

# Recent Innovations in Creating Annual Dual-System Estimates for Local Communities

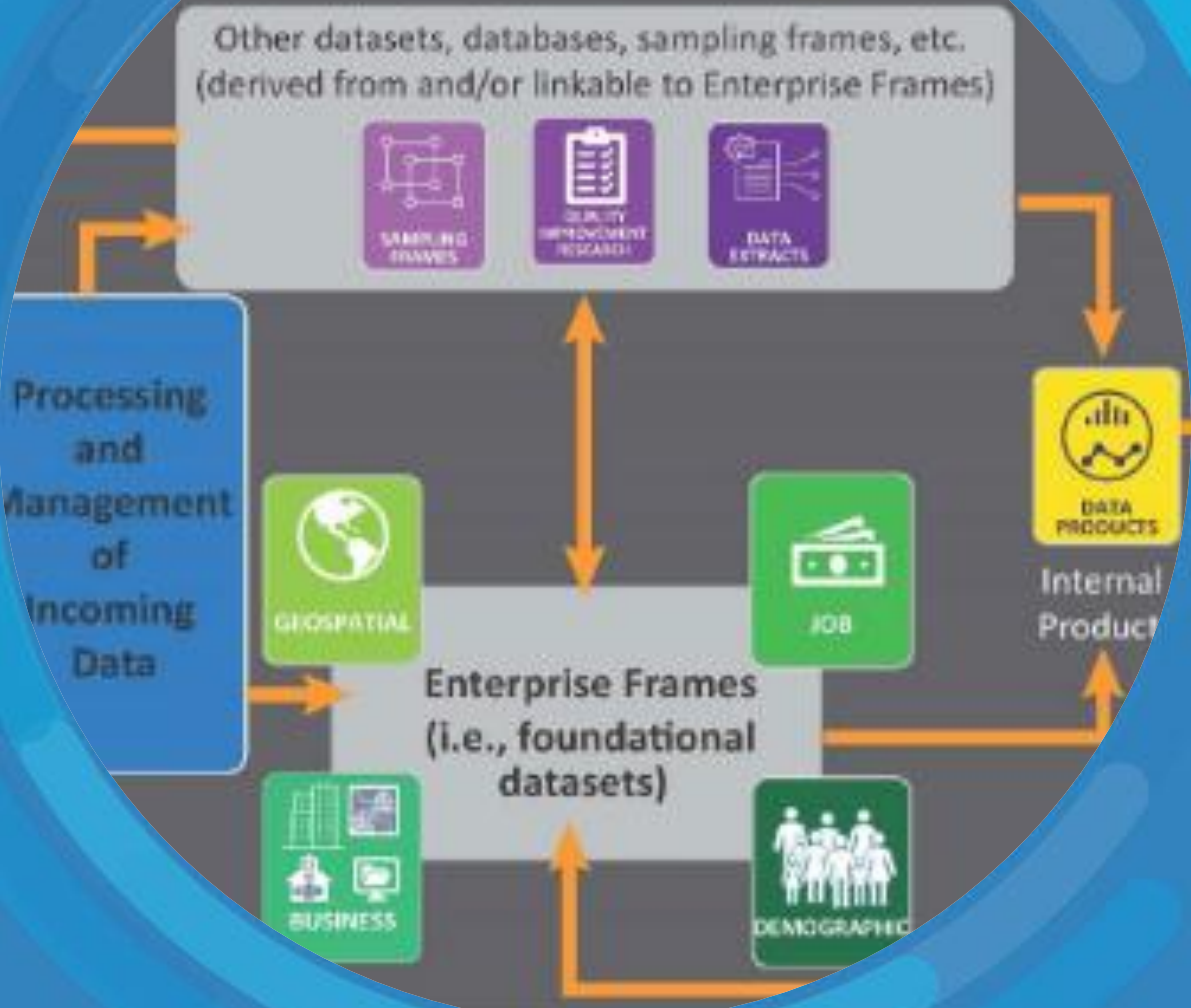
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# Outline

1. Background and motivation
  - The Continuous Count Study
  - Calibrated Administrative Records Dual-System Estimation
2. Recent methodological innovations
  - Improvements to the base year estimates
  - Improvements to the later year estimates
3. Concluding thoughts and future work

