For example, in 2017, ACS 1-year data were available for 837 counties (26 percent of all counties), while the remaining 2,383 counties (74 percent of all counties) received 5-year estimates.

Data users interested in ACS estimates for areas with populations of 65,000 or more have a choice between the 1-year and 5-year data series. Which data should be used and why? The 1-year estimates for an area reflect the most current data but have larger margins of error (MOEs)—indicating less reliability or precision—than the 5-year estimates because they are based on a smaller sample. The 5-year estimates for an area have a larger sample and smaller MOEs than the 1-year estimates. However, they are less current because the larger samples include data that were collected in earlier years. The main advantage of using multiyear estimates is the increased statistical reliability for smaller geographic areas and small population groups.

In the end, what makes the most sense is a matter of judgment regarding the balance between the period covered by an estimate and its level of reliability or precision. The key is to strive to use only reliable estimates, where the period covered best suits the question at hand. For more information about ACS 1-year and 5-year estimates, see the section on "Understanding and Using ACS Single-Year and Multiyear Estimates" in the Census Bureau's handbook on *Understanding and Using American Community Survey Data: What All Data Users Need to Know.*[8]

[6] PUMAs are collections of counties—or census tracts within counties—with approximately 100,000 people each. PUMAs do not cross state lines. PUMAs were initially adopted by the ACS because they were the only wall-to-wall geographic entities below the state level that met the minimum population threshold of 65,000 required to disseminate ACS 1-year estimates.

[7] For several years, the Census Bureau produced both ACS 3-year estimates (for areas with populations of 20,000 or more) and ACS 5-year estimates (for all geographic areas). Starting with the 2014 data release, the 3-year products were discontinued, but 5-year estimates are still published each year.

[8] U.S. Census Bureau, *Understanding and Using American Community Survey Data: What All Data Users Need to Know*, <www.census.gov/programs-surveys/acs/guidance/handbooks/general.html>.

Table 1.2. **Selected Geographic Areas Published in the 2017 American Community Survey (ACS) 1-Year and 5-Year Estimates**

Geographic areas	Total number of areas	Areas receiving 1-year and 5-year estimates		Areas receiving only 5-year estimates[1]	
		Number	Percent	Number	Percent
United States	1	1	100.0	0	0.0
Region	4	4	100.0	0	0.0
Division	9	9	100.0	0	0.0
States, the District of Columbia, and Puerto Rico	52	52	100.0	0	0.0
County or equivalent[2]	3,220	837	26.0	2,383	74.0
County subdivision[3]	36,631	224	0.6	36,407	99.4
Subminor civil division (Puerto Rico only)	145	N	N	145	100.0
Census tract	74,001	N	N	74,001	100.0
Block group	220,333	N	N	220,333	100.0
Place (incorporated places and census designated places)	29,576	614	2.1	28,962	97.9
Consolidated city	8	N	N	8	100.0
Alaska Native Regional Corporation	12	3	25.0	9	75.0
American Indian Area/Alaska Native Area/Hawaiian Home Land	695	13	1.9	682	98.1
Specified American Indian area—tribal census tract	483	N	N	483	100.0
Specified American Indian area-tribal census tract-tribal block group	917	N	N	917	100.0
Metropolitan/micropolitan statistical area	945	518	54.8	427	45.2
Principal city of metropolitan or micropolitan statistical areas	1,265	399	31.5	866	68.5
Metropolitan division	31	31	100.0	0	0.0
Combined statistical area	174	171	98.3	3	1.7
Combined New England city and town area	7	7	100.0	0	0.0
New England city and town area	39	25	64.1	14	35.9
Principal cities of New England city and town areas	59	19	32.2	40	67.8
New England city and town area division	10	10	100.0	0	0.0
Urban area	3,592	435	12.1	3,157	87.9
Congressional districts, 114th Congress	435	435	100.0	0	0.0
Delegate district, 114th Congress (at large, District of Columbia)	1	1	100.0	0	0.0
Resident commissioner district, 114th Congress (at large, Puerto Rico)	1	1	100.0	0	0.0
State legislative district, upper chamber[4]	1,954	N	N	1,954	100.0
State legislative district, lower chamber[4]	4,825	N	N	4,825	100.0
Public Use Microdata Area	2,378	2,378	100.0	0	0.0
5-Digit ZIP Code Tabulation Area	33,120	N	N	33,120	100.0
Elementary school district	1,995	80	4.0	1,915	96.0
Secondary school district	509	90	17.7	419	82.3
Unified school district	10,902	872	8.0	10,030	92.0
TOTAL	428,517	7,159	1.7	421,358	98.3

N Not available.

[1] Geographic areas with populations of 20,000 or more also receive 1-year Supplemental Estimates, which are simplified versions of popular ACS tables. About three-fifths of counties receive 1-year Supplemental Estimates.

[2] County equivalents include Alaska boroughs, municipalities, city and boroughs, and census areas; Louisiana parishes; Puerto Rico municipios; and independent cities in Maryland, Missouri, Nevada, and Virginia.

[3] For 1-year estimates, qualifying minor civil divisions in 20 states only. For 5-year estimates, all county subdivisions.

[4] Legislative session year 2016.

Note: Figures based on geographic area boundaries as of January 1, 2016, new and dissolved incorporations as of January 1, 2017, and population estimates from the July 1, 2017, Census Bureau Population Estimates. The Census Bureau does not publish ACS data for individual blocks.

Key Geographic Areas in the ACS

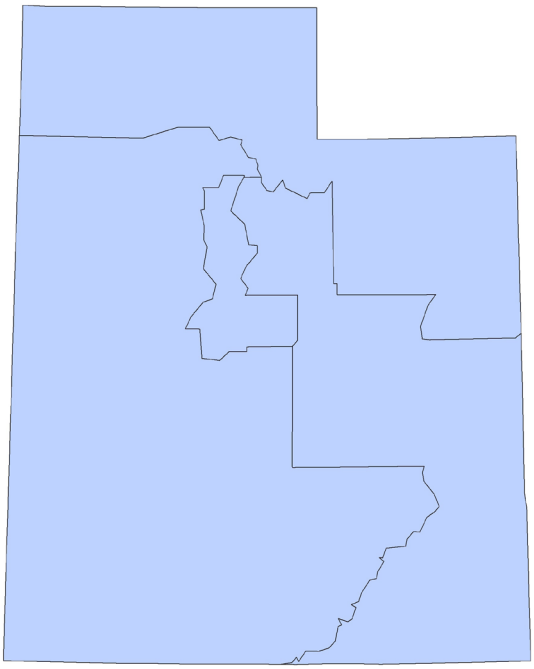
Figures 1.3 through 1.7 show data users some of the key geographic areas available through the ACS: congressional districts, counties, PUMAs, and census tracts.

Congressional districts are redrawn after each census for the purpose of electing the members of the U.S. House of Representatives.[9] Each of Utah's four congressional districts (shown in Figure 1.3) includes approximately 750,000 people. ACS data on congressional districts can be used to compare the characteristics of the home districts of the 435 House members and how they have changed over time.

Counties are also important because they are the primary legal subdivision within each state. ACS 1-year estimates are currently available for 10 of Iowa's 99 counties—those with populations of 65,000 or more in 2017 (see Figure 1.4). Iowa has 33 counties with populations of at least 20,000 people that receive 1-year

[9] Boundaries for congressional districts may change in between decennial censuses if a state initiative or court-ordered redistricting requires a change.

