

UN Statistical Commission Side Event: Enhancing Statistical Capacity through Global Training on Small Area Estimation

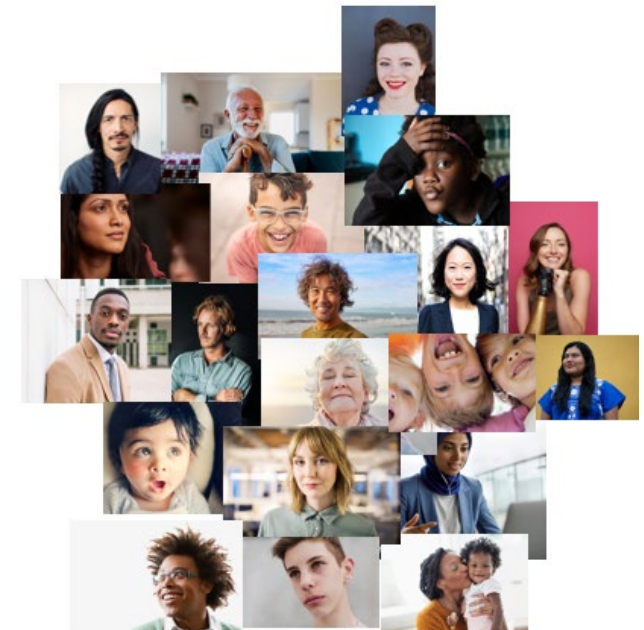
Perspective

February 5, 2024

Carolina Franco, Principal Statistician

What is small area estimation (SAE)?

- **Goal:** obtaining granular, disaggregated statistics from surveys
- **Problem:** surveys often cannot accurately estimate all the quantities of interest through “traditional” direct methods due to limited sample sizes
- **SAE:** modeling techniques that incorporate additional information (“borrow strength”) such as admin. records, censuses, other surveys, spatial information, estimates from previous years, commercial data, etc.
- **Impact:** allows for the production of disaggregated statistics, including for domains with limited or no sample size
- **Applications:** endless! Disease mapping, insurance coverage, poverty mapping, unemployment at local levels, etc. etc. etc.!