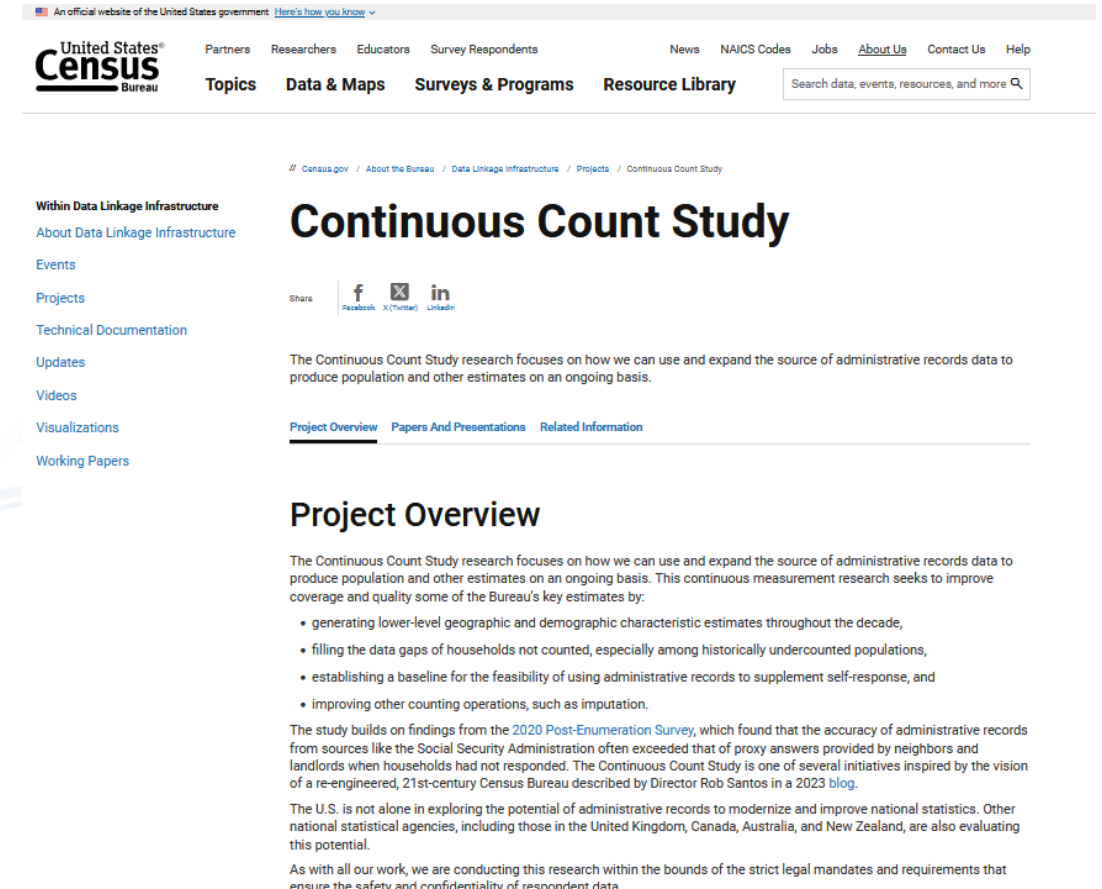
Enterprise Data Processing, Comp  
and Management (Enterprise Data Lake)



# Background and Motivation

# Continuous Count Study

- Low-level geographic and demographic population estimates throughout the decade
- Quantify the utility and availability of administrative data
- Develop **alternative estimates** to assess the quality of the administrative records results



The screenshot shows the official website of the United States Census Bureau. The page is titled "Continuous Count Study" and is part of the "Data & Maps" section. The navigation menu includes "Partners", "Researchers", "Educators", "Survey Respondents", "News", "NAICS Codes", "Jobs", "About Us", "Contact Us", and "Help". The main content area features a sidebar with links to "Within Data Linkage Infrastructure", "About Data Linkage Infrastructure", "Events", "Projects", "Technical Documentation", "Updates", "Videos", "Visualizations", and "Working Papers". The main text describes the Continuous Count Study research, which focuses on using and expanding administrative records data to produce population and other estimates on an ongoing basis. It lists three key objectives: generating lower-level geographic and demographic characteristic estimates throughout the decade, filling data gaps of households not counted, and establishing a baseline for the feasibility of using administrative records to supplement self-response, and improving other counting operations, such as imputation. The study builds on findings from the 2020 Post-Enumeration Survey, which found that the accuracy of administrative records from sources like the Social Security Administration often exceeded that of proxy answers provided by neighbors and landlords when households had not responded. The Continuous Count Study is one of several initiatives inspired by the vision of a re-engineered, 21st-century Census Bureau described by Director Rob Santos in a 2023 blog. The U.S. is not alone in exploring the potential of administrative records to modernize and improve national statistics. Other national statistical agencies, including those in the United Kingdom, Canada, Australia, and New Zealand, are also evaluating this potential. As with all our work, we are conducting this research within the bounds of the strict legal mandates and requirements that ensure the safety and confidentiality of respondent data.