Figure 1.3. **Congressional Districts in Utah**



Source: U.S. Census Bureau, Congressional District Cartographic Boundary Shapefiles, <www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html>.

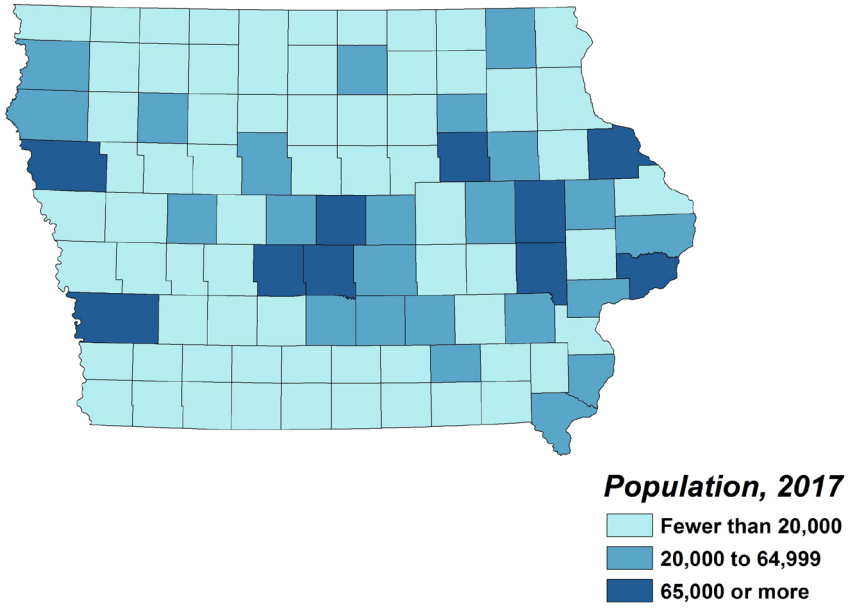
Supplemental Estimates.[10] The 66 counties in Iowa with fewer than 20,000 people only receive 5-year estimates.

The Census Bureau also divides each state into a series of PUMAs, each of which has a minimum population of 100,000. PUMAs are constructed based on county and census tract boundaries and do not cross state lines. PUMAs provide nationwide coverage for 1-year and 5-year data and can be aggregated to create custom geographic areas. PUMAs are updated after each decennial census.

[10] Geographic areas with 65,000 or more people receive both 1-year estimates and 1-year Supplemental Estimates.

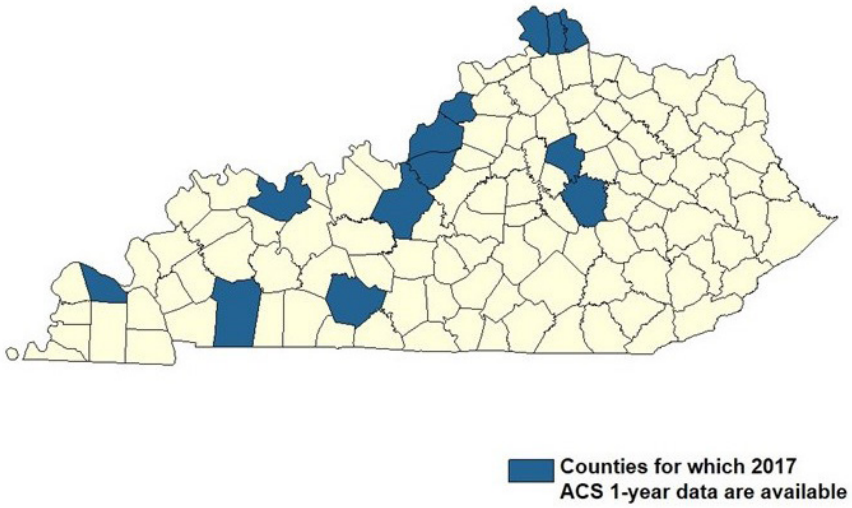
Typically, counties with large populations are subdivided into multiple PUMAs, while PUMAs in more rural areas are made up of groups of adjacent counties. PUMAs are especially useful for rural areas because, unlike counties, they meet the 65,000-population threshold required to provide ACS 1-year estimates. The value of using PUMA geography becomes apparent when looking at a state such as Kentucky (see Figures 1.5 and 1.6). The 2017 ACS 1-year estimates include data for only 13 of Kentucky's 120 counties, but they also include data for all 34 Kentucky PUMAs covering the entire state.

Figure 1.4. **Counties in Iowa by Population Size: 2017**



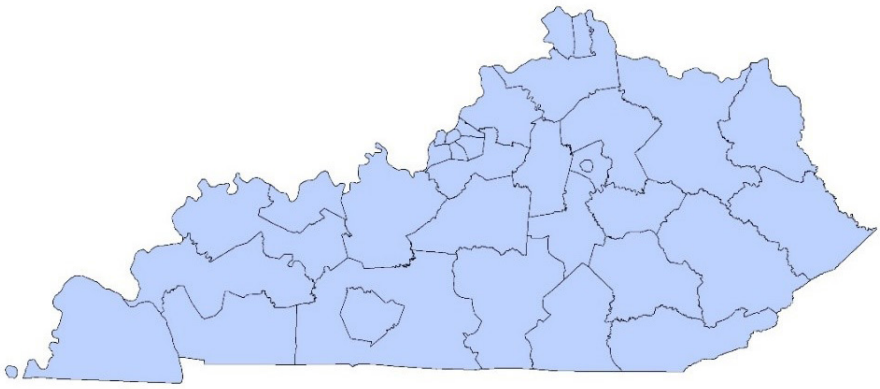
Source: U.S. Census Bureau, Congressional District Cartographic Boundary Shapefiles, <www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html>.

Figure 1.5. **Availability of ACS 1-Year Estimates for Kentucky: 2017**



Source: U.S. Census Bureau, 2017 American Community Survey, 1 Year Estimates, Population Reference Bureau analysis of data.

Figure 1.6. **Public Use Microdata Areas in Kentucky**



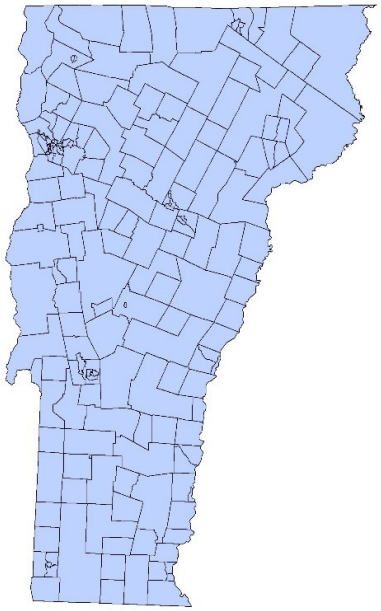
Source: U.S. Census Bureau, Congressional District Cartographic Boundary Shapefiles, <www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html>.

PUMAs are also useful for examining densely populated areas in depth. Data users who want to investigate single-year estimates for subregions within large urban areas can do so by using PUMA-level data to obtain detailed descriptions of the areas. For example, the ACS releases estimates for the city of Chicago (in Cook County, Illinois), but Chicago is also subdivided into 19 PUMAs, each with its own ACS 1-year estimates.

