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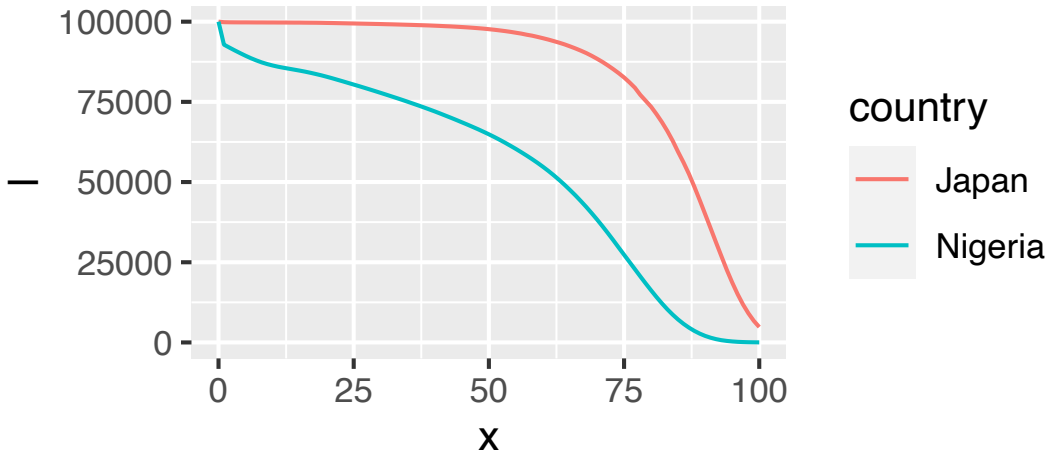
Spring 2025 ECON 125 Final

You have two hours to complete the exam. Please write your answers in the space provided. You may to refer to a one-page 8.5" x 11" note sheet, written in your own handwriting on both sides of the page. There are 25 questions, each worth the same number of points.

PART I. The graph below is taken from the Week 2 Methods slides. It shows the survivorship curves associated with 2023 death rates for Japan and Nigeria.



1. From $x = 0$ to $x = 10$, Japan's survivorship appears flat, while Nigeria's falls sharply at first and then gradually. Why do these patterns differ between the two countries?

The sharp drop followed by gradual decline in Nigeria is due to high mortality risk in infancy followed by moderate mortality risk in childhood. Mortality risk in Japan is very low throughout infancy and childhood, hence the flat survivorship curve.

Some of you answered that Japan has better socioeconomic determinants of mortality. This is not what the question was intended to ask, but it was a reasonable interpretation of the question. If you gave a correct answer given this alternative interpretation, you got full credit.

2. In terms of the concepts we discussed in class, what does the area between the two curves represent? Is this representation exact or approximate? Explain why.

The area under each curve (divided by 100,000) is life expectancy at birth in each country, so the area between the two curves (divided by 100,000) is the *difference* in life expectancy at birth between countries. It is approximate because the Japanese survivorship curve has not reached 0 at the oldest age. Some of you also argued that it is approximate because age is not measured continuously, which is also an acceptable answer.

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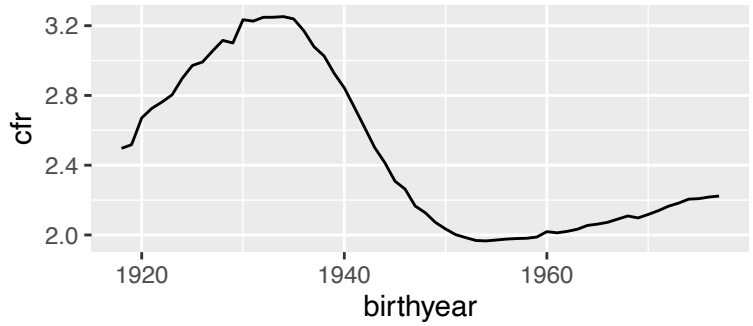
3. Suppose a group of people experiences Nigeria's survivorship curve starting at birth. By roughly which age will three-quarters of them have died?

Three-quarters will have died when the survivorship curve crosses 25,000 (or 25% of 100,000). For Nigeria, this happens at roughly age 75 or 76.

PART II. The graph below is taken from the Week 3 Methods slides. It shows US completed fertility rates by birth year.