<https://www.census.gov/about/adrm/linkage/projects/continuous-count-study.html>

# Limitations of Intercensal Population Estimates

## American Community Survey

- Tract-level estimates only available from the 5-year data release
- 5-year data released over a year after the last in-scope year
- Estimates subject to sampling error

## Population Estimates Program

- No tract-level estimates
- Estimates below county level (e.g., cities and towns) for totals only
- Uses unadjusted decennial census as the base

# Calibrated Administrative Records Dual-System Estimates

## 2020 Base Estimates

- Dual-system estimation using census and administrative records for base year

		Administrative Records System?	
		Yes	No
Census System?	Yes	Found in both $n_{11}$	Census only $n_{10}$
	No	AR only $n_{01}$	Missing in both $n_{00}$

$$\hat{n}_{00} = \frac{n_{10} \times n_{01}}{n_{11}}$$

$$\hat{N} = n_{10} + n_{01} + n_{11} + \hat{n}_{00}$$

# Calibrated Administrative Records Dual-System Estimates

## 2020 Base Estimates

- Dual-system estimation using census and administrative records for base year
- Create initial estimates for demographic groups at state, county, and tract levels
- Rake state estimates to 2020 Post-Enumeration Survey results
- Control country estimates to state estimates
- Control tract estimates to county estimates
- Result: population estimates for demographic groups by tracts that matched the 2020 Post-Enumeration Survey Results for states and national demographic groups

# Calibrated Administrative Records Dual-System Estimates

2021 and later year estimates

- Create county-level controls by moving prior year estimates forward using rates of change from Population Estimates Program
- Create initial tract-level estimates by moving prior year estimates forward using rates of change from administrative records
- Calibrate initial tract-level estimates to county controls

Refer to Kennel (2024) and Brown et al. (2024) for more details



# Recent Methodological Innovations

# Improvements to Base Year Estimates

- Elimination of calibration to 2020 Post-Enumeration Survey (PES) estimates
- Alignment of race and Hispanic origin with 2020 Census categories
- Improved imputation for age in administrative records

# Elimination of calibration to 2020 PES estimates

## Issues

- Initial uncalibrated administrative records dual-system estimates were too high overall but also potentially low in rural areas
- 2020 PES estimates for some states had large sampling errors

## Solution

- Restricted administrative records system to use only recently-observed records
- Removed people potentially not living in the United States
- Included people with records lacking address identifiers
- Estimated population totals at tract level that could be summed to higher levels

# Alignment of race and Hispanic origin with 2020 Census

## Issues

- Administrative records system did not provide detailed race groups; included single category for multi-race
- Race and ethnicity values in administrative records often disagree with census

## Solution

- Developed overwriting and imputation methodology to assign detailed 2020 Census categories to administrative records system
  - Used census values for matches
  - Leveraged additional census records to impute values for administrative records nonmatches
- Allows estimation for groups such as “race alone or in combination”

# Improved imputation for age in administrative records

## Issue

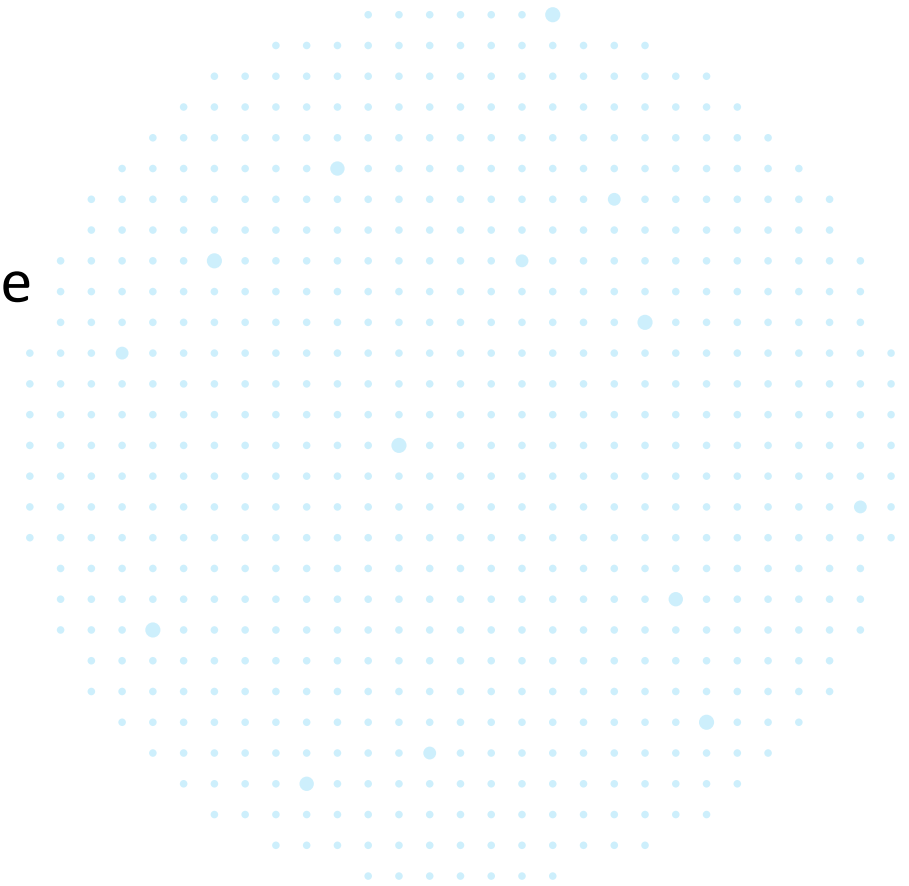
- Initial estimates for some groups were sensitive to the inclusion and imputation of records with missing age