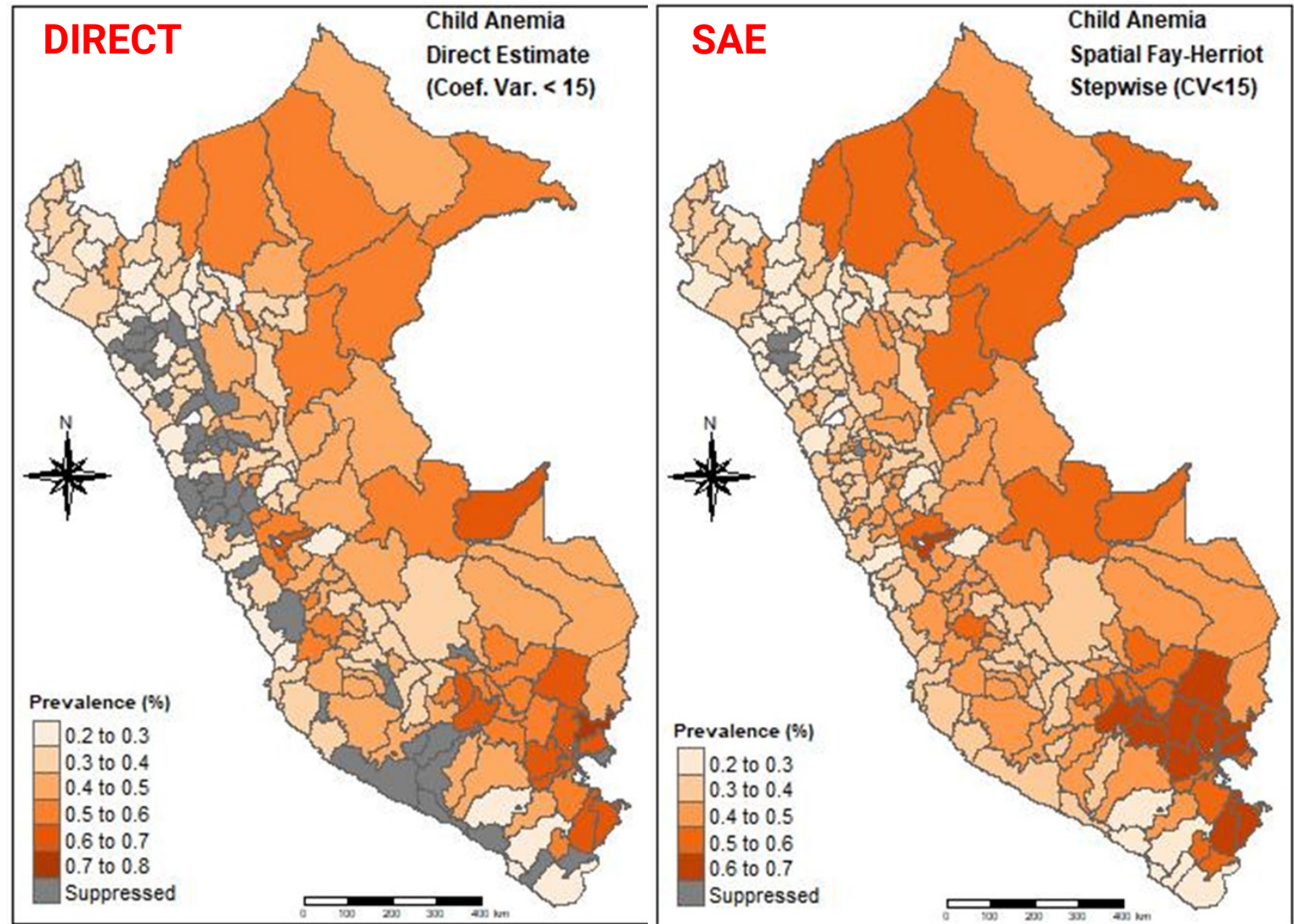


In a nutshell, SAE focuses on producing disaggregated, granular statistics beyond what traditional, direct survey methods can support by “borrowing strength”

Illustration

Comparison of estimates of **anemia** prevalences for children **0-4** in Peruvian provinces (based on ENDES 2017-2019 data).

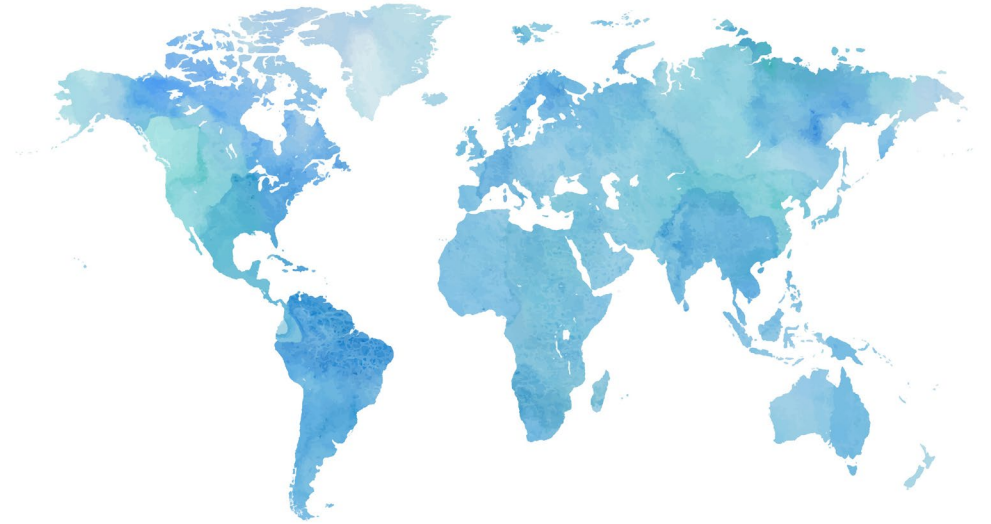
- **Estimates with CV>15 get suppressed**
- Many direct estimators have high variability
- SAE estimates borrow strength from administrative records and Census



Source: Angelo Cozzubo, NORC

Why is SAE useful?

- The complex problems faced by our societies today require detailed information!
- Crucial to understanding and addressing inequities
- Necessary for developing effective data-driven policy and interventions
- Can aid in efficient allocation of resources (e.g. US school-aged children in poverty)
- Can be used to create detailed maps, such as disease maps, poverty maps, etc.—essential tools!



Who uses SAE? (Examples in the United States)

SAE has been used in official statistics in the US for decades ...

