

# Modernizing the Population Estimates Base: What We've Learned from Three Years of Updates

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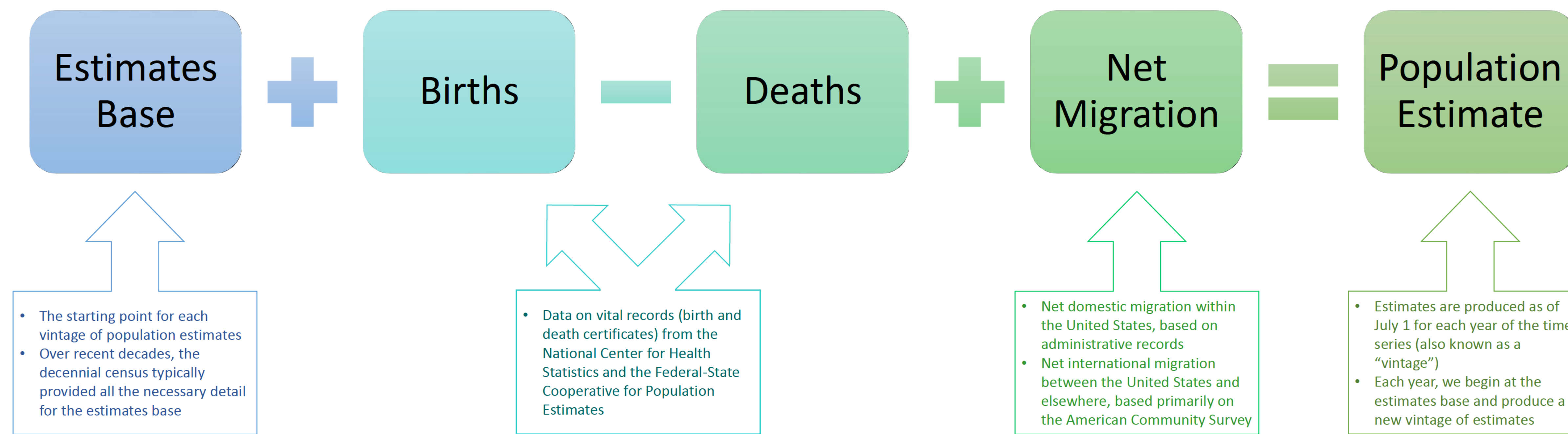
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## WHO WE ARE

The Population Estimates Program (PEP) produces the official population estimates of population and housing units for the U.S. Census Bureau between decennial censuses. These estimates serve a wide array of purposes, including being used:

- To support planning and the distribution of trillions of dollars in federal funding at the national, state, and local levels.
- As controls for major surveys like the American Community Survey, Current Population Survey, and many others.
- As denominators for keys statistical rates and indicators (e.g., fertility rates, crime rates, growth rates, economic indicators, etc.).
- For research across academia and the public and private sectors.

## THE COHORT-COMPONENT METHOD FOR THE NATION, STATES, AND COUNTIES



## UPDATING THE BASE

Instead of relying strictly on the results of the latest decennial census, the "blended base" approach integrates April 1, 2020 data from three separate sources:

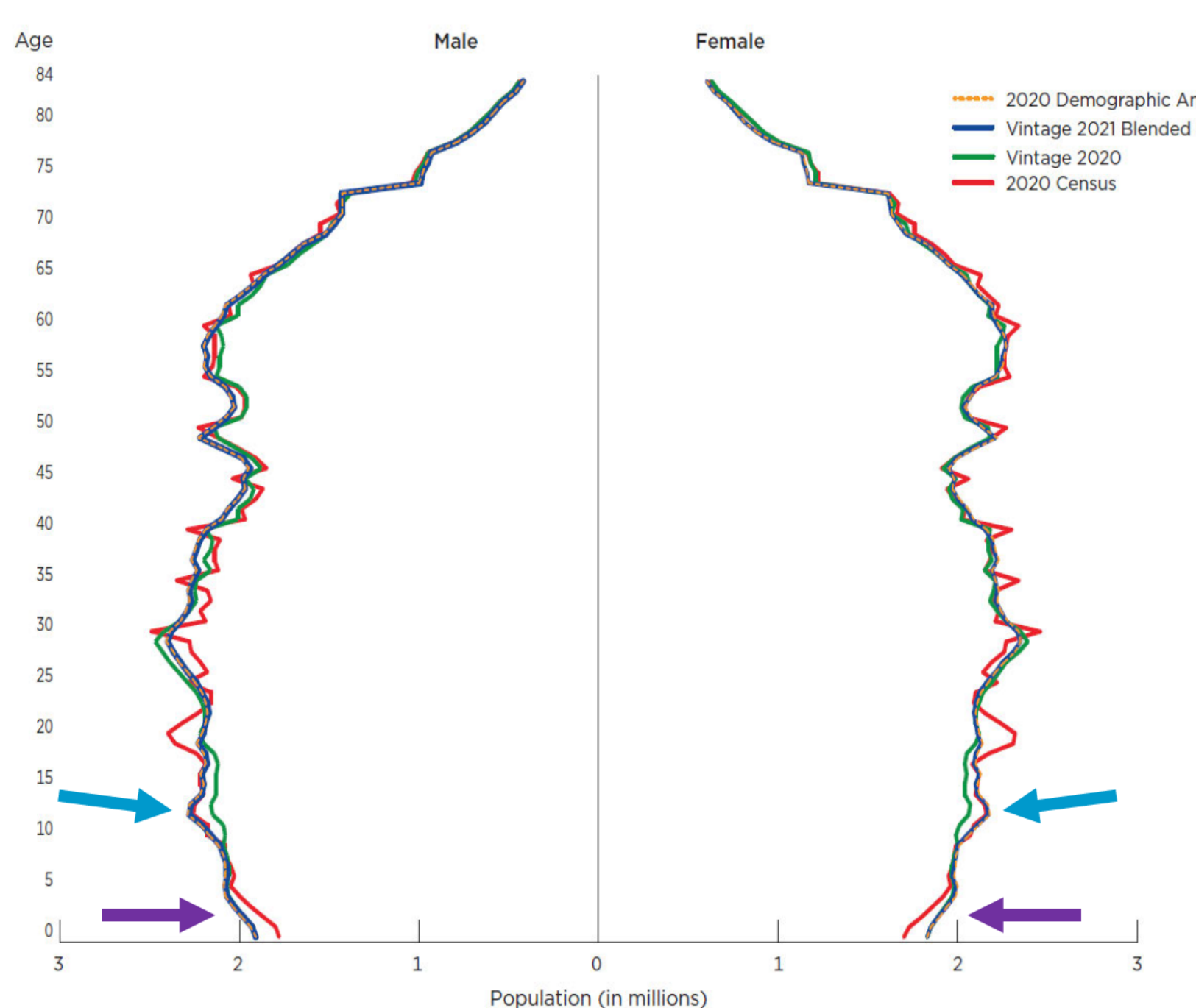
- Vintage 2020 population estimates
- 2020 Demographic Analysis estimates
- 2020 Census

This change was first implemented for the Vintage 2021 estimates series when the 2020 Census detail we needed to serve as the estimates base was not available in time to produce estimates for counties and higher levels of geography. This delay was the result of the notable and unexpected circumstances which impacted 2020 Census operations, including the COVID-19 pandemic, in conjunction with changes attributable to the modernized disclosure avoidance framework.

## IMPACT ON VINTAGE 2021

- Introducing additional data sources into the estimates base:
- Resulted in a smoother age/sex distribution than the **2020 Census counts**.
  - Had a mitigating effect on the persistent undercount of young children in the census, particularly **0 to 4-year-olds (undercounted in the 2020 Census)** and **10 to 14-year-olds (undercounted in the 2010 Census and aged forward in the estimates methodology)** – see arrows below!

Vintage 2021 Blended Base, Base Inputs, and 2020 Census Data by Sex for Ages 0-84: April 1, 2020



Note: These 2020 Census data by age and sex represent a special tabulation of the 2020 Census with confidentiality protections applied using the 2020 Census Disclosure Avoidance System. Source: U.S. Census Bureau, 2020 Decennial Census; 2020 Demographic Analysis; Vintage 2020 and 2021 Population Estimates.

