

UNIVERSITY OF SWAZILAND

MAIN EXAMINATION 2014/15

TITLE OF PAPER: DEMOGRAPHIC METHODS

COURSE NUMBER: DEM 202

TIME ALLOWED: 3 HOURS

INSTRUCTIONS: ANSWER QUESTION 1 AND 2 AND ANY TWO QUESTIONS FROM SECTION B. ALL QUESTIONS ARE WORTH 25 MARKS EACH.

REQUIREMENTS: CALCULATOR

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GIVEN BY THE INVIGILATOR

SECTION A: COMPULSORY

Question 1

- a) What is standardization? Why is it necessary to standardize rates(4)
- b) Back in 1950, the Crude Death Rates (CDRs) for Sweden and Japan were very similar, 10.0 and 10.9 deaths per 1000 respectively. The direct standardized rate for Japan using the Swedish age distribution as the standard was 15.7.
- I. Explain what this standardized estimate means. (2)
 - II. Describe what the results say about the mortality levels in the two countries. (3)
- c) The difference in crude death rates for Country A and B below is partly due to mortality differences and partly due to differences in age composition. Decompose the death rates for the two populations to determine how much of the difference is due to each of the two components. (16)

Table 1: Population and Deaths (in thousands) by age, Countries A and B

| Age group | Country A | | Country B | |
|--------------|----------------|-------------|---------------|-------------|
| | Population | Deaths | Population | Deaths |
| 0-19 | 6418.0 | 30.6 | 1415.2 | 1.5 |
| 20-39 | 2736.1 | 4.8 | 1505.5 | 2.1 |
| 40-59 | 1220.6 | 4.7 | 1062.2 | 7.4 |
| 60+ | 588.0 | 8.0 | 742.3 | 34.1 |
| Total | 10962.7 | 48.1 | 4752.2 | 45.1 |

Question 2

- a) Explain the difference between a ratio and rate. Provide an example for each type of measure. (3)
- b) Is the Crude Birth Rate (CBR) a better index of fertility than the Crude Death Rate (CDR) is of mortality? Why or why not? (3)
- c) If you only have census data on the age/sex structure of the population and total counts of births and deaths, how may you improve the index ? (3)
- d) In what way is the General Fertility Rate (GFR) a better measure of fertility than the CBR? (2)

- e) What is the major limitation of using the period TFR to measure trends in fertility? (2)
- f) Using the data presented in the table below, calculate the following:
- Crude Birth Rate given that the total population is 4 536 994 (2)
 - General Fertility Rate (2)
 - Total Fertility Rate (5)
 - Child –Woman Ratio given that the number of children aged 0-4 years in the population comprise 904 394 males and 925 080 females. (3)

Table 2: Female Population by age and births for a hypothetical population

| Age group | No. of Women | Total Births |
|--------------|------------------|----------------|
| 15-19 | 410 352 | 56 403 |
| 20-24 | 378 163 | 97 166 |
| 25-29 | 377 011 | 93 415 |
| 30-34 | 296 799 | 57 694 |
| 35-39 | 235 697 | 34 478 |
| 40-44 | 190 328 | 13 078 |
| 45-49 | 148 534 | 4 564 |
| Total | 2 036 884 | 356 780 |

SECTION B: ANSWER ANY TWO QUESTIONS

Question 3

- a) Complete the following table. (15)

Table 3: Abridged life table for USA, 2004

| Age | Population | Deaths | ${}_nM_x$ | ${}_nq_x$ | l_x | ${}_nd_x$ | ${}_nL_x$ | T_x | e_x |
|-------|------------|--------|-----------|-----------|--------|-----------|-----------|---------|-------|
| 0-1 | 1957337 | 11568 | | | 100000 | | | | |
| 1-4 | 7965041 | 1991 | | | | | | | |
| 5-9 | 9580605 | 1245 | | | | | | | |
| 10-14 | 10307570 | 1546 | | | | | | | |
| 15-19 | 10092051 | 3835 | | | | | 495660 | 6573166 | |

