### ECON 125 Midterm Practice Question Solutions

1. The Demographic Balancing Equation says that population growth is always equal to the crude birth rate minus the crude mortality rate. True or false? Explain.

False. The Demographic Balancing Equation says that population growth equals the crude birth rate minus the crude mortality rate plus the net migration rate. It equals the crude birth rate minus the crude mortality rate only in populations with no net migration.

2. Cohort life expectancy is the same as the average age at death. True or false? Explain.

*True. Cohort life expectancy (at birth) is the expected length of life for an individual who experiences the cohort's age-specific mortality rate at every age of her life. This is equivalent to the cohort's average age at death. (You could have also answered false because I did not specify cohort life expectancy **at birth**. Your explanation is what matters for your score.)*

The graph below reports the crude mortality rate (per 1000) over time in historical England.
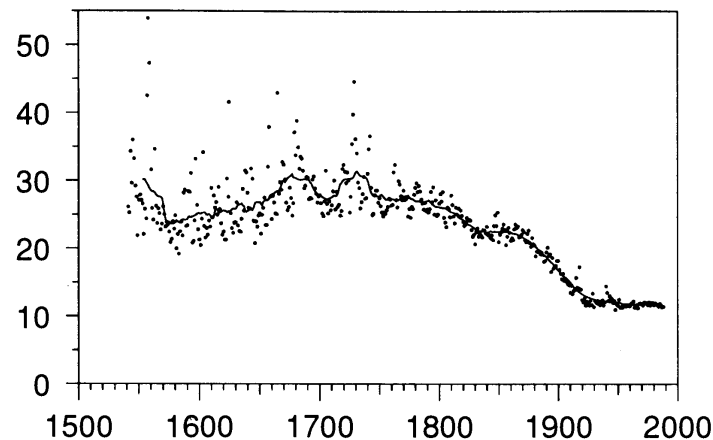
3. How is the crude mortality rate defined? What are its pros and cons relative to other measures of mortality?

The crude mortality rate equals the total number of deaths divided by the total number of people in the population. The pros are that it is easy to compute and only requires limited data. The con is that it does not account for the age structure of the population, so that population aging will raise the crude mortality rate even if age-specific mortality rates do not change.

4. From the mid 1500s to early 1700s, the crude mortality rate was high and volatile. In Malthus's view, what caused this volatility?

Malthus argued that mortality was a "positive check" on population and that it increased when the size of the population was larger than the capacity of the economy. Mortality rose during crises like droughts, famines, and epidemics. Mortality fell during times of relative abundance, such as when the population was small or when new production technologies were developed.

5. From the late 1700s to early 1900s, the crude mortality rate steadily declined. In the reading for week 2, what factors do Cutler et al. argue drove this decline?

Cutler et al. argue that improved nutrition due to economic growth drove mortality decline in the late 1700s and early to mid 1800s. After the widespread acceptance of the germ theory of disease in the late 1800s, the public health interventions became the main driver of mortality decline. These include clean water and sanitation systems, among others.

6. The crude mortality rate was flat through the second half of the 20th century. Do you think this pattern reflects stagnation in mortality decline? Why or why not?

The flattening of the crude mortality rate after 1950 is likely an artifact of population aging. The second half of the 20th century was a period of medical advance and rising longevity. As a result of rising longevity, the population became older, leading to more deaths per population.

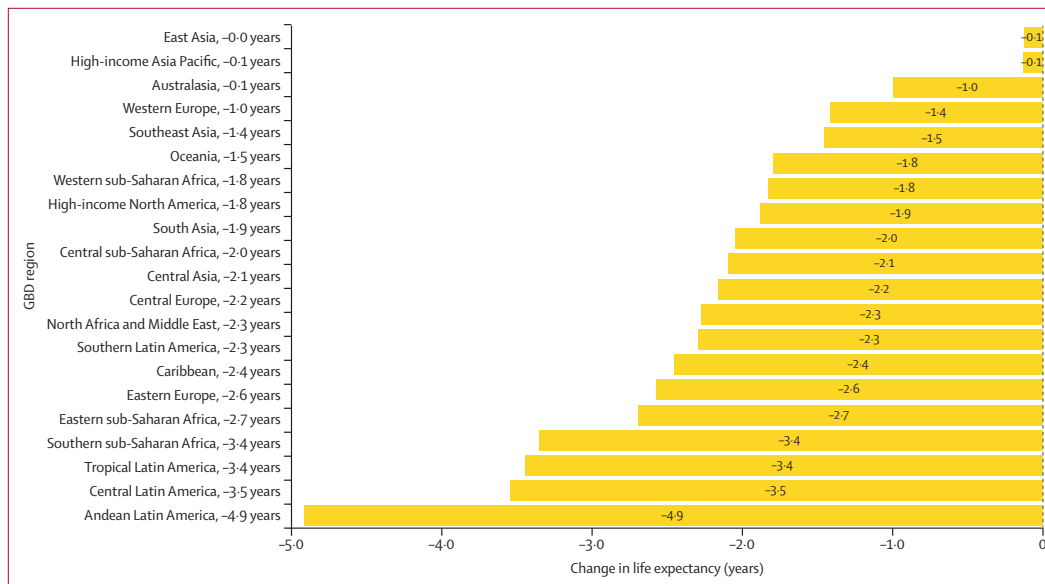The graph below is taken from the reading for week 3, by the GBD 2021 team.