## Solution

- Obtained more observable ages for these records using 2010 Census
- Like race assignment, leveraged additional census records to impute values for administrative records nonmatches

# Improvements to Later Year Estimates

- Consistency of administrative records sources over time
- Timeliness of:
  - Administrative records inputs, and
  - Population Estimates Program inputs



# Consistency of administrative records sources over time

## Issue

- Availability of administrative records sources changes over time, creating artificial jumps in observed population totals as sources enter and exit the system

## Solution

- Restricted calculations of administrative records rates of change to use only a core set of sources that has been relatively stable over the past several years

# Timeliness of administrative records inputs

## Issue

- Census Bureau enterprise Demographic Frame is compiled multiple years after the reference date

## Solution

- New Nowcast approach produces data concurrent with the reference date
- Multiple Nowcasts produced each year as more administrative data is received

# Timeliness of Population Estimates Program inputs

## Issue

- Public county-level Population Estimates are released nearly a year after the reference date

## Solution

- Use internal Population Estimates with more detail which are available earlier
- Includes projections for three years beyond the reference date

# Result of Innovations

## **Internal, experimental population estimates that are**

- At the tract level
- Uncalibrated in the base year
- Available in the current year accounting for recent low-level administrative records totals
- Available for three future years using county-level Population Estimates projections



# Conclusions and Future Work

# Conclusions

- Timely, community-level population estimates can be produced using census and administrative data
- Potential internal uses include:
  - Survey and census data collection monitoring
  - Outlier detection
- Limitations and robustness need thorough assessment before widespread use

# Future work

- Continue analyzing accuracy and utility of results
- Enhance methodology to account for change in demographic subgroups
- Base year improvements have motivated the 2030 Coverage Estimation Program
  - Plan to produce 2030 Census coverage estimates without much fieldwork
    - Reduced cost and time
    - Potential for greater geographic and demographic detail

# Related presentation

“Annual Dual-System Estimates Using Administrative Records and the American Community Survey”

Brandon Pipher, U.S. Census Bureau

Friday May 15, 2:15-3:45



**QUESTIONS?**

**THANK YOU**



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[HTTPS://WWW.CENSUS.GOV/](https://www.census.gov/)

# References

Brown, J.D., Hall, A., Ikeda, M., Kennel, T., Martinez, W., Maples, J., Murray Close, M., Mule, T. (2004). “Initial Results from the Continuous Count Study,” Report for the Census Scientific Advisory Committee Spring Meeting, March 14, 2024. Available at <https://www2.census.gov/about/linkage/projects/continuous-count-study/csac-ccs-full-report.pdf>.

Kennel, T. (2024). “A Methodology for Creating Annual Dual-System Estimates for Local Communities,” Paper presentation, 79th Annual Conference of the American Association for Public Opinion Research, Atlanta, GA, May 17, 2024. Available at <https://aapor.confex.com/aapor/2024/meetingapp.cgi/Paper/2729>.

The Continuous Count Study. Available at [https://www.census.gov/about/adrm/linkage/projects/continuous-count-study.Project\\_Overview.html#list-tab-708250430](https://www.census.gov/about/adrm/linkage/projects/continuous-count-study.Project_Overview.html#list-tab-708250430).