

UNIVERSITY OF SWAZILAND

MAIN EXAMINATION 2010

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 (Answer all questions)

Question 1

- a) Why is it necessary to standardize rates? (3)
- b) The standardized mortality ratio for the town of Burnley in England was 1.23 when the population of England as a whole was used as the standard. What does this tell you about the mortality in Burnley relative to that in England as a whole? (5)
- c) The data in Table 1 refers to the male populations of Argentina and Colombia in the mid 1980s.
 - a. Calculate the crude death rates for each country.(4)
 - b. Using the population of Argentina as the standard, calculate the directly standardized death rate for Colombia.(10)
 - c. Comment on your results. (3)

Table 1: Population (in thousands) and Deaths by age, Argentina and Colombia, mid 1980s

| Age group | Argentina | | Colombia | |
|-----------|------------------------|--------|------------------------|--------|
| | Population (thousands) | Deaths | Population (thousands) | Deaths |
| 0-4 | 1767 | 11832 | 1857 | 5179 |
| 5-14 | 3062 | 1390 | 3372 | 2300 |
| 15-24 | 2430 | 2816 | 3123 | 6646 |
| 25-44 | 4101 | 9690 | 3724 | 12702 |
| 45-64 | 2755 | 36581 | 1587 | 15441 |
| 65+ | 1129 | 70138 | 478 | 27034 |

Question 2

- a) The data in Table 2 relate to the country of Malawi. They come from a sample survey of the population of this country which took place in 1992. You are also told that the total number of urban women in the survey is 1334 and that the total number of rural women in the survey is 10 518.
 - i) Calculate the general fertility rates for rural and urban areas.(12)
 - ii) Calculate the total fertility rates for urban and rural areas.(2)
 - iii) What do the results tell you about fertility in Malawi? (3)

Table 2: Proportion of women in rural and urban areas of Malawi and ASFR per woman by age, 1992

| Age | Percentage of all women in age group | | ASFR per woman | |
|-------|---|-------------|----------------|-------------|
| | Urban areas | Rural areas | Urban areas | Rural areas |
| 15-19 | 9.7 | 9.4 | 0.135 | 0.165 |
| 20-24 | 10.1 | 7.8 | 0.268 | 0.291 |
| 25-29 | 9.0 | 6.3 | 0.242 | 0.273 |
| 30-34 | 6.3 | 5.3 | 0.210 | 0.261 |
| 35-39 | 4.7 | 4.4 | 0.149 | 0.202 |
| 40-44 | 3.0 | 4.4 | 0.086 | 0.123 |
| 45-49 | 1.9 | 3.1 | 0.012 | 0.062 |

b) A certain population has the following parity progression ratios:

$$P_1 = 0.862$$

$$P_2 = 0.804$$

$$P_3 = 0.555$$

$$P_4 = 0.518$$

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? (3)
- iii) the total fertility rate (3)

SECTION B: ANSWER ANY TWO QUESTIONS

Question 3

- a) Define the following terms and indices:
 - i. Parity Progression Ratio (2)
 - ii. Fecundability (2)
 - iii. Livebirth (2)
 - iv. Net Reproduction Rate (2)
 - v. Total Fertility Rate (2)
- b) Differentiate as clearly as possible, between the following pairs of concepts:
 - i) Mean age at marriage and Singulate mean age at marriage (3)
 - ii) Divorce and legal separation (2)

- c) Calculate the singulate mean age at marriage for males and females in Mali using the data in Table 3.(10)

Table 3: Proportion single by age and sex, Mali, 1995-96

| Age | Males | Females |
|-------|-------|---------|
| 15-19 | 99.6 | 98.6 |
| 20-24 | 89.1 | 77.7 |
| 25-29 | 58.6 | 42.9 |
| 30-34 | 33.2 | 21.7 |
| 35-39 | 20.8 | 12.5 |
| 40-44 | 13.7 | 8.4 |
| 45-49 | 10.9 | 6.5 |
| 50-54 | 10.0 | 7.0 |

Question 4

- a) The following matrix shows the region of residence of a certain population according to the 1985 census enumeration and according to their reported place of residence in 1975:

