Teaching the census

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Data for Good: Bringing Social and Professional Responsibility into the Statistics Classroom

Who am I?

Pure mathematician and an applied statistician.

Teach math, statistics and data science.

Do statistical work on various projects including biological ones.

I dye my hair purple periodically.

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- Small (<1600) liberal arts college in central PA.

- Has data science minor, major, and masters in data science degree

- Statistics is part of the math department. There is one stat Ph.D. and myself.

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Mathematics and Democracy

- Meets Formal Reasoning Requirement for Gen Ed

- Part math: Voting Theory, Apportionment, Gerrymandering

- Part stats: Sampling, Polls, the Census

- Part politics: Guest speakers

- Based off a course designed by Erika Ward

- 4 credits, semester class, about 28 students

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Why the census?

- Usually mentioned when teaching sampling

- Goes well with apportionment and gerrymandering

- Enumerating versus sampling

- Differential undercount

- Data privacy and census data

Census

- "The Census Bureau's mission is to serve as the nation's leading provider of quality data about its people and economy. We honor privacy, protect confidentiality, share our expertise globally, and conduct our work openly."

- Data is released completely after 72 years. 1950 most recent.

- Recent Census data is released anonymized in block groups of between 250 and 550 housing units for entire US.

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2020 Census

- Surprisingly about as accurate as recent censuses

- Special issues about count related to covid

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Enumerating versus sampling

- From article I, section 2 from the U. S. Constitution
  - Representatives and direct Taxes shall be apportioned among the several States which may be included within this Union, according to their respective Numbers.... The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct.

- January 1999: Supreme court rules Census Bureau cannot use sampling for reapportionment purposes

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Differential Undercount in 2020 Census

- Estimated by both the Post Enumerative Survey and Demographic Analysis

- Undercounted:

  - Black, Latino, Native American populations on reservations, persons who selected some other race

  - Children, especially 0 to 4 years

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Data Privacy and the Census Data

- ϵ −differential privacy is used
  - Increasing possible plausible results
  - Involves Jittering results
- Not fake data, but can appear to be so

future tense

Why the Census Invented Nine Fake People in One House

The bureau's zealous efforts to protect Americans' privacy are doing bizarre things to its data.

BY TIMOTHY B. LEE   MARCH 07, 2022 • 5:55 AM

From Slate

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Activities

- Establishment of historical timeline of census and issues by small group work with Prewett's The US Decennial Census: Political Questions, Scientific Answers

- Estimating priority intervals of population and talking about effect on apportionment based on Suzuki's Confidence in the Census

- Reflection on fairness and the census

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Fairness and the census reflection

- Found 3 articles: Two general, one state specific
- Intro about fairness.
- Discussion of fairness and the census
- Discussion of census and chosen state
- A conclusion of what you understand best about mathematical fairness in this class and what you would still like to learn in the future.

References

- Bureau, US Census. "U.S. Census Bureau at a Glance." Census.gov, December 16, 2021. https://www.census.gov/about/what/census-at-a-glance.html.

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- *Director Santos Delivers Remarks About 2020 Census Quality Results*. U.S Census Bureau, 2022. https://www.youtube.com/watch?v=ivw2WU1tpwU.

- Prewitt, Kenneth. "The US Decennial Census: Political Questions, Scientific Answers." *Population and Development Review* 26, no. 1 (2000): 1–16. https://doi.org/10.1111/j.1728-4457.2000.00001.x.

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- Minute Physics and US Census Bureau, "Protecting Privacy with Math." YouTube. YouTube, 2019. https://www.youtube.com/watch?v=pT19VwBAqKA.

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Questions? Comments? Ideas?

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Fairness and the census reflection

- Found 3 articles: Two articles about the fairness and the census in general at least one must talk about statistics or math. One article about how the census is used in their groups state.

- An introduction talking about the idea of fairness as discussed in this class. Reflect on the utility of having mathematical language/reasoning for fairness and what it does and does not capture

- A discussion about fairness specifically in the census discussing at least one mathematical issue and a non-mathematical issue from your articles

- A discussion of the article you found about how the census effects your state and some related part of the census results from your state. How does this interact with the general fairness of the census?

- A conclusion of what you understand best about mathematical fairness in this class and what you would still like to learn in the future.

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