Census tracts—small subdivisions of counties that typically have between 1,200 and 8,000 residents—are commonly used to present information for small towns, rural areas, and neighborhoods. For example, in Vermont, there are currently 184 census tracts with data available through the ACS 5-year data products (see Figure 1.7).

There are also more than 300 ACS data tables available for block groups—subdivisions of census tracts—that include between 600 and 3,000 people each. In the ACS, block groups are the lowest (smallest) level of geography published. Block group data are only available in the ACS 5-year data products.

Figure 1.7. **Census Tracts in Vermont**



Source: U.S. Census Bureau, Census Tract Cartographic Boundary Shapefiles, <www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html>.

User-Defined Areas

Beyond the standard legal and statistical geographic entities created by the Census Bureau, there are instances where analysts might want to show data for a custom, user-defined geographic area. For example, many states have regional planning commissions designed to foster cooperation among contiguous counties with similar needs. Figure 1.8 illustrates the boundaries of the Eastern Upper Peninsula Regional Planning & Development Commission, one of 14 regional agencies in Michigan that serves the needs of the three easternmost counties of the state's Upper Peninsula (Luce, Chippewa, and Mackinac counties).

TIP: When aggregating ACS estimates across different geographic areas or population subgroups, data users should avoid combining ACS 1-year estimates with ACS 5-year estimates. That is, 1-year estimates should only be combined with other 1-year estimates, and 5-year estimates should only be combined with other 5-year estimates. When such derived estimates are generated, the user must also calculate the associated MOE.

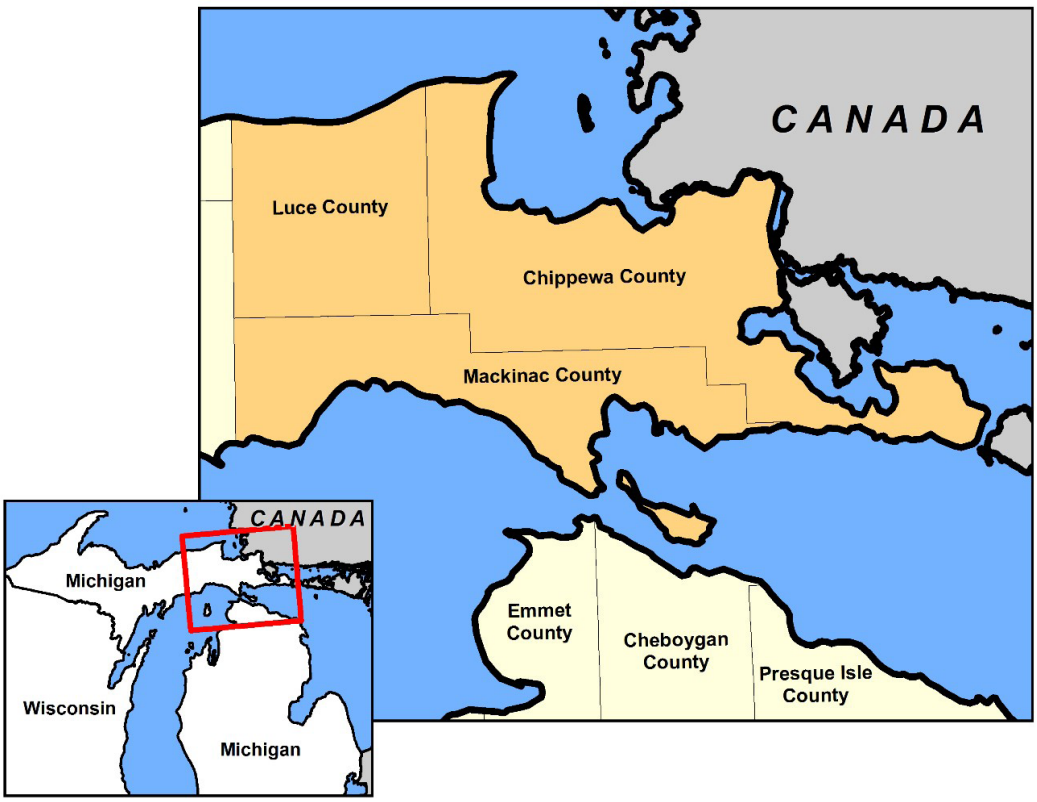
For more information about creating ACS estimates for custom geographic areas, see the section on "Calculating Measures of Error for Derived Estimates" in the Census Bureau's handbook on Understanding and *Using American Community Survey Data: What All Data Users Need to Know*.[11]

Advanced users who are aggregating ACS estimates can use the Census Bureau's Variance Replicate Tables to produce MOEs for selected ACS 5-year Detailed Tables.[12] Users can calculate MOEs for aggregated data by using the variance replicates. Unlike available approximation formulas, this method exactly matches MOEs published on data.census.gov by including a covariance term.

[11] U.S. Census Bureau, *Understanding and Using American Community Survey Data: What All Data Users Need to Know*, <www.census.gov/programs-surveys/acs/guidance/handbooks/general.html>.

[12] U.S. Census Bureau, American Community Survey (ACS), Variance Replicate Tables, <www.census.gov/programs-surveys/acs/data/variance-tables.html>.

Figure 1.8. **Eastern Upper Peninsula Regional Planning and Development Commission: Michigan**



Source: Eastern Upper Peninsula Regional Planning & Development Commission.

2. GEOGRAPHIC BOUNDARIES, VINTAGES, AND FREQUENCY OF UPDATES

The American Community Survey (ACS) publishes estimates using vintages (the latest available geographic boundaries). For the ACS 5-year estimates, the vintage is the last year of the multiyear period. For example, the 2017 ACS 1-year estimates and 2013–2017 ACS 5-year estimates use the same vintage (2017) of geographic boundaries.

More specifically, ACS data generally reflect the geographic boundaries of legal areas as of January 1 of the estimate year. For example, the 2017 ACS 1-year estimates use the geographic area boundaries in effect as of January 1, 2017, and the 2013–2017 ACS 5-year estimates (covering January 1, 2013, to December 31, 2017) also use the geographic area boundaries effective as of January 1, 2017.

While geographic boundary changes are not common, they do occur, and those changes can affect a data user's ability to make comparisons over time. For example, the city of Jurupa Valley, California, incorporated in July 2011. The U.S. Census Bureau published the first set of data for this city in 2012, and has produced updated data each subsequent year, but ACS data are not available for Jurupa Valley for 2011 and earlier years. The Census Bureau does not revise ACS data for previous years to reflect changes in geographic boundaries.

Congressional districts, which are redrawn every 10 years immediately following the decennial census, provide another example. Congressional district data from the 2012 ACS and later years reflect the new boundaries drawn after the 2010 Census, while ACS data for earlier years reflect the 2000 Census-based boundaries. Given the major changes to district boundaries after each census, a comparison of congressional district data between 2011 and 2012 is not feasible.

Many statistical areas (like census tracts and block groups) are updated once per decade to reflect the most recent decennial census. Beginning with the 2010 ACS data products, most statistical areas reflect 2010 Census geographic definitions and boundaries. The 2009 and earlier ACS data products use mostly 2000 Census statistical definitions. Most legal areas (like counties, places, and school districts) are updated every year or every other year. Boundary changes for selected legal areas are reported to the Census Bureau through the annual Boundary and Annexation Survey.[13]

TIP: In some cases, a geographic boundary may change, but the GEOID may remain the same, so data users need to pay attention to year-to-year changes to make sure the data are comparable over time. For example, the boundary of Bedford County, Virginia, was modified to add the former independent city of Bedford (effective July 1, 2013).