4. How is the completed fertility rate defined? How do we interpret its values for 1940 and 1960?

The completed fertility rate is defined as a cohort's average number of children ever born. Women born in 1940 averaged 2.8 children over their lifetimes, while women born in 1960 averaged 2.0 children over their lifetimes.

5. How is the completed fertility rate different from the total fertility rate? Which measure is typically more volatile (i.e., reaching higher highs and lower lows)?

The completed fertility rate is a cohort aggregate, while the total fertility rate is a period aggregate. In other words, the completed fertility rate is the average lifetime number of children for women from the same birth year, while the total fertility rate it the number of children a woman would expect to have if she experienced current age-specific fertility rates over her lifetime. The total fertility rate is typically more volatile because year-to-year fluctuations tend to get averaged out in the cohort rate.

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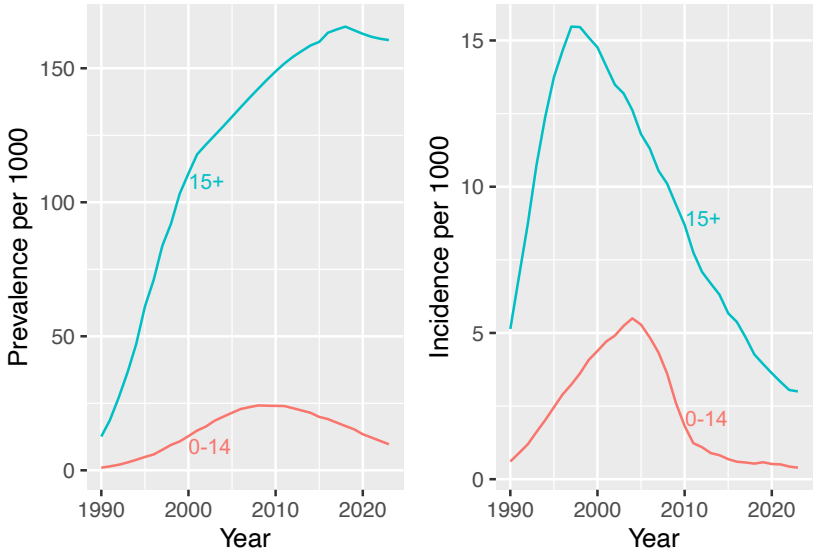
PART III. The graph below is taken from the Week 4 Methods slides. It shows HIV prevalence and incidence over time by age group in South Africa.



6. Define prevalence and incidence.

Prevalence equals the number of people living with the disease divided by the population, or equivalently the share of people living with the disease. Incidence equals the number of new infections during a period divided the person-time at risk, or the flow rate of new infections. In these annual data, incidence approximately equals the number of new infections divided by the number of uninfected people. Any of these statements received full credit.

7. Explain how the shape of the 15+ incidence curve influences the shape of the 15+ prevalence curve. Be specific about relating where the curves change slope.

The higher the incidence rate (a flow), the steeper the slope of the prevalence ratio (a stock). Along these lines, after the incidence rate peaks in the late 1990s, the slope of the prevalence ratio decreases.

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6. In South Africa, HIV is mainly spread by sexual or mother-to-child transmission (MTST). Behavior change and treatment both reduce sexual transmission; only treatment reduces MTST. What does the graph suggest about the timing of behavior change and access to treatment?

Sexual transmission affects incidence among adults, while MTST affects incidence among children. Since adult incidence starts declining in the late 1990s while child incidence starts declining in the mid-2000s, the graph suggests that behavior change preceded access to treatment.

PART IV. The table below is excerpted from the Week 5 reading, "Delayed Marriage and Very Low Fertility in Pacific Asia," by Jones.

TABLE 3 Comparison of the percentage of single, never-cohabited (European countries) and the percentage of single, never-married (Pacific Asian countries) men and women combined aged 25–34, 2000

Europe (1)	% single (2)	% single, not currently cohabiting (3)	% single, never cohabited (4)	Pacific Asia (5)	% single (6)	% single in city (7)
Sweden	72	33	13	Japan	49.1	
Denmark	63	31	14	South Korea	37.6	47.7
Finland	57	28	17	Hong Kong	51.6	51.6
Great Britain	43	32	16	Taiwan	42.3[a]	

7. What fact does the table show about Asia? How is Asia different from Europe, in Jones' view?

The table shows that a large share of 25-34 year-olds are single in the Asian countries. Jones argues that although a large share of 25-34 year-olds are also single in European countries, the European countries have high rates of cohabitation, which makes "effective singlehood" rarer and lessens the consequences for fertility rates. (You could get full credit without using the term "effective singlehood" or mentioning fertility consequences.)

