Homework 6

36-3313, Fall 2021

Due at 6 pm on **Wednesday, 13 October** 2021

NOTE THE DUE DATE: Thursday, 14 October is the mid-semester break day, when classes don't meet and nothing is supposed to be due. This week's homework is due a day early, but it's also shorter than usual to compensate.

Agenda: Examining inequality in life expectancy; practice in reading studies to see how they use the ideas we've already developed.

Your assignment for this week involves reading the following paper:

- Anne Case and Angus Deaton, "Life expectancy in adulthood is falling for those without a BA degree, but as educational gaps have widened, racial gaps have narrowed", *Proceedings of the National Academy of Sciences* (USA) **118** (2021): e2024777118, doi:10.1073/pnas.2024777118

This is an open-access paper, so you should be able to download it freely from the journal website[1]. Scientific papers are usually written with a fixed order to the sections which is not always the best order to read them in. In this case, I recommend the following reading order:

- The "abstract" at the beginning of the paper (which is a summary of its contents and findings);
- The introduction (the first section of the paper, immediately after the abstract)
- The figures and tables in the "results" section, and their captions;
- The text of the "results" section;
- The "discussion" section;
- Read the "methods" section only after those earlier sections, and perhaps only if it becomes relevant to answer particular questions.

You may also find it useful to watch [https://www.youtube.com/watch?v=vot_IQXIS5M&ab_channel=LSE], which is a presentation by Case and Deaton on their research (including but not just the results in this paper). The original presentation by Case goes up to minute 25, followed by questions and answers which you may also find interesting.

1. *The outcome* (7) What variable is being plotted on the vertical axis in Figures 1, 2 and 3? Why does it have a maximum value of 50? What's being plotted is a summary measure for each population or sub-population — what type of summary is it (mean, median, mode, something else)?

2. *Paired comparisons* Using Table 1, answer the following:

   a. (6) In 1990, what was the average difference in expected years of life between white people and black people (averaging over sex and education)? Which group lived longer? What was the difference in 2018? Had the groups grown more or less unequal?

   b. (6) What was the difference in expected years of life between those with and without BAs in 1990 (averaging over sex and race)? In 2018? Had the groups become more or less unequal?

   c. (6) What was the difference in expected years of life between black women with and without BAs in 1990? In 2018? Had those two groups become more or less unequal?

---

[1]"DOI" stands for "Digital Object Identifier". It's a string which is supposed to be a unique and permanent name for an academic paper or other resource. Going to [https://doi.org/] and plugging in the DOI re-directs you to the official version of the paper. Publishers often change the address of a paper, but they promise (basically) that the DOI will always work.

d. (6) What was the difference in expected years of life between black women with BAs and white women with BAs in 1990 and in 2018? Have these two groups become more or less unequal?

3. *Error bars* In the appendix ("supplemental information"), Case and Deaton present an alternative way of looking at the same basic data, by plotting mortality rates for people aged 25–74 in different groups. Mortality rates are commonly expressed as a certain number of deaths per year 100,000 people.

  a. (1) By 2018, the mortality rate for both black and white men with a BA was below 500 per 100,000. What *probability* per year of dying would a mortality rate of 500 per 100,000 per year correspond to?

  b. (2) According to the Census Bureau, in 2018 there were 10,309,982 non-Hispanic black men between the ages of 25 and 74 [https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-detail.html]. What was the number of black men with at least a BA? *Hint*: you'll need a fact from the introduction to the paper.

  c. (4) Assume that whether or not any two people died in 2018 was independent, given their age, education, sex and race[2]. If the mortality rate for black men with a BA, aged 25–74, was 500 per 100,000, what standard error would you calculate for the annual probability of death?

  d. (3) Case and Deaton don't report any error bars or margins of uncertainty. Based on what you've just calculated, why is that OK?

4. *Trends by sub-groups* Use Figure 3 to answer "true" or "false" to the following. If you think the statement is false, point out a group (or pair of groups) which shows that it's false.

  a. (4) All groups in the population lived longer in 2018 than in 1990.

  b. (4) All groups with BAs lived longer, in 2018, than all groups without BAs.

  c. (4) Both in 1990 and in 2018, women live longer than men, all else being equal.

  d. (4) Since 2010, all groups have been living shorter lives.

  e. (4) Since 2010, all groups without BAs have been living shorter lives, and all groups with BAs have been living longer lives.

  f. (4) All black groups lived longer in 2018 than in 1990.

  g. (4) All groups with BAs lived longer in 2018 than in 1990.

5. *Controls (implicitly)* In Figure 3 and Table 1...

  a. (5) Why does it make sense to include sex as a control variable in all the comparisons?

  b. (5) Should we include education as a control when evaluating inequality between races?

  c. (5) Should we include race as a control when evaluating inequality between educational levels?

6. (5) *Making a case* The title of the paper states a conclusion with three parts: about declining life expectancy for some groups, about changing educational gaps, and about changing racial gaps. How does the paper back up that conclusion? Specifically, what findings in the paper back up each of the three parts of the title?

7. (1) *Timing* How long, roughly, did you spend on this assignment?

Presentation rubric (10): The text is laid out cleanly, with clear divisions between problems and sub-problems. The writing itself is well-organized, free of grammatical and other mechanical errors, and easy to follow. Plots are carefully labeled, with informative and legible titles, axis labels, and (if called for) sub-titles and legends; they are placed near the text of the corresponding problem. All quantitative and mathematical claims are supported by appropriate derivations, included in the text, or calculations in code. Numerical results are reported to appropriate precision.

---

[2]This isn't *quite* true, because some causes of death, notably infectious disease, are correlated. But this is all pre-pandemic data so it's a decent approximation.

NOTE THE DUE DATE!!!!