For a complete schedule of legal and statistical area updates, see the Census Bureau's Web page on Geography Boundaries by Year.[14] Geographic changes for each ACS data release are recorded on the Census Bureau's Table & Geography Changes Web page.[15]

[13] U.S. Census Bureau, Boundary and Annexation Survey (BAS), <www.census.gov/programs-surveys/bas.html>.

[14] U.S. Census Bureau, American Community Survey (ACS), Geography Boundaries by Year, <www.census.gov/programs-surveys /acs/geography-acs/geography-boundaries-by-year.html>.

[15] U.S. Census Bureau, American Community Survey (ACS), Table & Geography Changes, <www.census.gov/programs-surveys/acs /technical-documentation/table-and-geography-changes.html>.

3. ACCESSING AND MAPPING ACS DATA

Data.census.gov is the Census Bureau's primary tool for accessing population, housing, and economic data from the American Community Survey (ACS), the Puerto Rico Community Survey, the decennial census, and many other Census Bureau data sets.

Data.census.gov provides access to ACS data for a wide range of geographic areas, including states, cities, counties, census tracts, and block groups. For more information about data.census.gov, view the Census Bureau's release notes and answers to frequently asked questions about the site.[16]

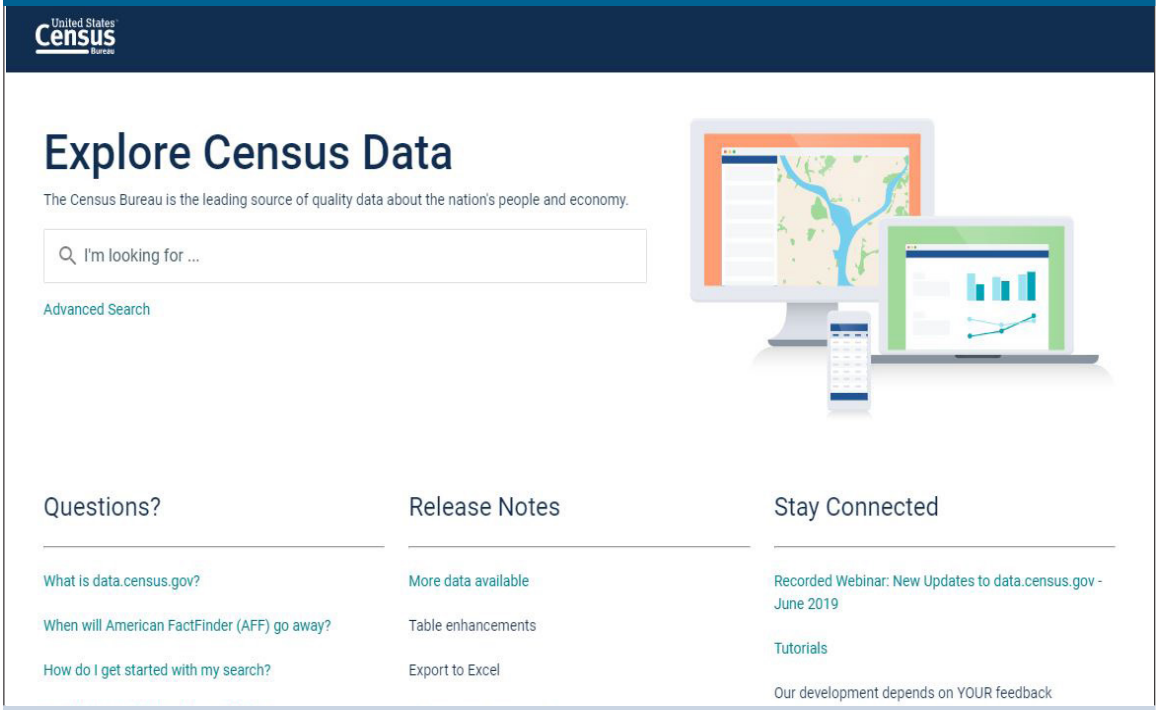
Other specialized tools, such as My Congressional District and Census Business Builder, provide users with quick and easy access to statistics for particular geographic areas and topics.[17] More advanced users also have several options to access more detailed ACS data through the downloadable Summary File, the Public Use Microdata Sample (PUMS) files, or the Census Bureau's Application Programming Interface (API).[18]

[16] U.S. Census Bureau, Data.census.gov: Census Bureau's New Data Dissemination Platform Frequently Asked Questions and Release Notes, <https://data.census.gov/assets/releasenotes/faqs-release-notes.pdf>.

[17] U.S. Census Bureau, My Congressional District, <www.census.gov/mycd/>; Census Business Builder (CBB), <www.census.gov/data/data-tools/cbb.html>.

[18] U.S. Census Bureau, American Community Survey (ACS), Summary File Data, <www.census.gov/programs-surveys/acs/data/summary-file.html>; American Community Survey (ACS), PUMS Data, <www.census.gov/programs-surveys/acs/data/pums.html>; Developers, <www.census.gov/developers/>.

Figure 3.1. **Data.census.gov Web Site**



Source: U.S. Census Bureau, data.census.gov, <https://data.census.gov>.

Topologically Integrated Geographic Encoding and Referencing (TIGER) Data and Products

If you need to combine ACS estimates with spatial data, the TIGER products are a good place to start. TIGER products are spatial extracts from the Census Bureau's Master Address File (MAF)/TIGER database (MTDB), designed for use with GIS (geographic information science/system) software. The data contain features, such as roads, railroads, and rivers, as well as legal and statistical geographic areas.[19]

TIGER products include the following:

- TIGERweb is a Web-based system that allows users to visualize TIGER data in several ways such as viewing spatial data online or streaming to mapping applications.
- TIGER/Line with Selected Demographic and Economic Data are geodatabases (or shapefiles, for some 2010 Census data) joined with selected attributes (including population and housing unit counts, demographic characteristics, such as sex by age, and socio-economic characteristics such as poverty) from the 2010 Census, 2006–2010 through current ACS 5-year estimates, and County Business Patterns for selected geographic areas.
- TIGER/Line Shapefiles provide legal boundaries, roads, address ranges, water features, and more.[20] These files do not include demographic information but can be linked to data from demographic tables using the GEOID.
- TIGER/Line Geodatabases are spatial extracts from the Census Bureau's MTDB. The geodatabases contain national coverage (for geographic boundaries or features) or state coverage (boundaries within state). These files do not include demographic data, but they contain GEOIDs that can be linked to the Census Bureau's demographic data.
- Cartographic Boundary Shapefiles are small scale (limited detail) mapping projects clipped to shoreline. These files are designed for thematic mapping using GIS and are available for a limited set of geographic types.
- Keyhole Markup Language—Cartographic Boundary Files are simplified representations of selected geographic areas from the Census Bureau's MAF/TIGER system. These boundary files are specifically designed for small-scale thematic mapping using an online tool such as Google Earth or Google Maps.