8. Jones writes about several possible reasons for the pattern in Asia. Describe one of them.

Jones suggests…

- **declines in men's job security may have made marriage less attractive**
- **rising women's but not men's education may have created a "marriage squeeze" that made marriage less attractive for more-educated women and less-educated men**
- **fear of divorce may have made marriage less attractive to women**
- **increased family burdens from aging parents (and parents-in-law) may have made marriage less attractive to women**
- **increased female labor force participation may have made marriage less economically crucial for women and may have made family life more burdensome**
- **increased child costs, for example related to education, may have made family life more burdensome to women**
- **rising individualism and emphasis on self-realization may have made marriage less attractive to women**

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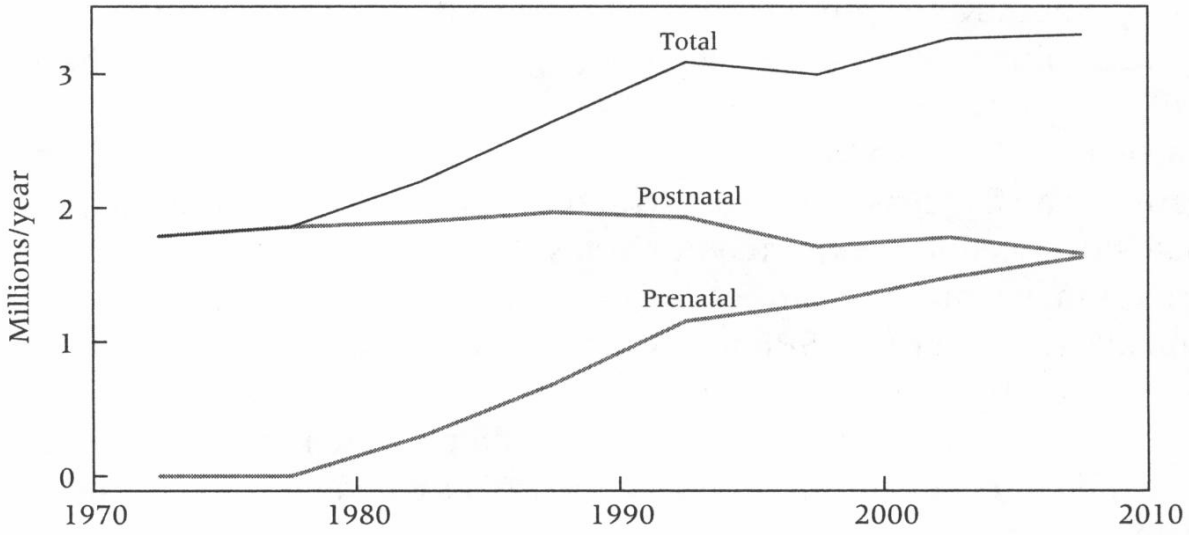
PART V. The graph below is taken from the Week 6 reading, "How Many More Missing Women," by Bongaarts and Guilmoto.

FIGURE 9 Annual number of newly missing females, 1970–75 to 2005–10



SOURCE: Computed by the authors from United Nations (2013a).

9. Amartya Sen coined the term "missing women." How did he estimate their number?

Sen noted that the sex ratio—the number of males divided by the number of females—was much higher in several Asian countries than in Western countries. To make Asian sex ratios equal to Western sex ratios, one would need to add 11% more women, amounting to over 100 million women, to the denominator. Sen argued that these women would have been alive and part of the population if they did not face gender discrimination.

10. What does the "Postnatal" curve quantify? Write one reason for "Postnatal" missing females.

The "Postnatal" curve quantifies the number of women newly missing from the population because of excess mortality after birth. Reasons include (i) the deprivation of daughters of the same nutritional resources available to their brothers, (ii) higher poverty rates among girls than boys because girls live in larger families due to son-biased fertility stopping, and (iii) the neglect of widows. You got credit for other reasons if they were sensible.