## BASE POPULATION UPDATES BY VINTAGE AND DATA SOURCE: 2020 TO 2023

| Vintage | Geographic Updates  | CQR | PCGQR | Most Recent Census (Nation, States, and Counties) |            |     |     |      |                 | 2020 Demographic Analysis (National) |            |     |     |      |                 | Vintage 2020 (Nation, States, and Counties) |            |     |     |      |                 |
|---------|---------------------|-----|-------|---|------------|-----|-----|------|-----------------|--------------------------------------|------------|-----|-----|------|-----------------|---|------------|-----|-----|------|-----------------|
|         |                     |     |       | Pop. by Universe (HH/GQ)                          | Total Pop. | Age | Sex | Race | Hispanic Origin | Pop. by Universe (HH/GQ)             | Total Pop. | Age | Sex | Race | Hispanic Origin | Pop. by Universe (HH/GQ)                    | Total Pop. | Age | Sex | Race | Hispanic Origin |
| 2020    | X                   | X   |       | X   | X          | X   | X   | X    |                 |                                      |            |     |     |      |                 |   |            |     |     |      |                 |
| 2021    | Subcounty & HU only |     |       |   | X          |     |     |      |                 |                                      | 0-85+      | X   |     |      | X               | X   | X          | X   | X   |      |                 |
| 2022    | X                   | X   |       | X   | X          |     |     |      |                 |                                      | 0-100+     | X   |     |      | X               | X   | X          | X   | X   |      |                 |
| 2023    | X                   | X   | X     | X   | X          |     |     | X    |                 |                                      | X          | X   |     |      | X               | X   | X          | X   | X   |      |                 |

Note: Count Question Resolution (CQR) and the Post-Census Group Quarters Review (PCGQR) were both official operations that allowed governmental units to seek review of their 2020 Census counts. Updates resulting from these programs are incorporated into the estimates base. HH = household population. GQ = group quarters population. HU = housing units.

## IMPACT ON VINTAGE 2023

- Processing improvements included:
- A more effective method for estimating the GQ population
  - An approach to avoid applying demographically implausible GQ distributions from Vintage 2020 if donor populations were too small
- These caused broad changes to the GQ population.

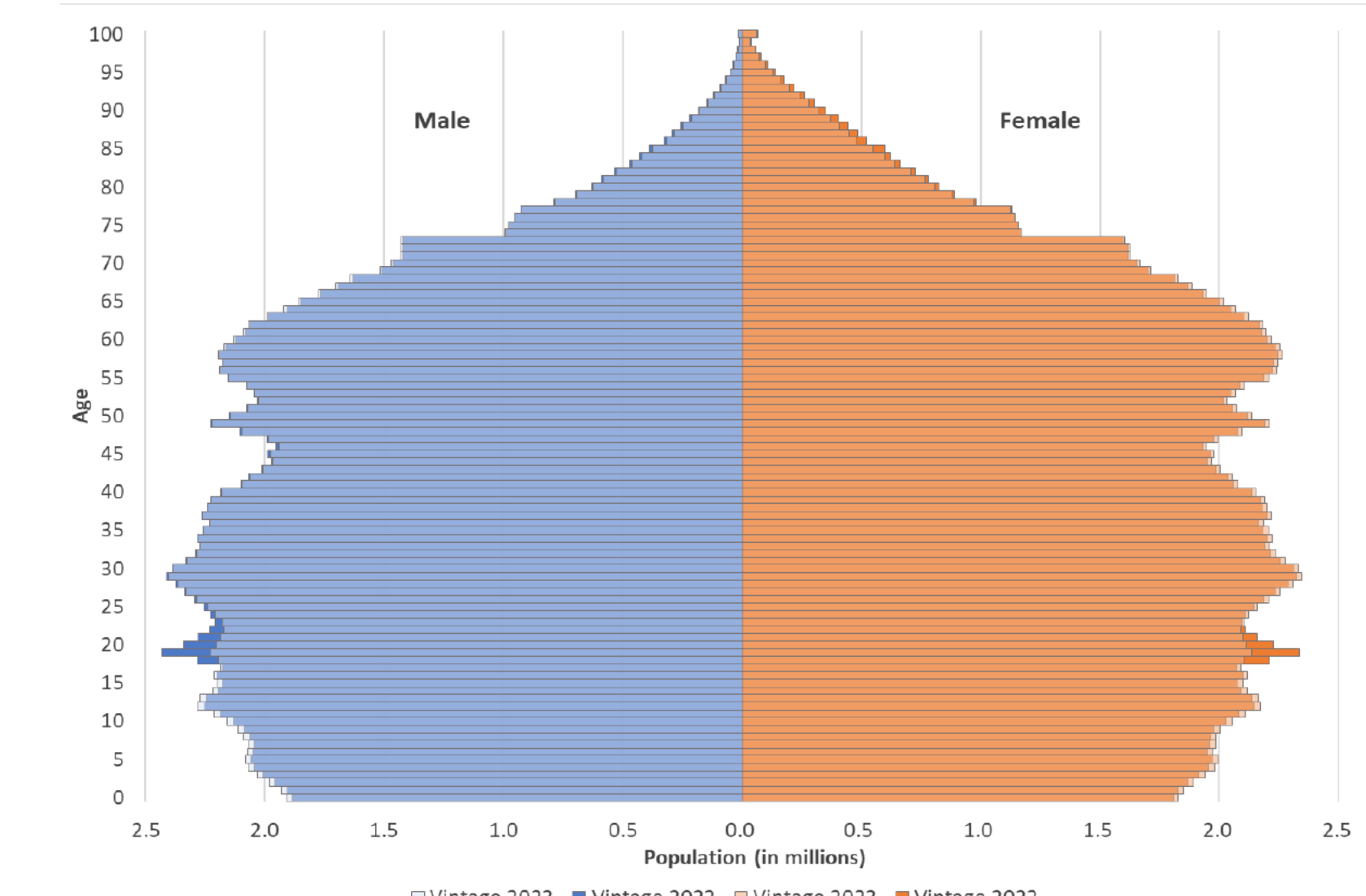
Degree of Population Change for Counties between Vintage 2022 and Vintage 2023 by Universe: April 1, 2020