The Census Bureau produced a brochure that describes several of these products in more detail.[21]

[19] U.S. Census Bureau, Geography Program, TIGER Data Products Guide, <www.census.gov/programs-surveys/geography/guidance/tiger-data-products-guide.html>.

[20] U.S. Census Bureau, Census Blogs, *Understanding Census Bureau Address Ranges*, <www.census.gov/newsroom/blogs/research-matters/2016/04/understanding-census-bureau-address-ranges.html>.

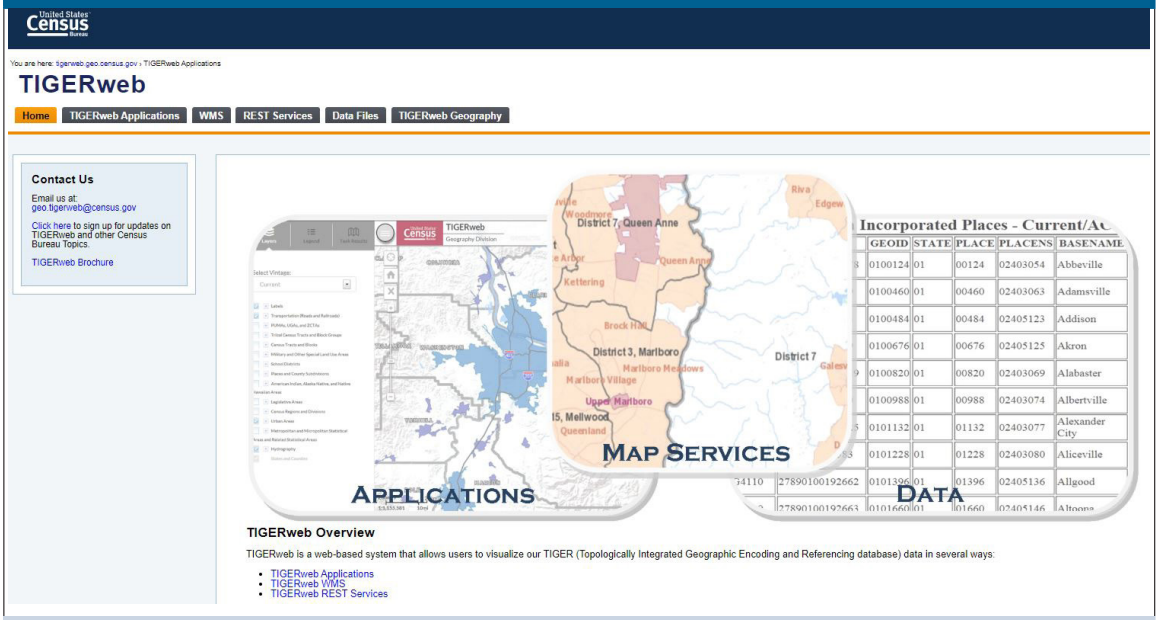
[21] U.S. Census Bureau, Geography Program, TIGER Products Brochure, <www.census.gov/programs-surveys/geography/about/training/brochures.html>.

Working With TIGERweb

TIGERweb applications allow users to select features and view their attributes, search for features by name or GEOID, and identify features by selecting them from a map (see Figure 3.2).[22] The TIGERweb and TIGERweb Decennial applications provide a simple way to view TIGER data without GIS software and without downloading data.

[22] U.S. Census Bureau, TIGERweb, <https://tigerweb.geo.census.gov/tigerwebmain/TIGERweb_main.html>.

Figure 3.2. **TIGERweb**



Source: U.S. Census Bureau, TIGERweb, <https://tigerweb.geo.census.gov/tigerwebmain/TIGERweb_main.html>.

Data users can visualize geographic boundaries, such as PUMAs, using the TIGERweb online application.[23]

- Go to the TIGERweb Web site at <https://tigerweb.geo.census.gov/tigerweb/>.
- Use the Zoom In feature on the map—by clicking on the individual plus sign or using the slide bar—to display a geographic area of interest.
- Then use the "Layers" menu to select "2010 Census Public Use Microdata Areas." Figure 3.3 shows a TIGERweb map of PUMA boundaries in portions of Utah and other states in the Mountain West.

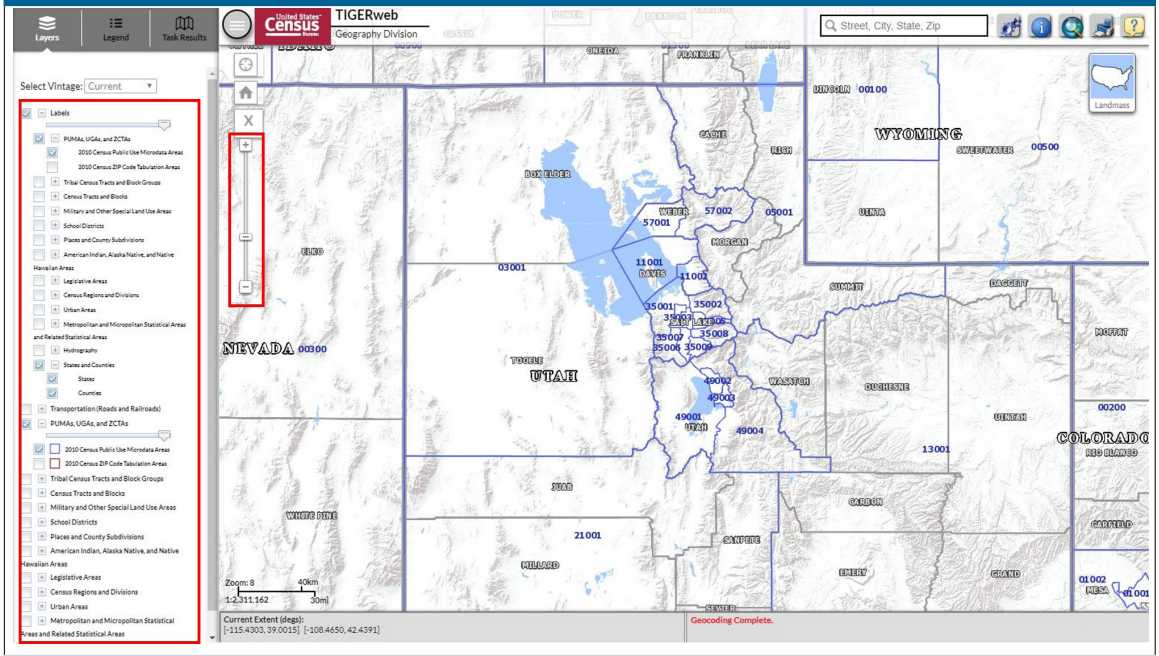
The TIGERweb WMS and TIGERweb REST Services allow users to integrate Census Bureau data into their own GIS or custom Web-based applications.

For more information about using TIGERweb, see the TIGERweb User Guide.[24]

[23] Ibid.

[24] U.S. Census Bureau, TIGERweb User Guide, <https://tigerweb.geo.census.gov/tigerwebmain/TIGERweb_apps.html>.

Figure 3.3. **Map of Public Use Microdata Areas in Portions of Idaho, Nevada, Utah, and Wyoming**



Source: U.S. Census Bureau, TIGERweb, <https://tigerweb.geo.census.gov/tigerweb/>.