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11. What does the "Prenatal" curve quantify? Why does it rise so much in the 1980s?

The "Prenatal" curve quantifies the number of girls newly missing from the population because of sex-selective abortion. It rises in the 1980s because prenatal ultrasound and abortion became more accessible, especially in China. (You got full credit for any mention of rising availability of sex-selective abortion.)

PART VI. The graph below is taken from the Week 7 reading, "Immigration in American Economic History," by Abramitzky and Boustan.

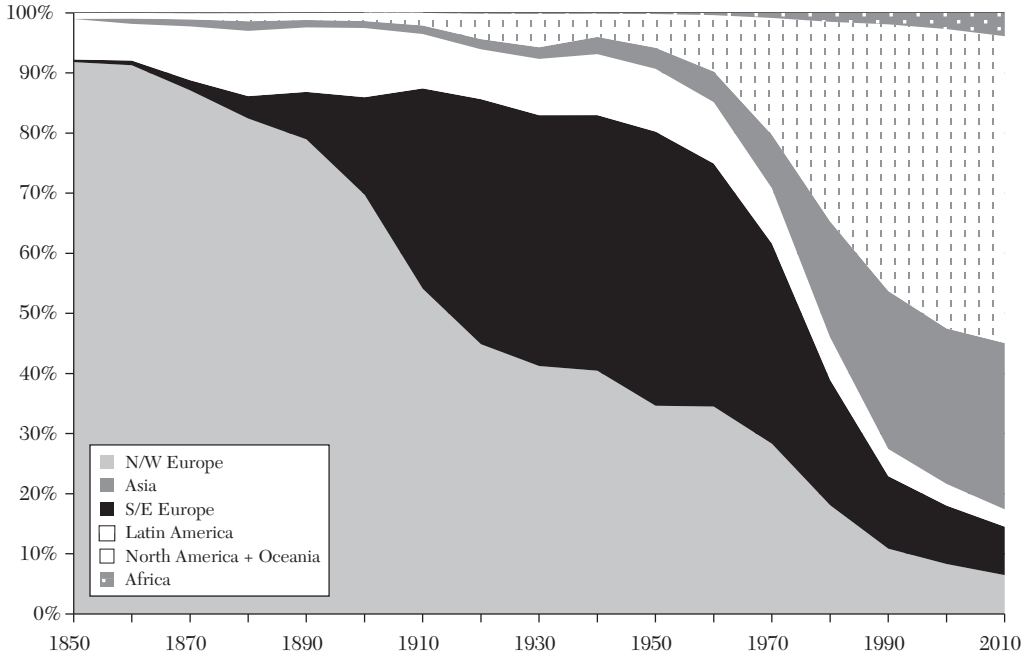

Figure 2. Sending Regions within the Foreign-Born Population, 1850–2010

12. Which periods of immigration do Abramitzky and Boustan describe in the graph? How did the composition of sending countries differ between these two periods?

Abramitzky and Boustan describe two waves of immigration. The first wave, from the mid-1800s to the early-1900s, is the Age of Mass Migration. The second wave, starting in the 1960s, is the period of renewed mass migration. The Age of Mass Migration mainly involved migrants from Europe, while the period of renewed mass migration mainly involves migrants from Asia and Latin America.

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13. Abramitzky and Boustan describe the concepts of positive and negative selection. What do these concepts mean?

Positive selection means that immigrants come disproportionately from the top part of the socioeconomic or skill distributions in their home countries. Negative selection means that immigrants come disproportionately from the bottom part of these distributions.

14. Do Abramitzky and Boustan argue that immigrants have been consistently positively selected over the course of US history? Or do they argue that the nature of selection depended on the period and country of origin? What kind of model do they use to understand these facts?

Abramitzky and Boustan argue that the nature of selection has depended on the context. Historical migrants were sometimes positively selected, sometimes neutrally selected, and sometimes positively selected. Recent migrants are increasingly positively selected, but not uniformly (with Mexico being a key counterexample). (You could have just written the first sentence, without these details.) Abramitzky and Boustan use the Roy Model of self-selection to understand these facts.

PART VI. The graphs below are taken from the Week 8 reading, "The Global Demography of Aging," by Bloom and Luca.