- Official estimation of **poverty** for states, counties, and school districts by the US Census Bureau: www.census.gov/programs-surveys/saie.html
- Official estimation of **health insurance coverage** at local levels by socioeconomic groups: www.census.gov/programs-surveys/sahie.html
- Official estimation of **unemployment** at local levels by Bureau of Labor Statistics. www.bls.gov/lau/
- **Voting Rights Act** Section 203 determinations www.census.gov/programs-surveys/decennial-census/about/voting-rights/voting-rights-determination-file.html



Who else uses SAE?

- SAE is also used in various other countries: Canada, Australia, Chile, Peru, Colombia, Mexico, UK, Netherlands, Indonesia, South Africa, etc.!
- There is a vast literature on SAE that is quickly expanding
- There is huge potential to apply SAE more broadly, but its important to promote training, proper use and “best practices”



*It is essential that countries around the world have **access to the right tools** to produce **reliable disaggregated statistics**, and the United Nation's capacity building efforts in SAE have been a **huge leap forward!***

Some of ECLAC's in-person events

- Seminar on Disaggregation of Estimates in Chile using SAE Techniques (Spanish-language event). Organized by ECLAC. **Santiago, Chile**. November 2022
- **Regional** Workshop on SAE Methodologies and data disaggregation. Organized by ECLAC and Cetic.br. **Sao Paulo, Brazil**. June 2023.
- Disaggregation of Data via SAE Techniques in Mexico. Organized by ECLAC, UNFPA and INEGI. **Mexico City, Mexico**. November 2023.

These events were incredible examples of effective capacity building!



The importance of SAE! Some prominent examples

Voting Rights Act, Section 203:

- This SAE program is used to determine which parts of the US are legally mandated to provide voting materials in other languages
- Determinations based on population characteristics related to citizenship, limited English proficiency, and illiteracy
- **Important for democracy!**

Small Area Income and Poverty Estimates:

- Example of a successful, long-standing SAE program
- Estimates for **school-aged children** used for the **allocation of funds**

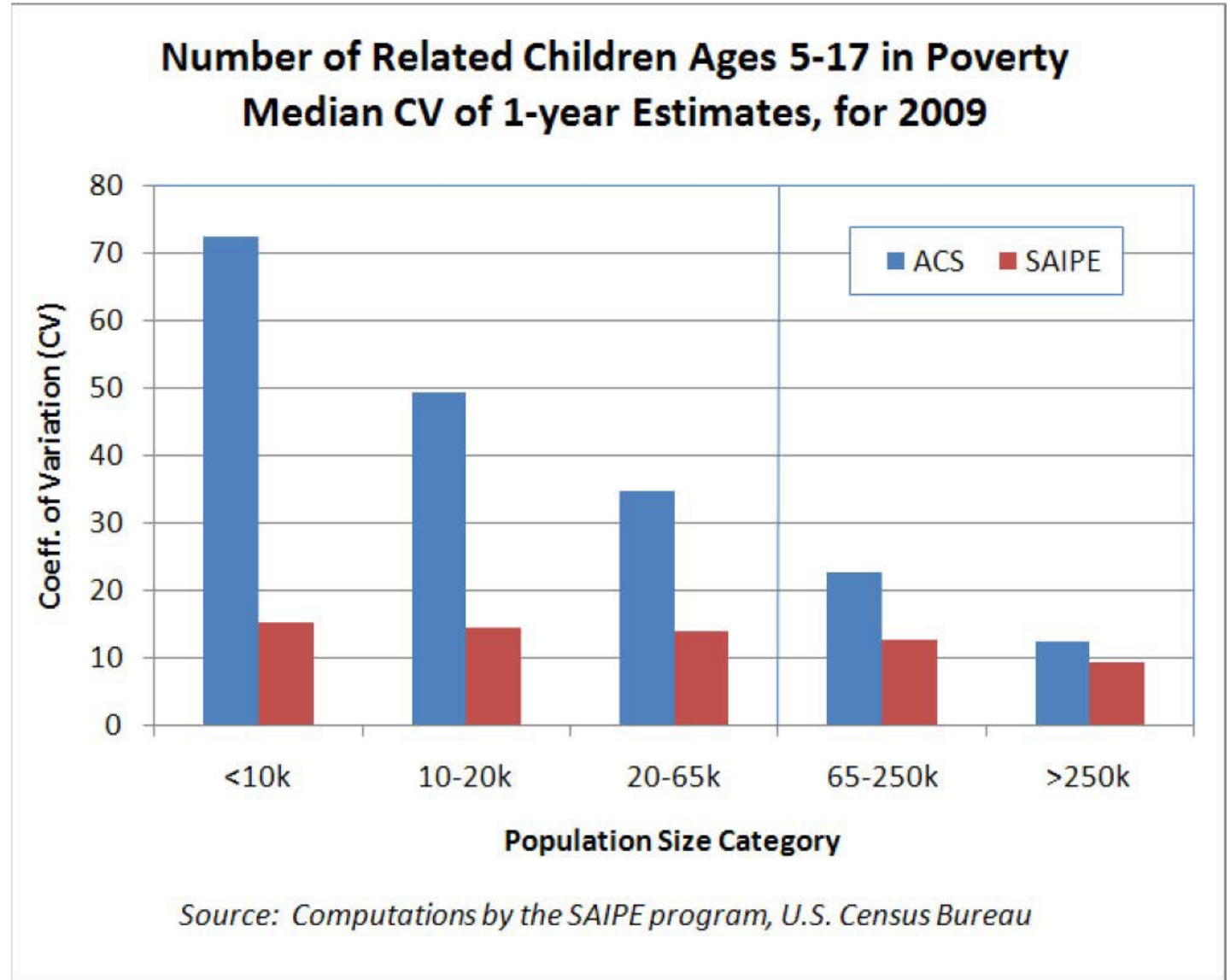
Hearing loss in the United States:

