American Community Survey: Incorporating the 2020 Census and the Use of the Population Estimates

Edward C. Castro Jr.
Chief, ACS Estimation Branch
Decennial Statistical Studies Division

California State Data Center
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Overview

- 2020 Census Updates

- Use of Population Estimates as Control Totals
  - How are ACS estimates created
  - Files received from the Population Estimates Program (PEP)
  - Creation of Initial Weighting Cells
  - Collapsing of Initial Weighting Cells

- Implications for which estimates are controlled

- ACS notes on effects of different vintages of population estimates on ACS estimates

2020 Census Updates

- Sampling Frame
  - Updates from the 2020 Census were incorporated in a series of updates to the frame over the 2021 and 2022 ACS time frame

- Data collection
  - Revised race question implemented in 2020 at the same time as the census

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2020 Census Updates (cont.)

- Post-Data Collection Processing
  - Gradual incorporation in the population estimates used as controls
- Tabulation geography since 2020
  - Political geographies are updated annually independent of the census
  - Statistical geography is updated only with the census
    - 2020: most statistical areas updated
      (e.g., tracts and block groups, Census Designated Places)
    - 2021: ZIP Code Tabulation Areas
    - 2022: Urban Areas and Public Use Microdata Areas
  - Metropolitan areas defined by OMB are released on a 5-year cycle
    - 2023: Most recent update

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Use of Population Estimates as ACS Control Totals

- ACS is a sample survey and not an enumeration
  - Designed to collect the population characteristics
  - Not designed to enumerate the population at all levels of geography
- Baseline counts come from the population estimates for supported geographies
  - Helps mitigate survey coverage error
  - Improves consistency of certain estimates across surveys

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How are ACS Estimates Created?

- Select a sample of housing unit (HU) addresses and interview the residents of those housing units.

- Also select a sample of group quarter (GQ) facilities and interview a subsample of the residents of that facility

- The data then go through
  - standardization
  - edits and allocation for consistency and to fill in missing data
  - weighting
  - tabulation

- Statistical weights are used to aid in tabulation so that the sample response data reflects the entire population and not just the sample

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Role of GQ Estimation

- Goal is to control to the ACS total resident population estimates from the Population Estimates Program (PEP)

- GQs are broken up into 2 groups based on size
  - Small GQs: 0-15 population
  - Large GQs: 16+ population

- Each state has its own sampling rate
  - National average of 2.5%

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GQ Sampling

- Small GQs
  - Each GQ is eligible for sample every 5 years (same as HU)
  - Entire population of GQ is interviewed, up to maximum of 15 persons

- Large GQs
  - Each GQ is eligible for sample every year.
  - Sample groups of 10 people, referred to as "hits"
  - GQs are selected for sample proportional to their population
  - Very large GQs can have multiple hits in a year
  - Field Representatives select a sample of 10 people from current population at time of interview
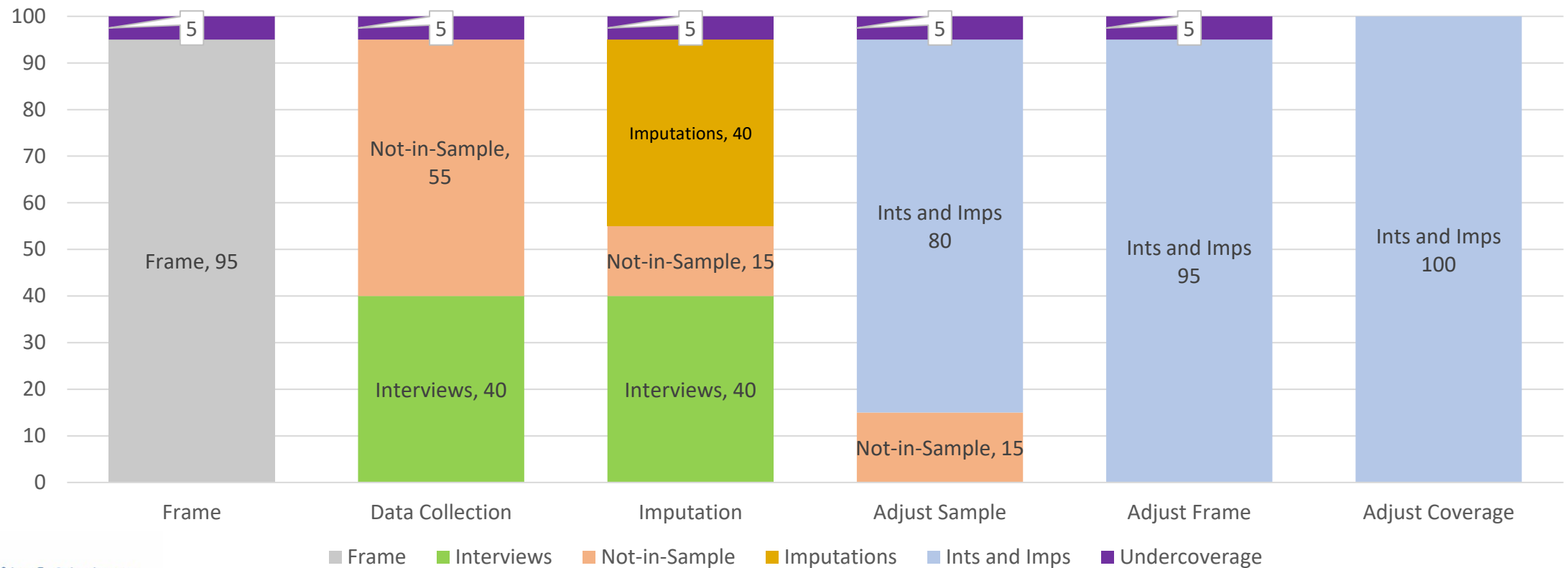
GQ Weighting

