

Intro to Stats Spring 2021 Exam 3 Grades

Student name: Jacob Hood

Question	Points Got
1a [3pts]	2.5
1b [4pts]	4
1c [4pts]	2
1d [2pts]	2
1e [4pts]	0.5
2a [4pts]	3.5
2b [4pts]	1.5
Total	16/25

1a: The interaction term will have its own coefficient, instead of the multiplication of β_{female} and β_{2015} . See solution for correct notations.

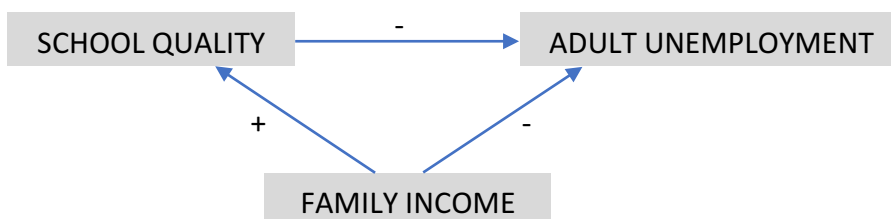
1c: There might be some mistake in your calculation of the gender gap in 1995. Should be 18.8.

1e: See solution. I will go through this question in this week's lab.

- The question states that we will focus on the 2015 data, therefore, the YEAR dummy should be removed in your equation.
- Similar to 1a, the interaction terms should have its own coefficients. See solution for correct notations.
- Since we want to know the **difference in gender gap between SOME COLLEGE and BA&HIGHER**, the reference group should be either SOME COLLEGE or BA&HIGHER.
- If we use SOME COLLEGE as the reference, the interaction terms should be **FEMALE*BA&HIGHER** and **FEMALE*HIGH SCHOOL**, and the coefficient of **FEMALE*BA&HIGHER** tells us the **difference in gender gap** between SOME COLLEGE and BA&HIGHER.

2a: It is possible that the relationship between school quality and unemployment is entirely spurious, but it is more likely that there will still be some effect of school quality on unemployment after controlling for family income.

For the diagram, need to show how the confounder affects X and Y, so the correct answer would show FAMILY INCOME as a confounder that positively affects school quality and negatively affects unemployment.



2b: You need to provide a more detailed justification for why state-level unemployment could be a **confounder**. A confounder needs to be causally directed to *both* SCHOOL QUALITY and ADULT UNEMPLOYMENT. Whereas in your case, the state-level unemployment is more like a **result** of some state-level cause/confounder such as a state's poverty rate or average income.

Jacob Hood

Inro Stats – March 22nd, 2021

Exam 3

1. Dummy variable for female where female =1 and for 2015 where 2015 =1
 - a. $\hat{Y} = \beta_0 + \beta_{\text{female}}X^1 + \beta_{2015}X^2 + (\beta_{\text{female}}X^1)(\beta_{2015}X^2)$
 - b. Woman in 1995 = 15.7/ Woman in 2015 = 21.3
 - c. Gender gap in 1995 = 53.3//Gender gap in 2015 = 22.4
 - d. Subgroup = Men in 1995
 - e. $\hat{Y} = \beta_0 + \beta_{\text{female}}X^1 + \beta_{2015}X^2 + (\beta_{\text{female}}X^1)(\beta_{2015}X^2) + (\beta_{\text{female}}X^1)(\beta_{2015}X^2)(\beta_{\text{some.col}^3}) + (\beta_{\text{female}}X^1)(\beta_{2015}X^2)(\beta_{\text{Dhigher}^4})$ //Focused on coefficient of last two interaction terms
2. If family income is a confounder, then it is likely that the claimed relationship is actually a spurious relationship between quality of childhood schooling and adult probability of employment – meaning that the relationship between the two would disappear if family income was controlled for

a. Qual. of Childhood Ed → Adult Unemployment



Family Income

- b. A possible state level confounder could be state levels of unemployment. Thus, without controlling for state-specific levels of unemployment, it would not be possible to say that quality of education affects unemployment in certain ways across all people in all states.