| Absolute Difference | Change in Resident Population |       |      | Change in Household Population |       |      | Change in Group Quarters Population |      |      |
|---------------------|-------------------------------|-------|------|--------------------------------|-------|------|-------------------------------------|------|------|
|                     | Gain                          | Loss  | None | Gain                           | Loss  | None | Gain                                | Loss | None |
| 5.00% or more       | 1                             | 0     | 0    | 0                              | 0     | 0    | 54                                  | 43   | 0    |
| 2.50 to 4.99%       | 1                             | 0     | 0    | 0                              | 0     | 0    | 82                                  | 84   | 0    |
| 1.00 to 2.49%       | 2                             | 0     | 0    | 1                              | 0     | 0    | 220                                 | 196  | 0    |
| 0.00 to 0.99%       | 1,408                         | 1,437 | 295  | 1,320                          | 1,394 | 429  | 927                                 | 960  | 511  |

Source: U.S. Census Bureau, Vintage 2023 and 2022 Population Estimates.

Incorporating county-level Hispanic origin resident population totals from the 2020 Census decreased the population among older ages and increased the population among younger ages.

Estimates of Resident Population in Vintage 2022 and Vintage 2023 by Age and Sex: April 1, 2020



Source: U.S. Census Bureau, Vintage 2023 and 2022 Population Estimates.

## IMPACT ON VINTAGE 2022

- Using subcounty GQ and HH data from the 2020 Census enabled us to:
- Capture geographic boundary changes, such as in Connecticut (see maps)
  - Incorporate GQ change from April 2020 to July 2022