- GQ sample design optimized at state level
  - Inconsistent coverage at substate level
- Perform whole-person imputation within not in sample GQs
  - Large GQs are selected with certainty
  - Small GQs are selected to ensure geographic coverage down to tract level
- Donor selection occurs from interviews for each year
  - Expanding search
    - Type -> Type Group
    - County -> Nation

GQ Weighting cont.

- Interviews and imputations are treated the same
- Three basic steps
  - Account for the sampling and imputation rates within each GQ
    - Makes the sample representative of the selected GQs
  - Adjust for substate frame totals
    - Makes the interviews and imputations representative of the sample frame
  - Adjust for coverage error
    - Mitigates coverage error due to deficiencies in the frame or differential response rates
- End result is an individual record for both interviewed and imputed people with geography and characteristic information along with a statistical weight
- Create estimates by summing the weights of all records having a given characteristic

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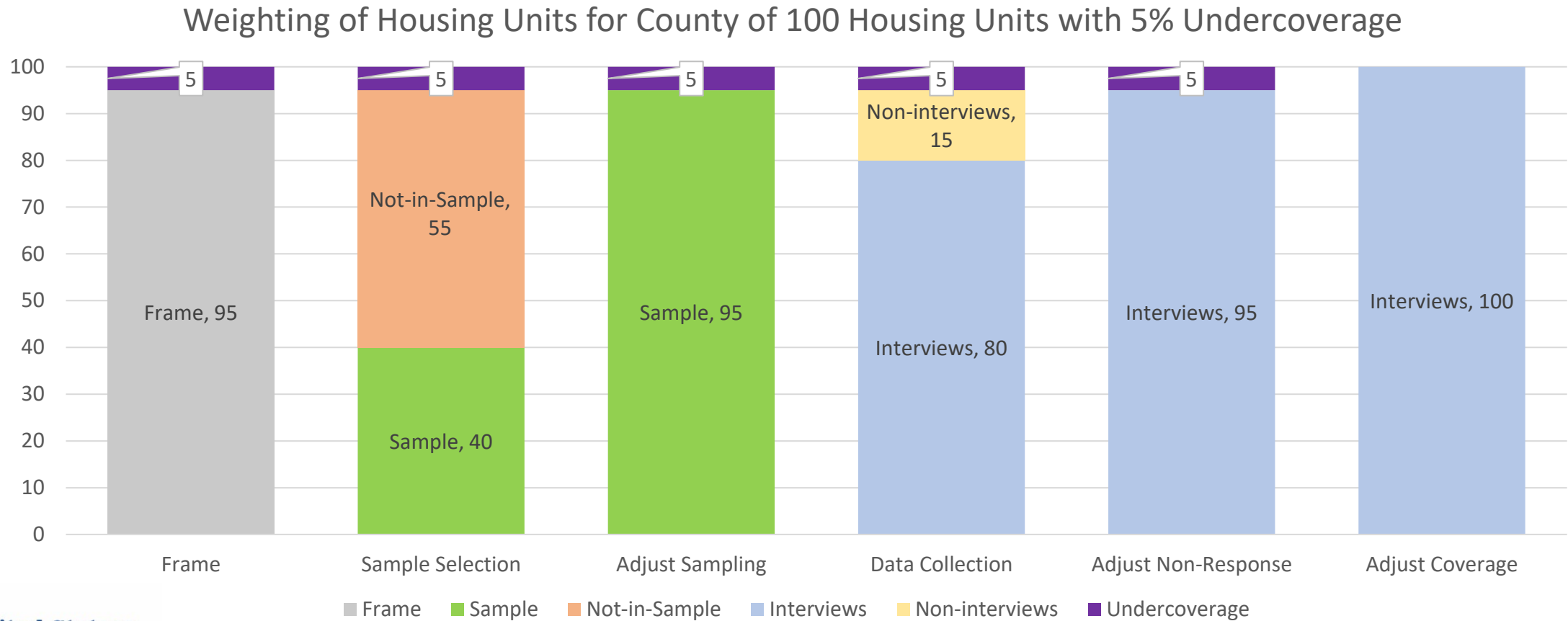# Pictorial Representation of GQ Weighting