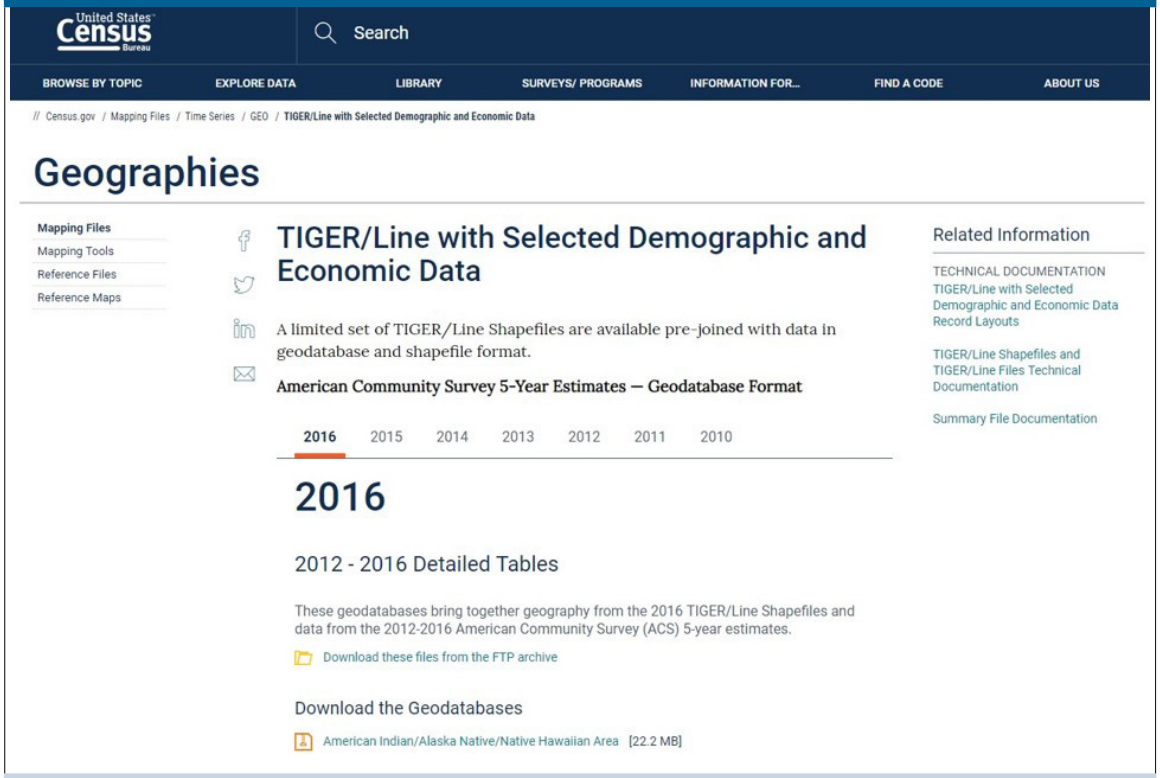
Working With TIGER/Line Geodatabases

The Census Bureau's TIGER/Line Geodatabase files provide access to ACS 5-year estimates that have been joined with frequently used geographic areas ranging from block groups to states. These prejoined geodatabases include thousands of variables such as age, ancestry, citizenship, disability, educational attainment, family structure, geographic mobility, household structure, housing (counts and characteristics), income, journey to work, language, marital status, nativity, occupation, poverty, race/ethnicity, school enrollment, and variables for a number of additional topics. Many of these variables are provided with cross tabulations by age, sex, or race/ethnicity.

Here are the steps to download TIGER/Line Geodatabases:

- Begin at the "TIGER/Line with Selected Demographic and Economic Data," page: <www.census.gov/geographies/mapping-files/time-series/geo/tiger-data.html>.
- Click on the tab corresponding to your data year of interest to view the list of available downloads (see Figure 3.4).
- From that list, select a geographic area of interest and download the file to your workspace.
- Open ArcMap (or other geospatial software) and select the "Add Data" option. Navigate to the geodatabase you downloaded. This will open a list of data items available to add to map. (You can use CTRL + Select to add more than one data item from the geodatabase.)
- Once you have added the data, you can join data to polygons using the GEOID field.

Figure 3.4. **TIGER/Line With Selected Demographic and Economic Data**



Source: U.S. Census Bureau, Geographies, TIGER/Line with Selected Demographic and Economic Data, <www.census.gov/geographies/mapping-files/time-series/geo/tiger-data.html>.

In each geodatabase is a metadata table with a short name and a full description of each data element (see Figure 3.5). Metadata for each geodatabase are published in text online, or you can open your GIS software tool (for example, ArcCatalog) and review metadata there.[25] In geodatabases, as with many other downloadable ACS data products, joined variables from data tables are short names beginning with a letter. The short names in the metadata file correspond to the data element field headings in the detailed tables of each geodatabase.

[25] U.S. Census Bureau, Geography Program, TIGER/Line with Selected Demographic and Economic Data Record Layouts, <www.census.gov/programs-surveys/geography/technical-documentation/records-layout/tiger-line-demo-record-layouts.html>.

Figure 3.5. **Metadata Example for County Geodatabase**

Short_Name	Full_Name
B00001e1	UNWEIGHTED SAMPLE COUNT OF THE POPULATION: Total: Total population -- (Estimate)
B00001m1	UNWEIGHTED SAMPLE COUNT OF THE POPULATION: Total: Total population -- (Margin of Error)
B00002e1	UNWEIGHTED SAMPLE HOUSING UNITS: Total: Housing units -- (Estimate)
B00002m1	UNWEIGHTED SAMPLE HOUSING UNITS: Total: Housing units -- (Margin of Error)
B01001e1	SEX BY AGE: Total: Total population -- (Estimate)
B01001m1	SEX BY AGE: Total: Total population -- (Margin of Error)
B01001e2	SEX BY AGE: Male: Total population -- (Estimate)
B01001m2	SEX BY AGE: Male: Total population -- (Margin of Error)
B01001e3	SEX BY AGE: Male: Under 5 years: Total population -- (Estimate)
B01001m3	SEX BY AGE: Male: Under 5 years: Total population -- (Margin of Error)
B01001e4	SEX BY AGE: Male: 5 to 9 years: Total population -- (Estimate)
B01001m4	SEX BY AGE: Male: 5 to 9 years: Total population -- (Margin of Error)
B01001e5	SEX BY AGE: Male: 10 to 14 years: Total population -- (Estimate)
B01001m5	SEX BY AGE: Male: 10 to 14 years: Total population -- (Margin of Error)
B01001e6	SEX BY AGE: Male: 15 to 17 years: Total population -- (Estimate)
B01001m6	SEX BY AGE: Male: 15 to 17 years: Total population -- (Margin of Error)
B01001e7	SEX BY AGE: Male: 18 and 19 years: Total population -- (Estimate)
B01001m7	SEX BY AGE: Male: 18 and 19 years: Total population -- (Margin of Error)
B01001e8	SEX BY AGE: Male: 20 years: Total population -- (Estimate)
B01001m8	SEX BY AGE: Male: 20 years: Total population -- (Margin of Error)
B01001e9	SEX BY AGE: Male: 21 years: Total population -- (Estimate)
B01001m9	SEX BY AGE: Male: 21 years: Total population -- (Margin of Error)
B01001e10	SEX BY AGE: Male: 22 to 24 years: Total population -- (Estimate)
B01001m10	SEX BY AGE: Male: 22 to 24 years: Total population -- (Margin of Error)
B01001e11	SEX BY AGE: Male: 25 to 29 years: Total population -- (Estimate)
B01001m11	SEX BY AGE: Male: 25 to 29 years: Total population -- (Margin of Error)
B01001e12	SEX BY AGE: Male: 30 to 34 years: Total population -- (Estimate)

