# Citations

COOKE DEMOGRAPHICS LLC. Population Projections 2022 – 2047. October 2022. Prepared by Cubit Planning, Inc.

United States Census Bureau. Annual Estimates of the Resident Population: April 1, 2020 to July 1, 2021. U.S. Census Bureau, Population Division. Web. May 2022. <https://www.census.gov/>

# Notes

GEO\_CODE

99 United States

State FIPS See details here: [USDA List of State FIPS](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/?cid=nrcs143_013696)

County FIPS See details here: [USDA List of County FIPS](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs143_013697)

\*Not included: Kalawao County, HI; Puerto Rico and other U.S. territories.

SEX

1. Male
2. Female

AGE

0 Under 5 years

5 5 to 9 years

10 10 to 14 years

15 15 to 19 years

20 20 to 24 years

25 25 to 29 years

30 30 to 34 years

35 35 to 39 years

40 40 to 44 years

45 45 to 49 years

50 50 to 54 years

55 55 to 59 years

60 60 and 64 years

65 65 to 69 years

70 70 to 74 years

75 75 to 79 years

80 80 to 84 years

85 85 years and over

# County Age-Sex Population Projection Methodology

**The Cohort Component Population Projection Model**

These population projections were made using a cohort-component model (a cohort is a group of people who were born in the same period, e.g., 1960-1964). Cohort-component models use assumptions about the components of population change - fertility, migration, and mortality - to “age” the current population into the future in five-year increments. These projections were made using the Hamilton Perry (HP) variation of the cohort-component model. The HP model relies on fewer assumptions and less data (Smith et al. 2006). They can be as accurate as standard cohort component projections when they are adjusted – or “raked” - to match projections for more significant regions (Wilson 2016).

**Implementation of the HP Model for US County Age-Sex Projections**

The goal is to produce a set of consistent projections for each US county, which reflect regional and national trends in mortality, fertility, and migration. These HP projections are based on US Census county age-sex population estimates for 2010-2020.

First, HP projections were made for each of the US Bureau of Economic Analysis Regions (BEAs). BEAs cover the entire US and identify regions with urban cores (high population densities) surrounded by suburban counties and rural counties. Next, the BEA projections were adjusted (or “raked”) so that the sum of projections is equal to each of 3 United Nations (UN) age-sex projections for the US:

1. Median Probabilistic Variant
2. Median Fertility Variant
3. Low Fertility Variant

The first two variants are “business as usual” models. The 3rd model assumes a decline in fertility, consistent with the long-term decline in US fertility rates.

The next step is to identify outlier CCRs. For example, Trousdale County, TN grew from 7,870 to 11,445 throughout the 2010s. But a significant portion of this population increase was due to the one-time opening of a prison in 2016 with approximately 2,500 young adult male inmates. The raw CCRs for young adult men are consequently very large, incorrectly forecasting that Trousdale will have continued rapid in-migration of young adult men rather than just a one-time increase. The systemic resolution to this - and a limited number of similar situations - is to identify extreme CCRs using Tukey’s rule (Montgomery 2013) and replace them with imputed CCRs using winsorizing (Cox 2013) and multiple imputations (Royston 2004).

The final step is calculating HP county age-sex populations from 2022 to 2047. This projection is then raked to each of the three previously estimated BEA projections. These three estimates are averaged to create the final county age-sex projections from 2022 to 2047. Averaging across slightly different projections significantly increases projection accuracy.

**2020 Population**

The population estimate is normally based on the decennial census; however, the 2020 Census could not be used for this estimate due to variables impacted by the new disclosure avoidance system, and delays due to COVID-19. Due to this, the Population Estimates Program developed a process for integrating three data sources to produce a Blended Base.

* 2020 Census PL 94-171 Redistricting File
* 2020 Demographic Analysis (DA) Estimates
* Vintage 2020 Postcensal Population Estimates

References

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Royston, P. (2004) Multiple imputations of missing values. *Stata Journal,* 4**,** 227-241.

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