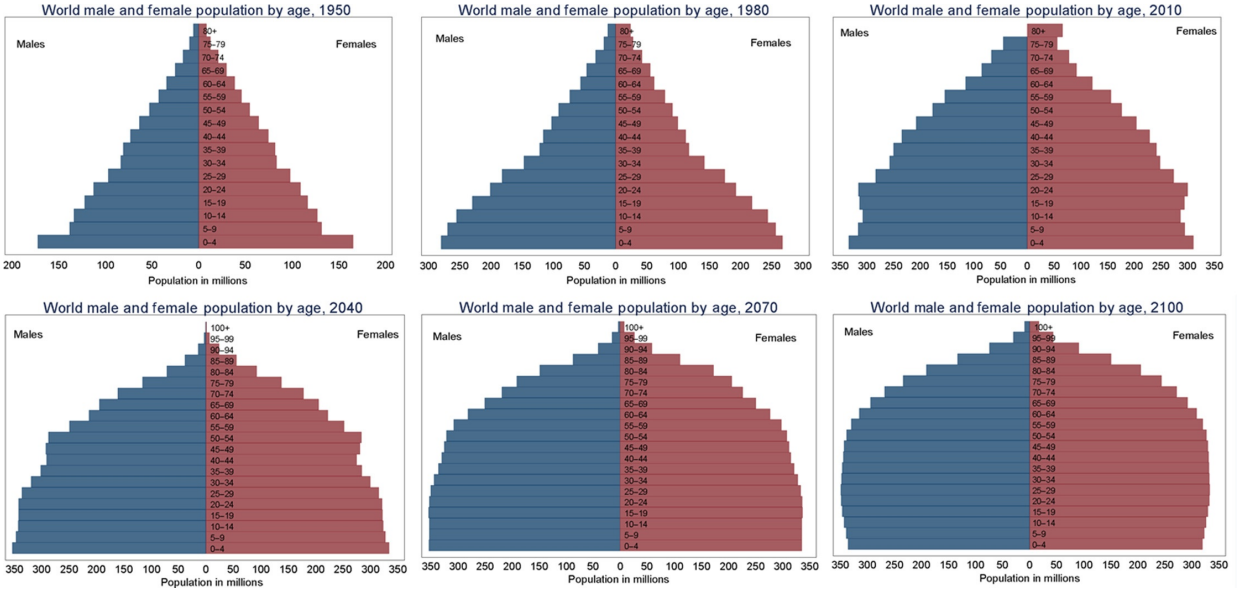

Fig. 1 World population by age group, 1950–2100. *Source: UN, World Population Prospects, 2015.*

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15. What are these graphs called?

The graphs are called population pyramids. You also got full credit if you named the shapes, e.g., pyramids, domes, and beehives.

16. How do fertility and mortality decline explain the different shapes for 1950 and 2100?

Fertility and mortality were high in 1950, so the base was wide (with many children) and thinned quickly with rising age (due to mortality). Fertility decline pulled in the base, and mortality decline widened the middle and top. By 2100, fertility is projected to decline by so much that the base will be narrower than the middle. (You could have noted the shapes we discussed in class—pyramid, dome, and beehive—but it was not necessary for full credit.)

17. Suppose World War III broke out in the decade before 2100. How would you expect the graph for 2100 to change?

We discussed in class how past world wars resulted in a deficit of military-age men (due to war deaths) and a deficit of babies (due to the curtailment of childbearing during war). Given these past patterns, we might expect to see fewer men in their 20s and 30s (making the pyramid look imbalanced), and even fewer young children (making the beehive shape even more pronounced).

Alternatively, you could have noted that these effects of past world wars were only visible in select *national* populations, not the world population, so that we should not expect the graph to change.

18. The 2040 graph is based on population projections made in the 2010-15 period. For which ages are these projections more certain? For which ages are they less certain? Explain why.

Bloom and Lee explain that projections are less uncertain for cohorts that have already been born, before they reach ages with significant mortality risk. So the projections are more certain at middle ages. Below age 30, the projections for 2040 will be more uncertain because they will be sensitive to predicted fertility flows. And at old ages, say 65+, the projections will be similarly sensitive to predicted mortality flows.

