

Problem Set 1

Due March 1, 2006

[1] World Population

- (a) What's the world population today? How fast is it growing? (Document your sources.)
- (b) The world population reached 6 billion sometime in 1999. When will it reach 12 billion at the current rate of growth? (Note: doubling time will get you only partial credit; as we are in 2006, not 1999.)
- (c) Describe a path for the rate of growth that will postpone reaching 12 billion until the end of the century (on Dec 31, 2100).

[2] Standardization

I used an extract from the 1998 DDHS survey for Kenya to tabulate current contraceptive use by age and type of place of residence. The table below shows counts of women and current users of contraception in each age group. We are interested in the percent currently using any method, also known as the contraceptive prevalence rate.

Age Group	Urban		Rural	
	N	Users	N	Users
15-19	298	37	1451	88
20-24	332	116	1020	281
25-29	267	132	926	370
30-34	185	103	714	299
35-39	162	73	782	343
40-44	69	37	556	213
45-49	68	17	452	119

- (a) Compute crude and standardized contraceptive prevalence rates using (i) the unweighted average of urban and rural as the standard, (ii) the overall age distribution as the standard.
- (b) Decompose the difference between the urban and rural contraceptive prevalence rates into parts attributable to differences in age composition and differences in age-specific prevalence rates. Comment.
- (c) Is it appropriate to summarize the difference in contraceptive use between urban and rural areas in a single number?

[3] Smoothing

- (a) File `ghhhpop.dat` in the datasets section of the course website has a single-year age distribution for Ghana based on the 1979-80 WFS household survey. Note that age is coded 95 for 95+ and 99 for not stated. Compute Myers' Index for a suitable age range.

- (b) Smooth the age distribution using any smoother of your liking and plot the observed and smooth counts.
- (c) Compute a measure of digit preference based on a comparison of observed and smooth counts.

[4] Life Tables

- (a) File `safed.dat` in the datasets section has person-years of exposure and counts of deaths for age groups 0,1-4,5-9,...,75-79 and 80+ for South African females in 1998. Compute an abridged life table, documenting carefully any assumptions you make, particularly about your choice of ${}_nq_x$ factors.
- (b) Repeat the calculation of ${}_nq_x$ (only) assuming that the force of mortality is constant in each age interval. Note any age groups where the choice of assumption makes a noticeable difference.
- (c) What's the infant mortality rate for girls in South Africa according to this life table?
- (d) What's the probability that a South African woman aged exactly 20 years will survive to her 40th birthday?
- (e) How can you explain the fact that expectation of life at age 1 is higher than at birth? When would it be exactly the same?

[5] More on Life Tables

- (a) Find a recent life table for the U.S. and document how they deal with exposure for ages below 5. Compare with the Coale-Demeny formula in the textbook.
- (b) During last year's debate on social security, the White House claimed that the system was a bad deal for African-Americans, particularly males, whose lower life expectancy (68.8 compared to 75.1 for whites) meant they would collect benefits only 3.8 years (compared to 10.1 for whites). They later revised the claim when critics objected to the use of life expectancy at birth.

Paul Krugman, for example, noted that the difference in life expectancy "is largely due to high death rates in childhood and young adulthood", which is true. He then went on to note that "African-American men who make it to age 65 can expect to live, and collect benefits, for an additional 14.6 years - not that far short of the 16.6 figure for white men", which is also true. But this ignores the fact that some people who contribute payroll taxes don't live to collect a pension.

The truth, as it often happens, lies somewhere in the middle. Hopefully your source from part (d) includes life tables for male African-Americans and whites; if not, keep looking. Let us agree to focus the demographic argument on the ratio of the number of years people would expect to spend in retirement (collecting) to the number of years they would spend working (paying). Assume for simplicity that people start paying at age 20 and start collecting at age 65, assuming of course they survive.

Show that the relative difference between African-Americans and whites is somewhere between the difference based on life expectancy at birth minus 65 (used initially by the White House) and that based on life expectancy at age 65 (cited by Krugman as part of his argument). [Krugman's

column was published in the NYT on 1/28/05 and is available at <http://www.pkarchive.org/column/012805.html>. We focus here on life expectancies only. Social security is also a disability insurance program. The original debate used males (possibly for greater effect) but you should feel free to use females or both sexes.]

(c) While you have the U.S. life tables at hand, how much of the difference in life expectancy between whites and African-Americans can be attributed to infant mortality? To childhood mortality?