Weighting of Group Quarters for State of 100 Group Quarters with 5% Undercoverage

ACS Housing Unit and Person Weighting

- Three basic steps
  - Account for the sampling rates which vary by area
    - Makes the sample representative of the sample frame
  - Adjust for housing unit non-response
    - Makes the sample interviews also account for nonresponding units
  - Adjust for coverage error
    - Mitigates coverage error due to deficiencies in the frame or differential response rates
- End result is an individual record for both HUs and people with geography and characteristic information along with a statistical weight
- Create estimates by summing the weights of all records having a given characteristic

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Pictorial Representation of HU Weighting

Weighting of Housing Units for County of 100 Housing Units with 5% Undercoverage

Files from the Population Estimates Program

- Total Population for all counties by demographics
  - 31 race categories – all combinations of the 5 OMB race categories (white, black, American Indian and Alaska Native, Asian, Native Hawaiian and Pacific Islander)
  - Hispanic / non-Hispanic
  - 86 age categories: single year of age 0-85+
  - Male / Female
- Total housing units and total population for counties and subcounty areas (county-place parts and Minor Civil Divisions)
- Puerto Rico municipios have only age and sex categories
- Group quarters population for state by GQ type (7)

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Combining GQ and HU Weighting

- Steps to accomplish this:
  - Control the ACS GQ to PEP estimates at state level
    - 52 state or state equivalents
    - 7 major GQ type groups
    - 52 x 7 = 364 cells across country
  - Form ACS GQ estimates by demographics at county level
  - Subtract the ACS GQ demographic estimates from the PEP demographic estimates at county-level
  - Use this balance as controls for the ACS household population estimates

Weighting Areas

- County or collection of less populous counties

- Never cross state boundaries

- Typically, static for 5 or more years

Class	1-year Population	5-year Population
Almost never grouped	65,000+	5,000+
Donor only if needed	24,000 – 64,999	2,500 – 4,999
Always grouped	> 24,000	> 2,500

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Weighting Race Groups

- Goal of the weighting race groups is to group individuals by race and ethnicity who have similar coverage rates within a local area
- Define <u>six</u> mutually exclusive weighting race groups
  - All Hispanics form a single group
  - Non-Hispanics are broken out by the 5 major OMB race categories
- How to go from 31 -> 5 race groups?
  - Based on the assumption that the coverage of people responding with multiple race categories is most similar to the minority race group that is largest in a particular area.
  - Black & American Indian may get mapped to Black in one area and get mapped to American Indian in another

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Age and Sex Categories

- Age is grouped into 13 age categories who boundaries line with important tabulation or demographic universes
  - 0-4, 5-14, 15-17, 18-19, 20-24, 25-29, 30-34, 35-44, 45-49, 50-54, 55-64, 65-74, 75+
- In all, we have 26 age-sex categories

