Problem Set 7: Solutions

Demography Camp

Summer 2013

Question 1

Calculate the following measures of fertility for the US in 2007:

- CBR: 0.0143 births per person year
- GFR: 0.0518 births per person year
- TFR: 2.1304 births per woman
- GRR: 1.0408 daughters per woman

Question 2

NRR: 1.0253 daughters per woman

In the long run, in the absence of migration, the US population will grow since the NRR>1

Question 3

$\bar{m}$= 27.89

Question 4

We have NRR = 1.03 and GRR = 1.04, and we know that $NRR \approx GRR * \cdot p(\bar{m})$ so this implies that $p(\bar{m}) \approx 1.03/1.04 = 0.985$

From Toms notes and our discussion in class, we know that the TFR when fertility is at replacement is:

$$replacement\, TFR \approx \left(\frac{NRR}{p(\bar{m})}\right) \cdot \frac{B_m + B_f}{B_f}$$

At replacement, NRR=1 by definition. substituting this in, and also use our estimate of $p(\bar{m})$, this becomes:

$$\frac{1}{0.985} \cdot \frac{B_m + B_f}{B_f}$$

Finally, we are given that the sex ratio at birth is 1.047 males per female, so that we have:

$$\frac{1}{0.985} \cdot (SRB + 1) = \frac{1}{0.985} \cdot 2.047 = 2.08$$

AGE	Female Pop	Births	nLx	ASFR	ASMR	ASMR*nLx	midpoint	age * ASFR
10-14	9,903,611	6,218	495972	0.0006	0.0003	152.1236	12.5	0.00785
15-19	10,455,025	445,045	495397	0.0426	0.0208	10301.8300	17.5	0.74493
20-24	10,152,233	1,082,837	494279	0.1067	0.0521	25754.6604	22.5	2.39985
25-29	10,237,510	1,208,504	492983	0.1180	0.0577	28429.4105	27.5	3.24628
30-34	9,585,304	962,179	491412	0.1004	0.0490	24097.8279	32.5	3.26237
35-39	10,496,803	499,916	489247	0.0476	0.0233	11382.8318	37.5	1.78596
40-44	11,008,892	105,071	485887	0.0095	0.0047	2265.4615	42.5	0.40563
45-49	11,555,604	7,349	480661	0.0006	0.0003	149.3333	47.5	0.03021

Question 5

This simply means that $p(\bar{m}) = 1$, so our result in this case is 2.047.

Question 6

The NRR is a function only of the fertility and mortality schedules of a population; in particular, it is not a function of a population's current age distribution. It tells us about the long term growth or decline of a population, that is, what will happen once fertility and mortality rates have been constant for a long time and a stable age structure has been achieved. On the other hand, CBR and CDR are functions of the fertility schedule and the observed population age distribution (CBR) and the mortality schedule and the observed population age distribution (CDR). So there is no contradiction in seeing results that imply different things about population growth for NRR and natural increase if the population's current age structure is different from the stable age structure its rates imply.