- Developed estimates of two severities of hearing loss for counties by age, race/ethnicity, and gender
- Estimates at this level were **previously unavailable**



SAIPE school-aged children in poverty: SAE enables estimation and publication at the county level

SAIPE uses a (log-transformed) Fay-Herriot model borrowing strength from administrative records and census data



Small area estimation of hearing loss in the United States

DATA HIGHLIGHTS HOW TO USE THE MAP DATA SOURCES DOWNLOAD THE DATA

CLOSE X

COUNTY & STATE DATA TABLES >

Select geography

Counties

MAP FILTERS

Hearing Loss Severity

Any hearing loss

Age Group

All ages

Race/Ethnicity

All races

Gender

All genders

Estimate Type

Crude Prevalence

OVERLAY

Audiologists

Self-Reported Disability

High-Risk Occupation Rate

Socio-Demographic

Economic

Prosperity Index

Percent of Population affected by Any Hearing Loss

All Ages, All Races, All Genders
National Rate: 11.56%

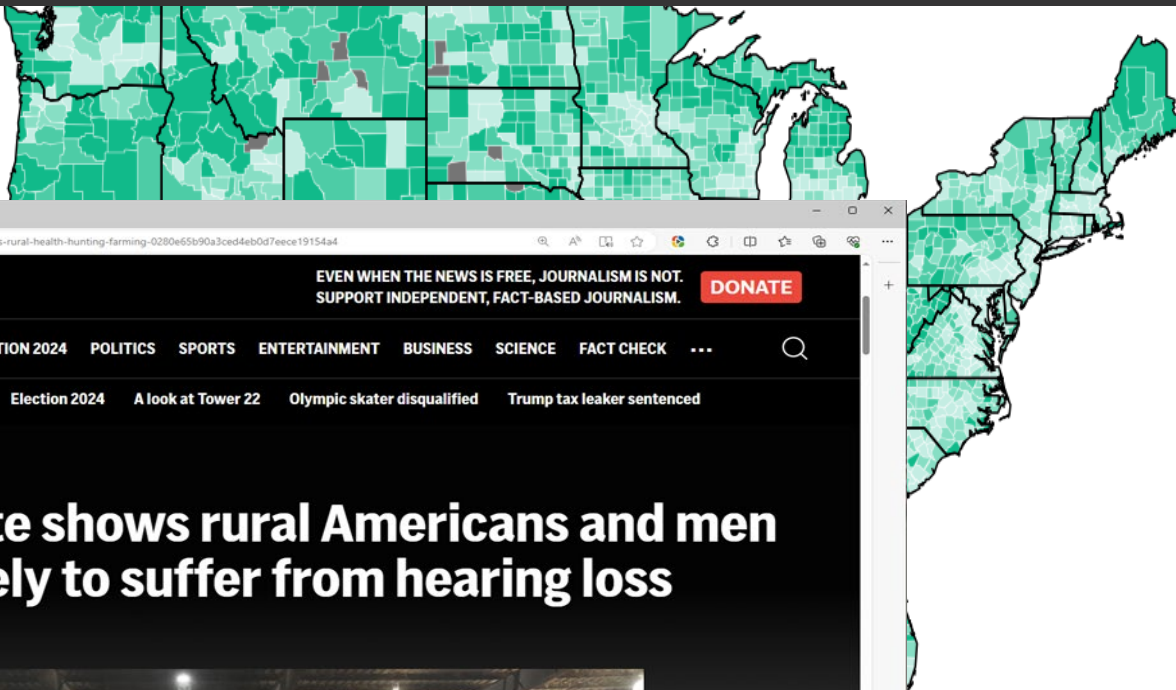
High -

- > 18.8%
- 16.6% - 18.8%
- 12.8% - 16.6%
- 5.2% - 12.8%
- Insufficient Data

Low -

Zoom + -

Dozens of media outlets informed the public about new insights



Work New estimate shows rural Amer... x +
https://apnews.com/article/hearing-loss-rural-health-hunting-farming-0280e65b90a3ced4eb0d7eece19154a4

EVEN WHEN THE NEWS IS FREE, JOURNALISM IS NOT. SUPPORT INDEPENDENT, FACT-BASED JOURNALISM. DONATE

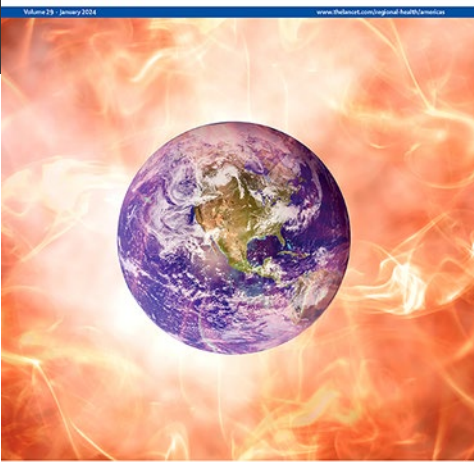
AP WORLD U.S. ELECTION 2024 POLITICS SPORTS ENTERTAINMENT BUSINESS SCIENCE FACT CHECK ...

Israel-Hamas war Election 2024 A look at Tower 22 Olympic skater disqualified Trump tax leaker sentenced

HEALTH

New estimate shows rural Americans and men are more likely to suffer from hearing loss

THE LANCET Regional Health Americas



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Health Policy: Overnight and obesity prevention strategies in Latin America

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The prevalence of bilateral hearing loss in the United States in 2019: a small area estimation modelling approach for obtaining national, state, and county level estimates by demographic subgroup

