Soc 756
Problem Set 6

1. The following data describe the U.S. population in 1997. The life table values come from a female life table (remember our small correction to eq. 5.18 in the textbook) with a radix of 100,000.

Age Group	Females[a]	All births	Female births	${}_nL_x$	l_x
10	9,315,000	10,121	4,899	495,678	99,174
15	9,302,000	483,220	236,207	494,913	99,083
20	8,591,000	942,048	460,534	493,741	98,868
25	9,446,000	1,069,436	523,179	492,428	98,624
30	10,447,000	886,798	432,638	490,757	98,336
35	11,373,000	409,710	200,533	488,395	97,945
40	10,800,000	76,084	37,288	484,977	97,381
45	9,409,000	3,333	1,617	479,969	96,561

Total Population by Sex	Number
Males	130,783,000
Females	137,001,000

[a] Population as of July 1, 1997.

A. What was the Crude Birth Rate in the United States in 1997?

B. What was the General Fertility Rate in the United States in 1997? By what factor does the GFR differ from the CBR and why?

C. Calculate and graph the age-specific fertility rates in the United States in 1997.

D. Calculate and interpret the Total Fertility Rate in the United States in 1997.

E. Calculate and interpret the Gross Reproduction Rate (GRR) in the United States in 1997. Assume that the sex ratio of births is invariant to the age of the mother and equal to 1.05.

F. Calculate and interpret the Net Reproduction Rate (NRR) in the United States in 1997. Make the same assumption as in 2.E.

G. How close is your answer in F to the NRR you would approximate by NRR = $p(A_m)$ x GRR? What is the value of this approximation?

The mean age of the maternity schedule can be obtained as follows:

$$A_m = \frac{\int_{\alpha}^{\beta} m(a)\cdot a\ da}{\int_{\alpha}^{\beta} m(a)\,da} = \frac{\sum_{x=\alpha}^{\beta-n} {}_nF_x^F \cdot (x+\frac{n}{2})}{\sum_{x=\alpha}^{\beta-n} {}_nF_x^F}$$

(eq. 5.21 of the textbook)

You may assume that $l(x)$ is linear within the intervals (follows the form $l(x)$=a+bx) to interpolate the value of $l(A_m)$ if needed.

2. In hypothetical population Tau, the fecund period is 250 months, the fecundability of all women is 0.2 at all ages during the fecund period, the average anovulatory period after pregnancy is 13 months, the duration of aborted pregnancies is 2 months and the post-abortion anovulatory period is 3 months.

Suppose that eleven possible contraceptive techniques are being considered for a cohort of women. The effectiveness of these techniques range from 0.45 to 0.95 in increments of 0.05.

Using equation 1, graph the expected TFR by contraceptive effectiveness, both in the absence of abortion and in the presence of a 1:1 ratio of abortions to live births. Graph the percent decrease in the TFR implied by the presence of abortion by contraceptive effectiveness.
Interpret both graphs.

(1) $$TFR = \frac{L}{\left[\frac{1}{p(1-e)}\right] + S + K\left[\left[\frac{1}{p(1-e)}\right] + S^*\right]}$$