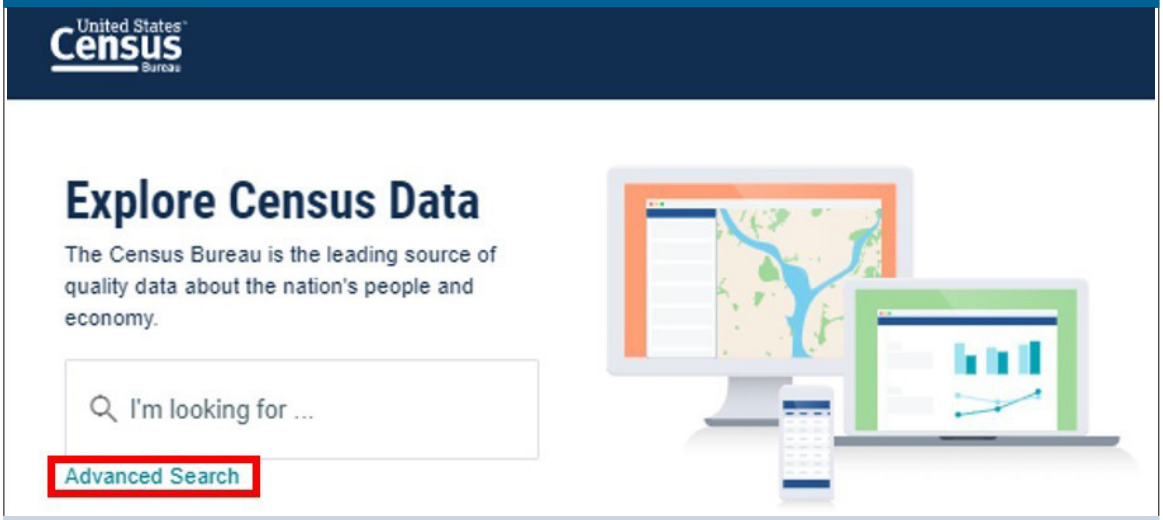
Source: U.S. Census Bureau, TIGER/Line with Selected Demographic and Economic Data Record Layouts, County Metadata, <www.census.gov/programs-surveys/geography/technical-documentation/records-layout/tiger-line-demo-record-layouts.html>.

Linking Other ACS Data to TIGER/Line Shapefiles

In some cases, users may not be able to find the ACS data they need in the Selected Demographic and Economic Data geodatabases (for example, users working with ACS 1-year data). A more comprehensive set of ACS data tables is available through data.census.gov and the ACS Summary File.

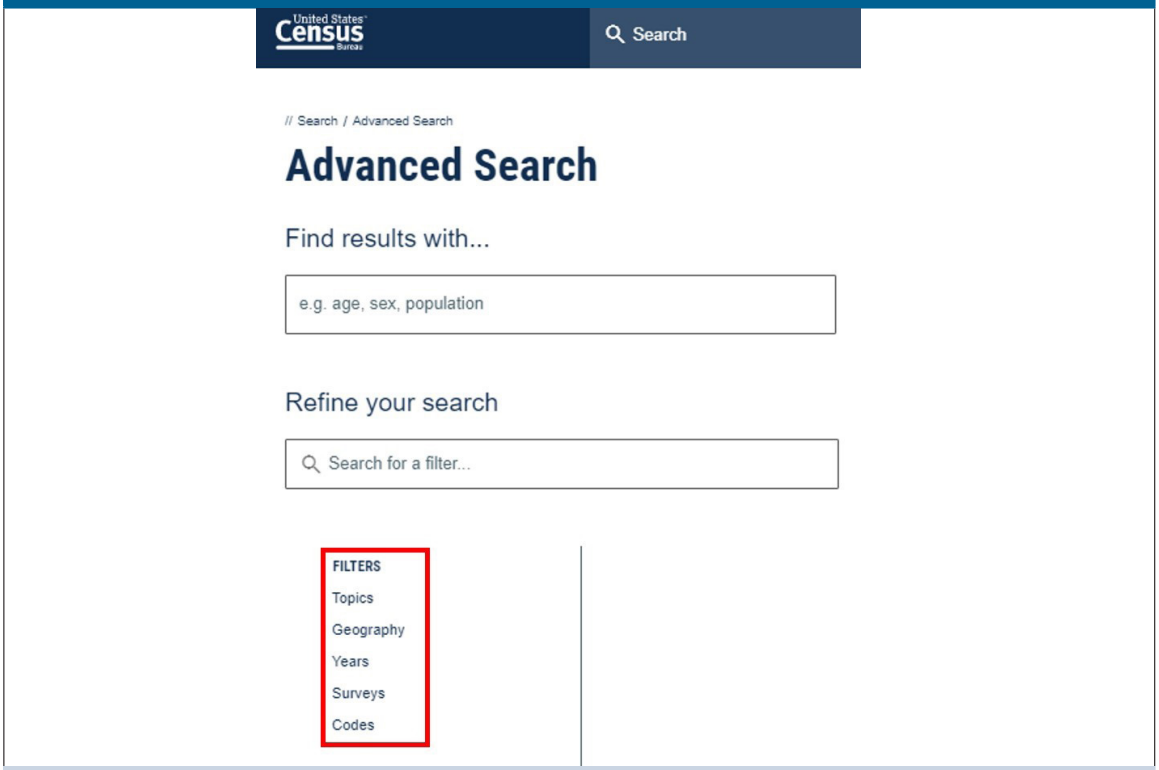
Experienced users can access aggregate ACS data by using the "Advanced Search" feature in data.census.gov, which allows users to conduct keyword searches or search by predefined topics, geographies, years, surveys, or codes (see Figures 3.6 and 3.7).

Figure 3.6. **Advanced Search in Data.census.gov**



Source: U.S. Census Bureau, <https://data.census.gov>.

Figure 3.7. **Advanced Search Filters in Data.census.gov**



Source: U.S. Census Bureau, <https://data.census.gov>.

Data users looking for a particular table can also use the search bar on the data.census.gov home page to search by Table ID. For example, typing "B01001" into the search bar generates a list of relevant Sex by Age tables (see Figure 3.8).

After the required ACS estimates from data.census.gov have been downloaded, they can be linked to TIGER shapefiles using the GEOID.

Data users with programming skills and access to statistical software can use the ACS Summary File to download and analyze ACS data from the same set of Detailed Tables that are available in data.census.gov. The Summary File provides access to aggregate ACS data and includes information for geographic areas down to the block group. It is useful for skilled programmers who want to access multiple ACS tables for large numbers of geographic areas.

TIP: The ACS Summary File is geared toward more advanced data users, so the Census Bureau recommends that users check to see if their tables of interest are easily available for download through data.census.gov before using this data product.