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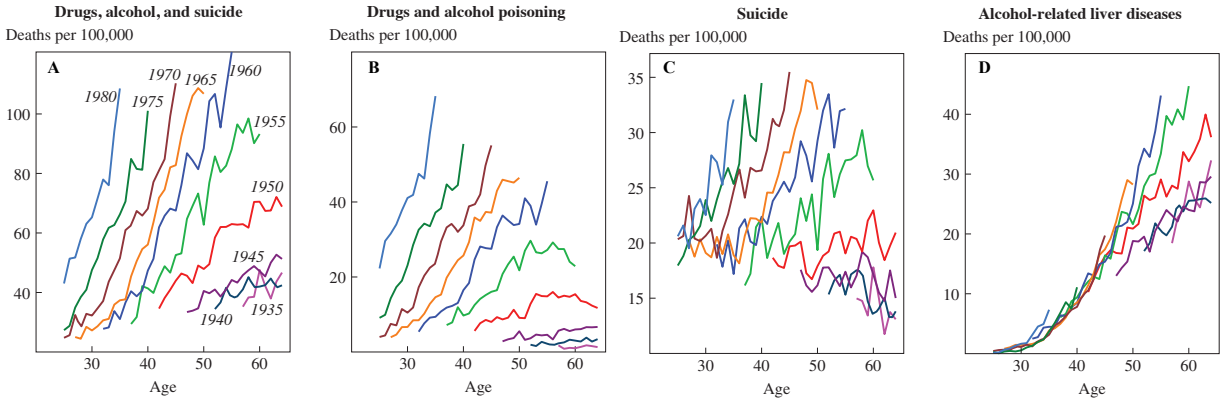
PART VII. The graphs below are taken from the Week 9 reading, "Mortality and Morbidity in the 21st Century," by Case and Deaton. They plot death rates among less-educated non-Hispanic whites for three causes, either combined (panel A) or separately (panels B-D), by age and cohort.



19. What do Case and Deaton call these causes of death? In their view, what broader mortality trend do these causes of death help explain?

Case and Deaton call them "deaths of despair." They argue that "deaths of despair" help explain why midlife mortality in the United States has been rising and falling behind other industrialized countries.

20. Looking at Panel A, did death rates from drugs, alcohol, and suicide at age 50 rise in the 1990s and 2000s? Explain.

Yes, death rates at age 50 rose in the 1990s and 2000s. You can see this by comparing successive cohorts at age 50. The 1945 cohort, which reached age 50 in 1995, had a death rate less than 40. The 1950 cohort, which reached age 50 in 2000, had a death rate over 40. The 1955 cohort, which reached age 50 in 2005, had a death rate over 50. And so on.

21. Looking at Panels B-D, which causes exhibit age effects across all ages? Explain.

Only Panel D shows a clear slope with respect to age across all ages, so only alcohol-related liver diseases exhibit age effects across all ages. Panels B and C show positive slopes at younger ages but are flat at older ages.

22. Looking at Panels B-D, which causes exhibit cohort effects across all cohorts? Explain.

Only Panel B shows clear vertical gaps between all cohort age profiles, so only drugs and alcohol poisoning exhibit cohort effects across all cohorts. Panels C and D show some vertical gaps, but they are not consistent across all cohorts and all ages.

PART VIII. General questions.

23. For studying mortality and fertility, what are the pros and cons of using period measures versus cohort measures?

Period measures give an up-to-date snapshot of current demographic outcomes, but they summarize a synthetic (or hypothetical) group of people. Cohort measures summarize the demographic outcomes of an actual group of people, but we have to wait until those people have aged out of being at risk for that outcome.

24. Is there a method that can always differentiate between age, period, and cohort effects, no matter the outcome? Explain why or why not.

No, no method can differentiate age, period, and cohort effects, no matter the outcome. Age, period, and cohort are linearly dependent, so their influences generally cannot be separated. (Sometimes it is possible to restrict at least one of them based on scientific or conceptual knowledge, which may allow us to separate the other two. But these sorts of restrictions depend on the specific phenomenon under study.)

25. Is the coming decline of the world population consistent with Malthusian theory? Why or why not?

No, the coming decline of the world population is not consistent with Malthusian theory. Malthusian theory predicts that population shrinks in response to low economic output. But the world economy is richer than ever in the past and still growing, yet it is projected to shrink amidst this prosperity. (You could have argued that low fertility is the result of "moral restraint" and is the reason for our prosperity. That is extremely unlikely to be true, but it demonstrates an understanding of the Malthusian model so would get full credit.)