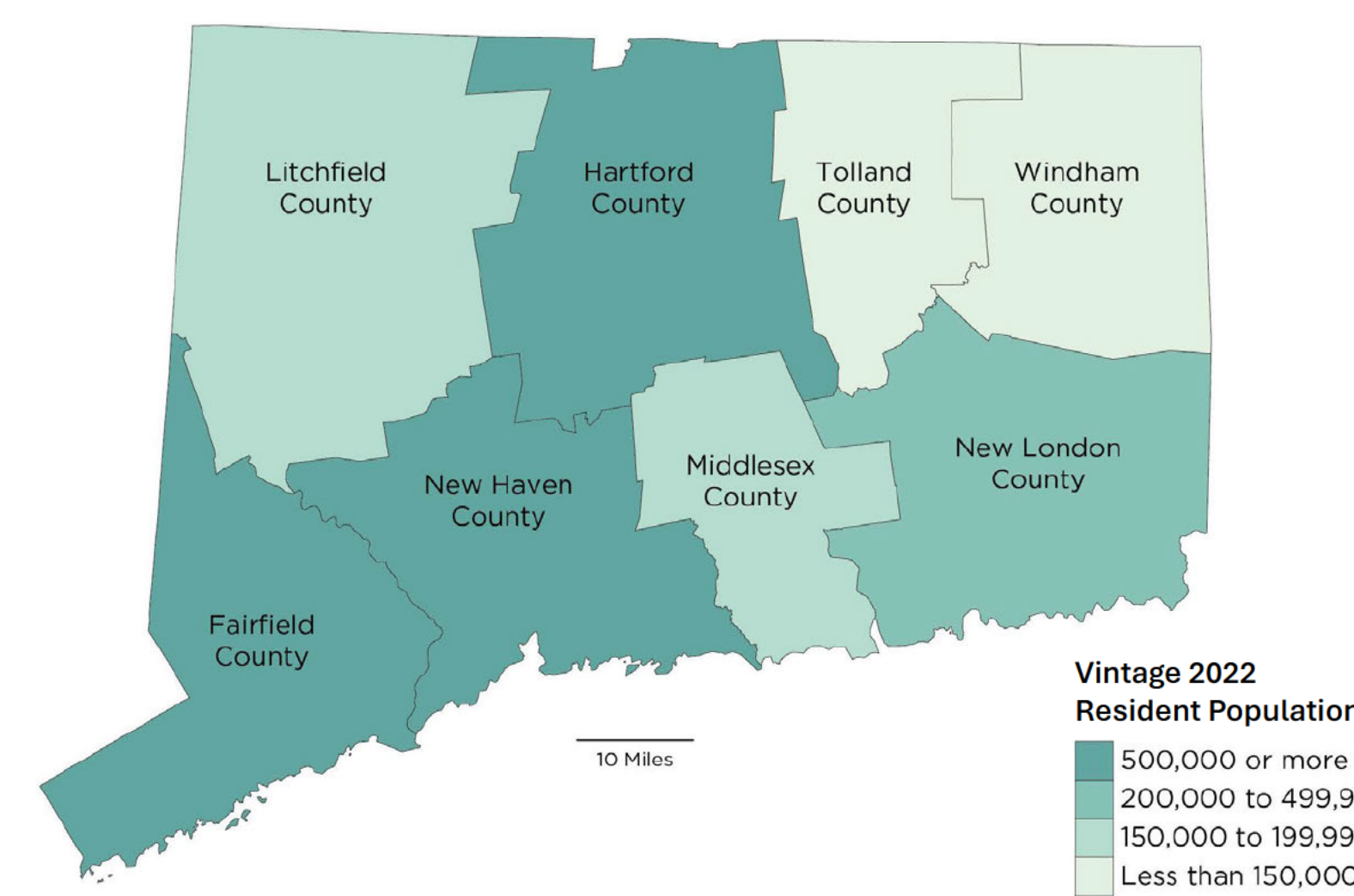
We also enhanced our method of processing GQ data and thus increased the GQ population to better approximate 2020 Census GQ population count of approximately 8.2 million, as seen below.

Population Estimates and Differences by Vintage and Universe: April 1, 2020

|                    | Population Universe |             |                |
|--------------------|---------------------|-------------|----------------|
|                    | Resident            | Household   | Group Quarters |
| Vintage 2021       | 331,449,281         | 323,688,422 | 7,760,859      |
| Vintage 2022       | 331,449,520         | 323,210,615 | 8,238,905      |
| Numeric Difference | 239                 | -447,807    | 478,046        |
| Percent Difference | 0.0%                | -0.1%       | 6.2%           |

Source: U.S. Census Bureau, Vintage 2022 and 2021 Population Estimates.