David B. Sawrey¹, Gordon Frenck², Nicholas S. Reed³, Owen K. Harney-Nahata⁴, Rhoder A. Lamotte⁵, Kristin M. Aggar-Holst⁶, Wen-Hsiung Li⁷, Alvin J. Harman⁸, Karl A. Whitte⁹, and John S. Wittebank¹⁰

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Background: The goal of this study was to re-estimate rates of bilateral hearing loss nationally, and create new estimates of hearing loss prevalence at the U.S. State and County levels.

Methods: We developed small area estimation models of mild, moderate or worse bilateral hearing loss in the U.S. using data from the National Health and Nutrition Examination Surveys (2011–2012, 2013–2018), the American Community Survey (2019), Census County Business Patterns (2019), Social Security Administration Data (2019), Medicare Fee-for-Service and Advantage claims data (2019), the Area Health Resources File (2019), and other sources. We defined hearing loss as mild (0.25 dB through 49 dB), moderate or worse (50 dB), or any (0.25 dB in the better hearing ear based on a 4-frequency pure-tone-average threshold, and created estimates by age group (0–4, 5–17, 18–34, 35–64, 65–74, 75+), gender, race and ethnicity, state, and county.

Findings: We estimated that 37.9 million (95% Uncertainty Interval [U.I.] 36.6–39.1) Americans experienced any bilateral hearing loss; 24.9 million (95% U.I. 23.6–26.0) with mild and 13.0 million (95% U.I. 12.1–13.9) with moderate or worse. The prevalence rate of any hearing loss was 11.6% (95% U.I. 11.2%–12.0%); Hearing loss

With David Rein et al.

Thank you, UN, for the impactful work!

- The need for disaggregated statistics and SAE will only continue to grow
- SAE is crucial to understanding and addressing inequities, planning and evaluating policy interventions, efficient allocation of funds and resources
- The training opportunities that the UN is providing are invaluable!
- Congratulations to all who already participated!
- I encourage others to take advantage of these resources!





Thank you.

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University of
Chicago