Total Categories

- 31 x 2 race/ethnicity combinations reduced to 6 weighting race groups

- 86 x 2 age/sex combination reduced to 26 age-sex categories

- In all, we have 6 x 26 = 156 initial weighting cells

- Within each cell, we make the same adjustment to all weights within the cell: (PEP population estimate) / (ACS precontrolled estimate)

- After this adjustment, the sum of the weights equal the population estimate: e.g., for non-Hispanic Asian, 0–4-year-old males

Collapsing of Initial Weighting Cells

- Collapsing is still necessary, must meet:
  - interview count for the cell meets minimum threshold of 10
  - ratio of population estimate total to ACS precontrolled estimate is within bounds of (1/3.5, 3.5).
- Collapsing is performed in order:
  - 1st we collapse weighting race groups keeping minority groups together
  - 2nd we collapse age-sex cells within the collapsed weighting race groups
- Important to note: the collapsing is performed dynamically and is specific to each county (or groups of smaller counties)

What Tends to be Controlled?

- Controlled estimates are shown with five asterisks, "*****", in the margin of error column.
- Nearly controlled estimates will have noticeably smaller margins of error (e.g., county estimate for Under 18 years old = 4,261 +/- 19).
- Counties, places, and MCDs (especially if entirely within single county)
  - Total population
- Counties
  - Hispanic
  - Broad age categories (less than 18, 18+, etc.)
  - Race totals are never controlled

Vintage of PEP Estimates Used

- Reminder that ACS estimates are period estimates. For example,
  - 2023 1-year contains the interviews collected in calendar year 2023
  - 2023 5-year contains the interviews collected in calendar years 2019—2023.
- For controls we use the most recent July 1st estimates that cover the same period.
  - 2023 1-year used July 1, 2023 Vintage 2023 PEP estimate
  - 2019 5-year used average of July 1, 2015—2019 Vintage 2019 PEP estimates
- However, if five-year period crosses the decennial year, then we use the intercensal estimates if available.
  - 2013 5-year used the average of July 1, 2010—2013 Vintage 2013 PEP postcensal and July 1, 2009 intercensal estimates.
  - 2023 5-year used the average of July 1, 2020—2023 Vintage 2023 PEP postcensal / blended base and an adjusted July 1, 2019 Vintage 2020 postcensal estimates.

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Vintage Updates to Population Estimates

- Highlights visible in ACS from updates to population estimates
  - 2020: Used the Vintage 2020—no 2020 Census information
  - 2021: Blended base used total resident population from 2020 Census, age-sex information from demographic analysis at national level
  - 2022: Added 2020 Census total population by household and group quarters (GQ) improved consistency in GQ estimates with census
  - 2023: Added 2020 Census Hispanic origin distributions
- 2024 will be the first year where we exclusively use the blended-base estimates for 2020—2024.

Upcoming ACS Updates

- 2025 Questionnaire Updates
  - Updated household roster questions
  - Updates to educational attainment, health insurance coverage, labor force questions
  - New questions on electric vehicles, solar panels, sewage disposal
- 2027 Questionnaire Update
  - 2024 revisions to Statistical Policy Directive 15
    - Updates to race and ethnicity questions
    - Addition of Middle Eastern or North African category

User Notes on Effects of Pop Estimates on ACS

- Population Controls for the 2020 ACS
  census.gov/programs-surveys/acs/technical-documentation/user-notes/2021-01.html

- Population Controls for the 2021 ACS
  census.gov/programs-surveys/acs/technical-documentation/user-notes/2022-10.html

- Population Controls for the 2022 ACS
  census.gov/programs-surveys/acs/technical-documentation/user-notes/2023-06.html

- Population Controls for the 2023 ACS
  census.gov/programs-surveys/acs/technical-documentation/user-notes/2024-02.html

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Other ACS Resources

- Accuracy of the Data Statement (updated each release) census.gov/programs-surveys/acs/technical-documentation/code-lists.html

- Geographic Boundaries by Year (updated each release) census.gov/programs-surveys/acs/geography-acs/geography-boundaries-by-year.html

- ACS Design and Methodology Report (updated periodically, v4.0) census.gov/programs-surveys/acs/methodology/design-and-methodology.html

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Thank You!

- General ACS User Support List

  acso.users.support@census.gov

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