Table 4: Migration Flow Matrix

| Region of residence in 1975 | Region of residence in 1985 | | | | Total |
|-----------------------------|-----------------------------|-------|-------|-------|--------|
| | A | B | C | D | |
| A | 15000 | 1500 | 1800 | 2500 | 20800 |
| B | 200 | 23000 | 2000 | 3500 | 28700 |
| C | 50 | 100 | 4200 | 200 | 4550 |
| D | 18250 | 25800 | 10500 | 46200 | 100750 |

- i. Estimate the number of intercensal in-migrants, out-migrants and net migrants for each district and the country as a whole. (14)
 - ii. Estimate the inter-regional migration rate (3)
- b) Distinguish between projections and estimates. (4)
- c) Describe two uses of population projections. (4)

Question 5

- a) Why is it necessary to adjust the conventional infant mortality rate? (3)
- b) Describe as clearly as you can the cohort method for adjusting the conventional infant mortality rate, giving the relevant formula as well. (5)
- c) Populations that have a low mean age at marriage tend to have relatively higher levels of fertility. Briefly discuss this statement.(5)
- d) You are given the following gross nuptiality table for a hypothetical population. Fill in the missing values numbered (i) to (vi) in Table 5, showing clearly the formulae and notations used for each answer. (12)

Table 5: Gross Nuptiality Table for a Hypothetical Population

| Age | nM_x | nN_x | S_x | nH_x | nE_x | nL_x | T_x | P_x | e_x |
|-------|--------|---------|--------|--------|--------|--------|-------------|--------|-------|
| 15-19 | 0.0630 | 0.27215 | 100000 | 27215 | 62071 | 431962 | 175029 2 | 0.6207 | 17.5 |
| 20-24 | 0.0794 | 0.33120 | 72785 | 24106 | 34856 | (iv) | (v) | 0.4789 | 18.1 |
| 25-29 | 0.0290 | 0.13534 | 48679 | 6588 | 10750 | 226925 | 101467 0 | 0.2208 | (vi) |
| 30-34 | 0.0100 | (i) | 42091 | 2048 | (iii) | 205335 | 787745 | 0.0989 | 18.7 |
| 35-39 | 0.0050 | 0.02492 | 40043 | 998 | 2114 | 197720 | 582410 | 0.0528 | 14.5 |
| 40-44 | 0.0031 | 0.01522 | (ii) | 594 | 1116 | 193740 | 384690 | 0.0286 | 9.9 |
| 45-49 | 0.0027 | 0.01357 | 38451 | 522 | 522 | 190950 | 190950 | 0.0136 | 5.0 |
| 50-54 | 0.0010 | --- | 37929 | --- | --- | --- | --- | --- | --- |

Question 6

- a) Distinguish between complete and abridged life tables. (2)
- b) Complete the following life table, showing clearly the notation and formulae used. (12)

Table 6: Abridged life table for country X

| Age | q_x | l_x | ${}_n d_x$ | nL_x | T_x | e_x |
|-------|---------|--------|------------|--------|---------|-------|
| 0-1 | 0.03168 | 100000 | (ii) | 97782 | 6997475 | 69.97 |
| 1-4 | 0.00793 | 96832 | 768 | 385793 | (iv) | (v) |
| 5-9 | 0.00344 | 960064 | 331 | (iii) | 6513900 | 67.81 |
| 10-14 | 0.00280 | (i) | 268 | 477998 | 6034406 | 63.03 |
| 15-19 | 0.00444 | 95466 | 424 | 476269 | (vi) | 58.20 |
| 20-24 | 0.00613 | 95042 | 583 | 473752 | 5080139 | 53.45 |
| 25-29 | 0.00747 | 94459 | 706 | 470531 | 4606386 | 48.77 |
| 30-34 | 0.00911 | 93753 | 854 | 466632 | 4135855 | 44.11 |

- c) Use this life table to answer the following questions:
- i. What is the probability of survival between exact age 10 and 30 given survival to age 10? (2)
 - ii. What is the probability of surviving from birth to age 25? (2)
 - iii. What is the probability of dying between exact ages 15 and 20 given survival to age 15? (2)
- d) Conceive of the life table as a stationary population in which nL_x is the number of persons alive between ages x and $x+n$.
- i. What is the proportion of those aged 20-24 in the stationary population? (2)
 - ii. What is the death rate? (2)
 - iii. What is the death rate above age 30? (1)