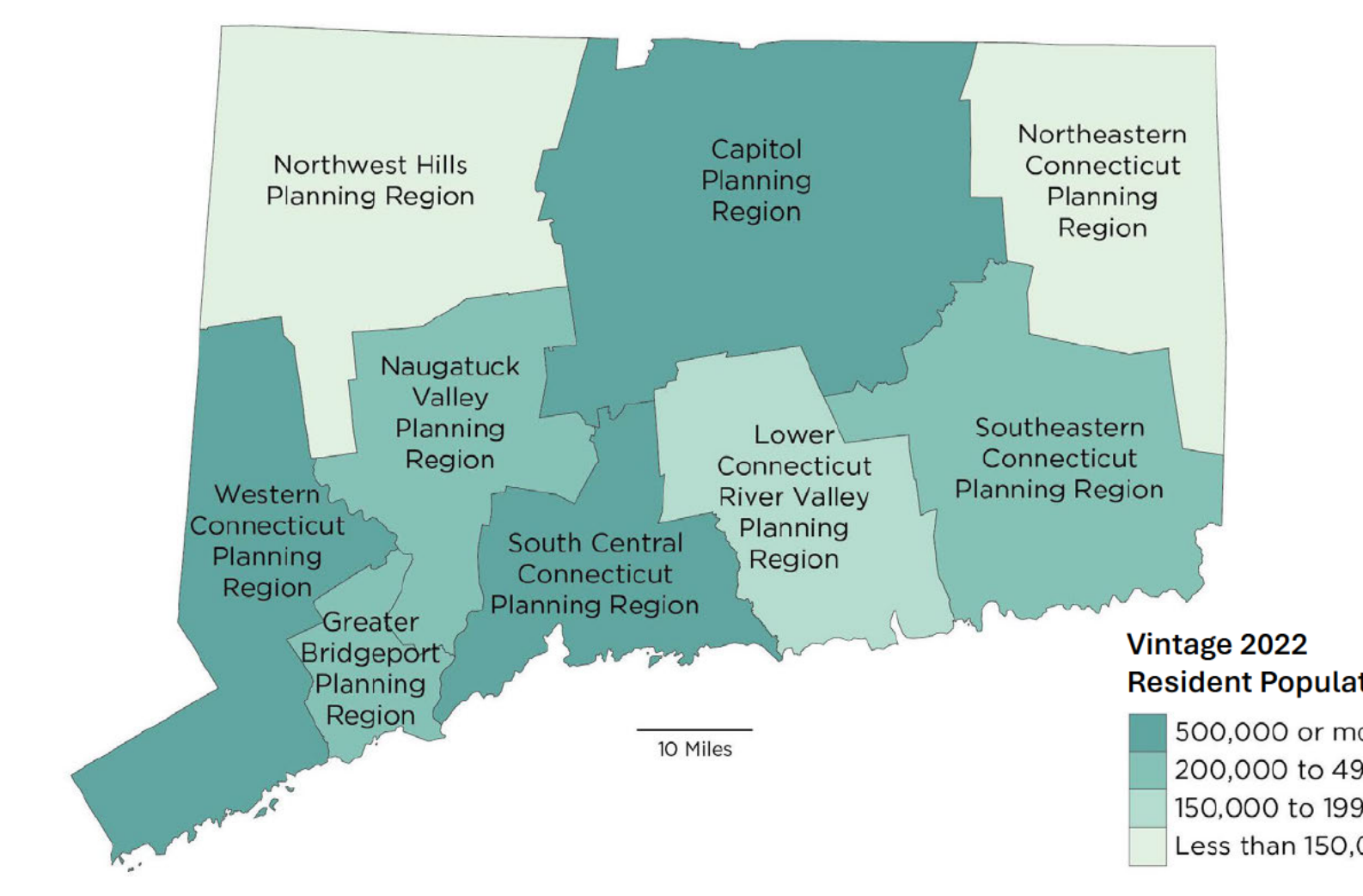
April 1, 2020 Population Estimates for Connecticut by County



Vintage 2022 Resident Population

- 500,000 or more
- 200,000 to 499,999
- 150,000 to 199,999
- Less than 150,000

April 1, 2020 Population Estimates for Connecticut by Planning Region



Vintage 2022 Resident Population

- 500,000 or more
- 200,000 to 499,999
- 150,000 to 199,999
- Less than 150,000

## LESSONS LEARNED & FUTURE RESEARCH

### A "gold standard" can evolve.

By systematically building an estimates base from multiple data sources, it becomes possible to target specific populations or patterns for improvement based on known demographic trends—to objectively redefine the gold standard and use each research cycle to strive for it.

### Once the base population becomes adaptive, the resulting possibilities are numerous.

Introducing additional sources into the estimates base means the scope of eligible changes must be defined and managed. Even though the blended base method is adaptable, adjustments must be deliberate and justified.

### The blended base approach is complex.

Integrating multiple sources of data requires assessing the strengths of each to isolate the detail to use in the blended base. The order and manner in which the alternative sources are introduced affects the outcome and can introduce implausible patterns.

### Future research factors in these lessons, previous findings, and stakeholder input.

- Priorities include a closer look at:
- The impact of imputations
  - Potential causes for the increase in heaping in the 2020 Census
  - The results of the 2020 Census by sex
  - 2020 Census data by race, including diversity metrics
  - Alternative data sources to potentially inform adjustments for coverage issues
  - Group quarters population by demographic characteristics

This presentation is released to inform interested parties of ongoing research and to encourage discussion of work in progress. Any opinions and conclusions expressed herein are those of the author(s) and do not reflect the views of the U.S. Census Bureau. The U.S. Census Bureau has reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release. (CBDRB-FY24-0085, CBDRB-FY23-0063, CBDRB-FY22-0054, CB-FY22-DSEP-001)

For population estimates methodology statements, see <https://www.census.gov/programs-surveys/popest/technical-documentation/methodology.html>.