- b) In a certain country, the life expectancy at birth in 2007 was 77 years. Provide an explanation of what this means in terms understandable by non-demographers. (2)
- c) Describe two uses of life tables. (4)
- d) Use the data below to calculate crude incidence and prevalence rates per 100 000 population : (4)
- Total estimated population: 452 780
 - Total cases of AIDS: 850
 - Total new cases of AIDS: 95
 - Total deaths from AIDS: 595

Question 4

- a) Define the following gross nuptiality table functions and provide the formula used for computing each function:
- i. ${}_nH_x$ (2)
 - ii. P_x (2)
 - iii. ${}_nL_x$ (2)
- b) Provide the formula for computing the singulate mean age at marriage (SMAM) and using the data given below, calculate the SMAM for females in England. (7)

Table 4: Proportions of Females Never Married, England, 1981

| Age group | % single England |
|-----------|------------------|
| 15-19 | 97.9 |
| 20-24 | 63.2 |
| 25-29 | 25.7 |
| 30-34 | 13.8 |
| 35-39 | 11.1 |
| 40-44 | 10.8 |
| 45-49 | 9.9 |
| 50-54 | 8.7 |

- c) Why is it necessary to adjust the conventional infant mortality rate? (3)
- d) Generally, there are 3 major reasons why people die. Discuss. (9)

Question 5

- a) What are the limitations of the national growth rate method for estimating internal migration?(4)
- b) What is the main difference between the forward survival ratio method and the reverse survival ratio method? (2)

- c) List the sources of data that could be used for the analysis of migration. (3)
- d) Using the life table forward survival ratio method, calculate
- i. the number of net migrants for the age groups 15-19,20-24,35-39 and 40-44 in 2001. (8)
 - ii. The net intercensal migration rates for the above age groups. (8)

Table 5: Net migration estimates for a coastal region

| Age in 1996 | Age in 2001 | ${}_5S_x$ (survivorship ratio) | Population in 1996 | Population in 2001 |
|-------------|-------------|-----------------------------------|--------------------|--------------------|
| 10-14 | 15-19 | 0.99672 | 98415 | 101045 |
| 15-19 | 20-24 | 0.99207 | 93957 | 101544 |
| 20-24 | 25-29 | 0.99259 | 84342 | 93220 |
| 25-29 | 30-34 | 0.99350 | 83598 | 92756 |
| 30-34 | 35-39 | 0.99301 | 70191 | 77853 |
| 35-39 | 40-44 | 0.98956 | 59982 | 64334 |
| 40-44 | 45-49 | 0.98223 | 53313 | 55713 |
| 45-49 | 50-54 | 0.96979 | 55775 | 57715 |

Question 6

- a) What data are needed to implement a cohort component projection? (3)
- b) You are given a female population (in 5 year age groups), a female life table, and age specific fertility rates for a population in 2010. List the steps you would need to take and the assumptions you would need to make to predict the number of females under age 5 in 2015? (6)
- c) Define a Parity Progression Ratio. What data are required to compute the PPRs? (3)
- c) Suppose a certain hypothetical birth cohort for women has the following parity progression ratios:
- $P_1 = 0.890$
 $P_2 = 0.857$
 $P_3 = 0.516$
 $P_4 = 0.416$

Assuming that no woman in this birth cohort had a fifth child, out of 1 000 women calculate:

- i) the number of women who remain childless (2)
- ii) the number of women who have exactly one child? (2)
- iii) the cohort total fertility rate (3)

e) Given the following births and infant deaths recorded in Belgium, calculate:

- I. The conventional infant mortality rate for 1968. (2)
- II. The adjusted infant mortality rate for 1968 using the cohort method (2)
- III. The adjusted infant mortality rate for 1968 using the additive method (2)

Table 6: Births and Infant deaths in Belgium, 1967-69

| Year | Birth Cohort | Age (yrs) | Deaths | Births |
|------|--------------|-----------|--------|---------|
| 1967 | 1967 | 0 | 2 893 | 142 471 |
| 1968 | 1967 | 0 | 481 | ----- |
| 1968 | 1968 | 0 | 2 603 | 138 214 |
| 1969 | 1968 | 0 | 302 | ----- |