

Cemetery Demography

In this project you will apply concepts of population age structure, discussed in class, to data on human survivorship. This is a model exercise that has been conducted in communities across the U.S. We will apply concepts and methods in this project later in the course to study more advanced topics in populations where survival and reproduction vary with age.

Field Methods:

- 1 Go to the older region of the cemetery, along Woburn Street.
- 2 Please be respectful of gravesites and any people who visit them.
- 3 Record dates of birth and death of people born between 1 January 1890 and 31 December 1909. Then determine age at death for each individual. You should obtain dates for at least 50 females and 50 males. You may find the attached Table 2 useful.

Data Analysis:

Construct survivorship curves for Bellingham, using dates of birth and death recorded on headstones in the City's Bayview Cemetery. Use the instructions below, and then answer the following questions.

- 1 Using Table 1, sort your data into 10-year age classes (0-9, 10-19, ...90-99, ≥ 100). Then record the number of individuals who died in each age class. Check that the total number of deaths equals the number of individuals recorded.
- 2 For each age class, determine the number surviving from birth by subtracting the number of deaths in that age class from the total number in your sample. Then calculate the survivorship per 1000 in each age class by multiplying 1000 by the ratio of number surviving to sample size:

$$\text{survivorship per 1000} = 1000 \times \left(\frac{\text{number surviving}}{\text{total recorded}} \right)$$

- 3 Plot the logarithm (base 10) of survivorship per 1000 vs. age for both females and males.
- 4 Download a cemetery dataset from another town, available from links in the following URL.
<http://academics.hamilton.edu/biology/ewilliam/cemetery/default.html>
 Repeat steps 3-4 above and plot male and female survivorship curves for that other town.

Questions and Interpretation

- 1 Do the survivorship curves most closely resemble type I, II, or III? Why?
- 2 Compare survivorship curves of females vs. males. Suggest plausible reasons for any differences observed.
- 3 Compare your survivorship curves from Bayview Cemetery with curves you plotted in step 4 of Data Analysis. Suggest plausible reasons for any differences observed between survivorship curves from the two towns.
- 4 Use your Bayview Cemetery data to estimate survivorship rates [$l(x) = S(x)/S(0)$] at 10-year increments.
- 5 Suggest how survivorship curves would change if most infant mortality and diseases were eliminated due to continuing medical advances and universally available medical care. Express your answer using numerical changes in $l(x)$ values relative to those in (4) and as a line superimposed on your plot of survivorship data.

- 6 Suggest how survivorship curves would change if diseases related to environmental degradation increase substantially. Express your answer using numerical changes in $l(x)$ values relative to those in (4) and as a line superimposed on your plot of survivorship data.

Table 1: Survivorship calculations (complete for both females and males)

Age Class (yrs)	# deaths	# surviving from birth	Survivorship per 1000 (S_{1000})	$\log_{10}(S_{1000})$	$l(x)=S(x)/S(0)$
0-9					
10-19					
20-29					
30-39					
40-49					
50-59					
60-69					
70-79					
80-89					
90-99					
≥ 100					

Table 2: Cemetery Data Sheet (complete for both females and males)

Individual	Birth yr	Death yr	Age@death
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Individual	Birth yr	Death yr	Age@death
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
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