Figure 6: **Effect of COVID-19 on life expectancy by GBD region, 2019–21**
For readability, labels indicating a change in life expectancy of less than 0·05 years are not shown. GBD=Global Burden of Diseases, Injuries, and Risk Factors Study.

7. In which parts of the world did COVID-19 have the largest effect on life expectancy at birth? Conceptually explain the magnitude of the effect for the most affected region.

COVID-19 had the largest effects in the three Latin American regions, with a maximum in Andean Latin America. The magnitude of -4.9 years means that life expectancy was 4.9 years lower than it would have been if age-specific mortality rates from COVID-19 were 0 and age-specific mortality rates from all other causes were unchanged.

8. COVID-19 was a leading cause of death in 2021. What was one other leading cause of death in that year?

The leading cause of death in all study years was heart disease.

The graph below is taken from the reading for week 4, by Bongaarts and Casterline.

FIGURE 7   Trends in ideal number of children by total fertility rate
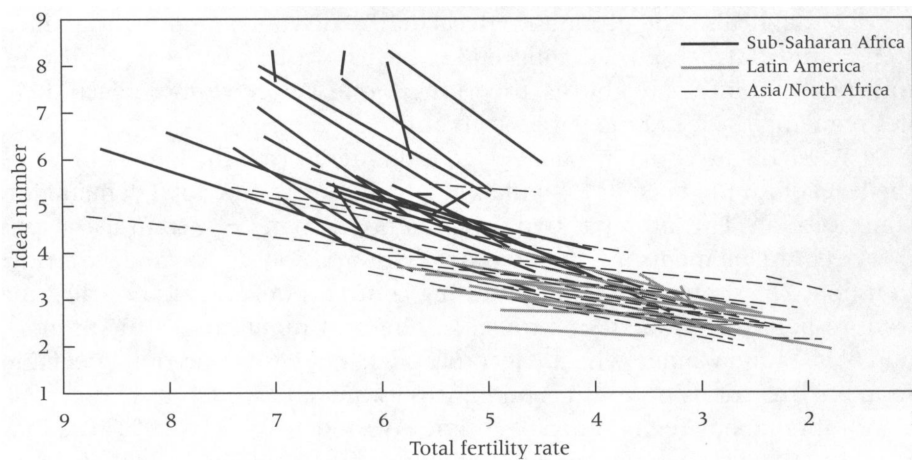
NOTE: Earliest and most recent survey in each country, n = 63 countries.

9. What does the graph reveal about the relationship between the total fertility rate and the ideal number of children? Is the within-country relationship similar to or different from the cross-country relationship?

The graph reveals that a higher total fertility rate is associated with a higher average ideal number of children. Each line corresponds to a separate country, such that the slope of the line corresponds to a country's trajectory over time. Women in higher fertility countries tend to want more children, and as fertility declines within a country over time, women report wanting fewer children. The within-country relationship is broadly similar to the cross-country relationship, although sub-Saharan African countries tend to have higher fertility ideals than is predicted by the within-country relationship or the cross-country relationship in other regions.

10. Describe one conclusion Bongaarts and Casterline draw from this graph regarding Africa's high level of fertility.

Bongaarts and Casterline interpret the high average ideal number of children in African countries, even at a given level of the total fertility rate, is consistent with pronatalism. They argue that pronatalist culture in Africa helps explain why Africa has high fertility rates and why fertility decline in Africa has been later and slower than in other world regions.