Estimation of Doctors in Each State

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Instructions on obtaining the data

- 1. Go to the IPUMS website and click on "VISIT SITE" under the IPUMS USA section.
- 2. Click on "Get Data".
- 3. Click "Select Samples", uncheck "Default sample from each year", and check only "ACS" for the year 2022.
- 4. Click "Submit Sample Selections".
- 5. Under HOUSEHOLD, hover over "GEOGRAPHIC" and add "STATEICP" to your cart.
- 6. Under PERSON, hover over "DEMOGRAPHIC" and add "SEX" to your cart.
- 7. Under PERSON, hover over "EDUCATION" and add "EDUC" to your cart.
- 8. In your **Data Cart**, you should now see 4 variables and 1 sample. Click "View Cart".
- 9. Click "Create Data Extract".
- 10. Change the **Data Format** from .dat to .csv and click "Apply Selections".
- 11. Click "Submit Extract".
- 12. Wait for the status to become **COMPLETED**, then click "**Download .csv**" under the "Download Data" column.
- 13. Finally, unzip the downloaded file to access your data.

Overview of the ratio estimators approach

1. Let:

- $-R_{CA}$ be the ratio of the number of people with doctoral degrees to total respondents in CA.
- $\text{-}N_{doctoral_degrees,state}$ be the number people with of doctoral degrees in any other state.
- - $N_{respondents,state}$ be the estimated number of respondents in other states.
- 2. Application to Other States: For any other state, the estimated number of total respondents can be expressed as:

$$N_{respondents, state} = \frac{N_{doctoral_degrees, state}}{R_{CA}}$$

This uses the ratio observed in California to estimate the total number of respondents based on the number of doctoral degrees in other states.

Summary table of estimated and actual respondents

Table 1: Estimated and Actual Respondents

state_id	estimated	actual	diff
NA	37043	37369	326
NA	10187	14523	4336
NA	124340	73077	-51263
NA	15064	14077	-987
NA	10928	10401	-527
NA	8088	6860	-1228
NA	9384	9641	257
NA	88779	93166	4387
NA	174656	203891	29235
NA	100015	132605	32590
NA	89952	128046	38094
NA	38277	69843	31566
NA	61182	101512	40330
NA	74888	120666	45778
NA	31672	61967	30295
NA	15928	33586	17658
NA	19818	29940	10122
NA	35314	58984	23670
NA	38339	64551	26212

Table 1: Estimated and Actual Respondents

state_id estimated actual diff NA 9446 19989 10543 NA 3704 8107 4403 NA 4383 9296 4913 NA 94521 88761 -5760 NA 28399 51580 23181 NA 15496 31288 15792 NA 168606 217799 49193 NA 168606 217799 49193 NA 16237 29796 13559 NA 16237 29796 13559 NA 16237 29796 13559 NA 39944 54651 14707 NA 198549 292919 94370 NA 27659 46605 18946 NA 198549 292919 94370 NA 29274 62442 -36832 NA 19824 72374 20452 NA 9816 18135 83				
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	NA	3149	6972	3823
NA 19200 6718 -12482		13212	14995	1783
	NA	19200	6718	-12482

Explanation of the differences

If we estimate the total number of respondents using the ratio estimator approach with Laplace's method, we are assuming that the proportion of people with doctoral degrees is

the same across all states. However, this is not necessarily the case. California, with its many large universities and research institutions, likely has a higher concentration of individuals with doctoral degrees. As a result, the doctor-to-respondent ratio in California would be higher than in other states, leading to an underestimate of the total number of respondents in those states.