The Summary File documentation provides users with all the information they need to access and process these data, including survey methods and links to sample SAS (statistical software) programs for processing the data files.[26] The ACS Summary File can be downloaded as zipped files from the Census Bureau's FTP site.[27] Developers can also access Summary File data through the Census Bureau's APIs.[28]

After the required ACS Summary File data have been downloaded, they can be linked to TIGER shapefiles using the GEOID. For instructions, see the Census Bureau's: Instructions on Joining the ACS Summary File to the TIGER/Line Shapefiles.[29]

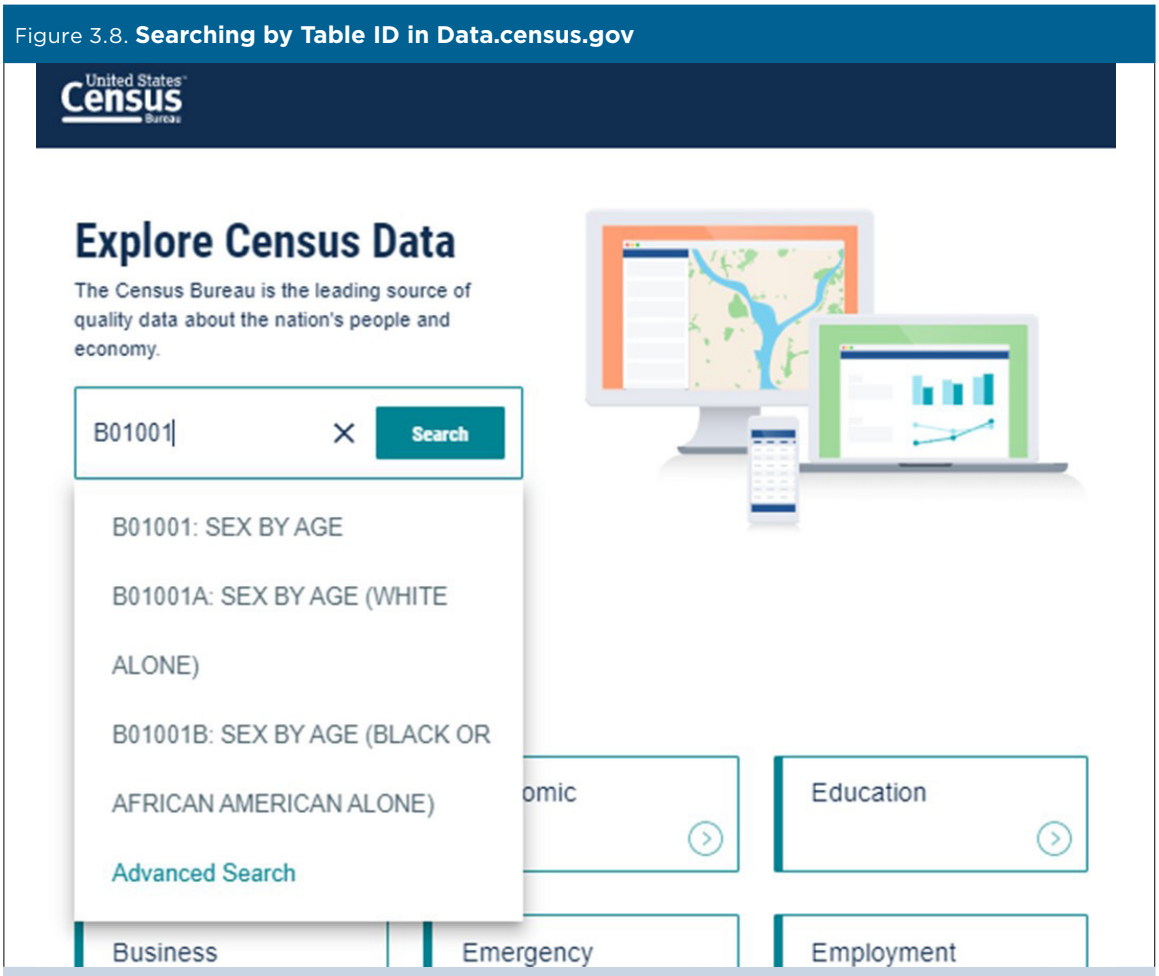
[26] U.S. Census Bureau, American Community Survey (ACS), Summary File Documentation, <www.census.gov/programs-surveys/acs/technical-documentation/summary-file-documentation.html>.

[27] U.S. Census Bureau, American Community Survey (ACS), Data via FTP, <www.census.gov/programs-surveys/acs/data/data-via-ftp.html>.

[28] U.S. Census Bureau, Developers, Available APIs, <www.census.gov/data/developers/data-sets.html>.

[29] U.S. Census Bureau., Instructions on Joining the ACS Summary File to the TIGER/Line Shapefiles, <https://www2.census.gov/programs-surveys/acs/summary_file/2014/documentation/tech_docs/ACS_SF_TIGERLine_Shapefiles.pdf>.

Figure 3.8. **Searching by Table ID in Data.census.gov**



Source: U.S. Census Bureau, <https://data.census.gov>.

4. ADDITIONAL RESOURCES

Understanding and Using American Community Survey Data: What All Data Users Need to Know
<www.census.gov/programs-surveys/acs/guidance/handbooks/general.html>

This handbook provides an overview of the America Community Survey (ACS) to help data users understand the basics of the survey, how the data can be used, how to judge the accuracy of ACS estimates, and how to access ACS data.

Geography and ACS
<www.census.gov/programs-surveys/acs/geography-acs.html>

This Web page includes information about changes in geographic boundaries in the ACS, key concepts and definitions, and reference materials.

Gazetteer Files
<www.census.gov/geographies/reference-files/time-series/geo/gazetteer-files.html>

The U.S. Gazetteer Files provide a listing of all geographic areas for selected geographic area types. The files include geographic identifier codes, names, area measurements, and representative latitude and longitude coordinates.

Hierarchy Diagrams
<www.census.gov/programs-surveys/geography/guidance/hierarchy.html>

The hierarchy of census geographic entities displays the relationships between legal, administrative, and statistical boundaries maintained by the U.S. Census Bureau.

Census Geocoder
<https://geocoding.geo.census.gov/>

The Census Geocoder is an address look-up tool that converts an address to an approximate coordinate (latitude/longitude) and returns information about the address range that includes the address and the census geography the address is within.

Census Data API User Guide
<www.census.gov/data/developers/guidance/api-user-guide.html>

The purpose of this user guide is to instruct developers and researchers on how to use the Census Data Application Programming Interface to request data from Census Bureau data sets.

How to Use ACS Geodatabase Files and ArcMap
<www.census.gov/programs-surveys/acs/guidance/training-presentations/acs-geodatabase.html>

This Webinar covers background information about the ACS, as well as how to join ACS data with a layer of geography by downloading a geodatabase file, opening the file in ArcMap, and joining the ACS data table to a feature class.

U.S. Census Bureau, data.census.gov: Census Bureau's New Data Dissemination Platform Frequently Asked Questions and Release Notes
<https://data.census.gov/assets/releasenotes/faqs-release-notes.pdf>

Data.census.gov is the main platform to access data and digital content from the Census Bureau, created based on overwhelming feedback to streamline the way you get data.

Related Sites
<www.census.gov/programs-surveys/geography/about/related-sites.html>

Many outside groups, such as other federal agencies and academic institutions, have mapped census data and can provide additional tools to data users. The Census Bureau compiled a list of sites that either map Census Bureau data or help you map census data.