**PCB-3043 – Fall 2016**

**Assignment 2**

**HEADSTONE PROJECT**

With this data base, do the following:

1. (16 pts.) Divide the data into the following age classes: 0-9, 10-19, 20-29, etc. in 10 year groups. Therefore, if someone was born in 1855 and died in 1865, we will assume that they lived for 10+ years and belong in the 10-19 age class.

a. (4 pts.) Use this data to construct a table with age classes and a separate lx for each sex and each age class. Basically, give 2 pts. for each gender. CHECK TO MAKE SURE THAT THEY DIDN’T USE LAST YEAR’S DATA. Last year, no males made it to be 90. This year, one individual did – if they don’t have this final male, flag this paper and bring it to my attention.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | **num.fem** | **lx.fem** | **num.males** | **lx.male** |
| 0 | 64 | 1 | 86 | 1.00 |
| 10 | 62 | 0.97 | 77 | 0.90 |
| 20 | 57 | 0.89 | 74 | 0.86 |
| 30 | 46 | 0.72 | 69 | 0.80 |
| 40 | 43 | 0.67 | 60 | 0.70 |
| 50 | 39 | 0.61 | 50 | 0.58 |
| 60 | 32 | 0.50 | 43 | 0.50 |
| 70 | 24 | 0.38 | 22 | 0.26 |
| 80 | 17 | 0.27 | 4 | 0.05 |
| 90 | 3 | 0.05 | 1 | 0.01 |
| 100 | 0 | 0.00 | 0 | 0.00 |
| 110 | 0 | 0.00 | 0 | 0.00 |

b. (6 pts.) Construct a graph showing separate survivorship curves for each gender on the same graph. Label the axes clearly.

2 pts. for a graph with some form of the correct axes. Then 2 more points for each of the two lines (male and female) in the correct place and correctly labeled. They can give us either untransformed data (left) or one like on the right with log scaling (either using transformed numbers or on a log scaling), but it needs to be labeled correctly.

 Overall, however, the curve should look like either the log curve (right) or regular curve (left), shown below.



c. (3 pts.) Are these type I, II, or III survivorship curves? How do you know?

(1 pt. for curve type, 2 pts. for the explanation). Clearly, this is a type I survivorship curve. They can either (1) use a log plot and say they know by shape or (2) explain that the proportion of individuals surviving decreases older ages.

d. (3 pts.) Note and explain the 3 major differences between the male and female survivorship curves.

(3 pts., one for each difference) Be lenient here. Both graphs show that (1) females survive better until age of childbirth, then (2) a dramatic decline in female survival brings their line down. Ultimately, (3) the lines cross again at 38 or so, as female survivorship becomes greater once again. Or, put another way, (4) females tend to live longer. Any of these is OK.

2. I cannot get age specific birth rates from cemetery data. I have used other records\* to estimate mx and obtain the following:

age mx x

0-9 0.0 0

10-19 0.086 10

20-29 0.561 20

30-39 0.528 30

40-49 0.142 40

50 + 0.0 --

For simplicity, we are going to just use the survivorship for women and assume it reflects the entire population.

They don’t need to show their work here --. however, this is what I found:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x** | **num.fem** | **lx.fem** | **mx** | **lxmx** | **xlxmx** |
| 0 | 64 | 1 | 0 | 0.000 | 0.000 |
| 10 | 62 | 0.97 | 0.086 | 0.083 | 0.833 |
| 20 | 57 | 0.89 | 0.561 | 0.500 | 9.993 |
| 30 | 46 | 0.72 | 0.528 | 0.380 | 11.385 |
| 40 | 43 | 0.67 | 0.142 | 0.095 | 3.816 |
| 50 | 39 | 0.61 | 0 | 0.000 | 0.000 |
| 60 | 32 | 0.50 | 0 | 0.000 | 0.000 |
| 70 | 24 | 0.38 | 0 | 0.000 | 0.000 |
| 80 | 17 | 0.27 | 0 | 0.000 | 0.000 |
| 90 | 3 | 0.05 | 0 | 0.000 | 0.000 |
| 100 | 0 | 0.00 | 0 | 0.000 | 0.000 |
| 110 | 0 | 0.00 | 0 | 0.000 | 0.000 |

a. (6 pts) Use the female’s lx with the mx above to determine R0, G, and r for this population (r = ln(Ro)/G). Show your work.

(2 pts. each = 6 pts.)

|  |  |
| --- | --- |
| R0 = | 1.058 |
| G =  | 24.604 |
| r =  | 0.002286142 |

b. (3 pts) Is the population increasing or decreasing? Explain the basis for your answer. What assumptions are you making to say if it will increase or decrease?

(1 pt.each for 3 pts.) Well, essentially the population is slightly growing. However, we will accept either stable or increasing, as long as they explain that this is predicted by known stable values of R0 and/or r and that they must assume a stable age distribution. Lose 1 point if they don't mention the stable age distribution.