

Homework 2, Due Friday, September 16, 2016

1. The data below give population and death rate information by age groups for males and females in a town (Rateboro) by age and sex. Also given is the age-specific population in thousands for the US (the standard population).
 - (a) Confirm the crude (total) death rates for Rateboro males and females.
 - (b) Confirm the male 18-34 age group death rate of 0.0067. This is the only one you need to do.
 - (c) Find the directly-adjusted death rates for Rateboro males and females separately using the US population as the standard population.

Age	Rateboro			Rateboro			US	
	Pop	Males Deaths	Rate	Pop	Females Deaths	Rate	Both Sexes Pop*	Deaths*
18-34	900	6	0.0067	800	1	0.0013	60,000	90
35-59	800	3	0.0038	800	5	0.0063	45,000	270
60-74	300	15	0.0500	500	10	0.0200	20,000	600
75+	200	22	0.1100	500	38	0.0760	15,000	1,500
Total	2,200	46	0.0209	2,600	54	0.0208	140,000	2,460

* In thousands. Population and deaths for Rateboro are actual data.

2. Based on the results in Question 3:
 - (a) Based on the crude rates do males or females have a more favorable mortality experience in Rateboro?
 - (b) Based on the adjusted rates do males or females have a more favorable mortality experience in Rateboro?
 - (c) Which of the rates (crude versus adjusted) are more appropriate in comparing the overall death rate of males and females and why?
 - (d) An experienced epidemiologist had this to say about the data: “the Rateboro data are generally consistent with the typical finding of a more favorable mortality experience of U.S. females; the anomolous result for the 35-59 year-old group, with the high death rate among females (more than 50% greater than the rate for males) is evidence that the Rateboro environment is more suitable for males in the age range 35-59 than for females.” (Hint: How many deaths is the epidemiologist basing the latter part of the conclusion on?)
3. Tuberculosis (TB) was once a major problem in the US. Improvements in physical conditions of living and the development of drugs such as isoniazid helped reduce the impacts of the disease and even led to some public health officials dreaming of eradicating it in the US (AIDS helped change that). TB has always been more of

a problem in nonwhite populations than in white populations. Data from 3 North Carolina counties are shown below. The first table shows the cases of TB in these 3 counties during the 5 year period from January 1, 1986 to December 31, 1990. The second table shows the mean population size in the 3 counties during the same time period. The third table shows the mean annual incidence of TB in the US over the same time period.

Table 1: Cases of TB in the 3 counties during the 5 year period from January 1, 1986 to December 31, 1990.

County	White males	White females	Nonwhite males	Nonwhite females
Johnston	11	8	43	13
Orange	5	3	3	4
Wilson	6	10	51	27

Table 2: Mean population sizes of the 3 counties during the 5 year period from January 1, 1986 to December 31, 1990.

County	White males	White females	Nonwhite males	Nonwhite females
Johnston	31,721	33,955	6,910	8,078
Orange	34,542	37,649	7,510	8,753
Wilson	19,844	22,259	10,692	12,788

Table 3: Mean annual incidence of TB in the US during the 5 year period from January 1, 1986 to December 31, 1990.

	White males	White females	Nonwhite males	Nonwhite females
Cases/100,000	7.4	3.6	39.2	19.8

- (a) The table below gives age and sex specific incidence rates for TB for each county and overall. Actually the rates are approximations based on the mean population sizes above. Confirm the rate of 7 for white males in Johnston County (this is the only one you need to compute). In computing the rate note that there are 5 years with an average population of 31,721 for each year. Compare the rates discussing any potential reasons for differences.

Table 4: Incidence of TB, per 100,000 in the 3 counties during the 5 year period from January 1, 1986 to December 31, 1990.

County	White males	White females	Nonwhite males	Nonwhite females	Overall
Johnston	7.0	4.7	124.5	32.2	18.6
Orange	2.9	1.6	8.0	9.1	3.4
Wilson	6.0	9.0	95.4	42.2	28.7

- (b) The table below gives SMRs comparing each county to the national TB rates. Confirm the row entries for Johnston County. Compare the 3 rates and discuss.

Table 5 Standardized mortality ratios (SMRs) for the 3 counties.

County	Expected	Observed	SMR
Johnston	39.39	75	1.9
Orange	43	15	0.35
Wilson	45	94	2.1

- (c) There are 3 possible pairwise comparisons of county-level SMRs we can make. Which of them, if any, is reasonable and which are problematic? Justify your answer.
4. A simple random of 5,000 is taken from a population and none of them have rare illness of interest. Give an approximate 95% CI for the proportion who have the disease using the Rule of Three and the exact interval method.
5. Italy played Bulgaria in a semifinal match in the 1994 World Cup (soccer). A newspaper reported that the *odds* Italy wins are 11/10 whereas the odds Bulgaria wins are 3/10. Based on the given odds find the probability each wins this semifinal match. Do the given odds make sense? Justify your answer.
6. Problem 4.2 on page 42 in Jewell.