Lab exercise on Standardization

Instructor Guide

Goals:

To gain experience computing and evaluating crude and standardized rates.

Background:

Determining mortality rates from specific diseases is commonly the goal of disease surveillance studies involving entire communities or specific cohorts. In one such study, the Atherosclerosis Risk in Communities (ARIC) study, whole communities (315,000 population) are monitored for cardiovascular disease events. Concurrently, a cohort of 16,000 persons selected from this population at baseline are being followed as well. Below are actual data from this study and questions for discussion about standardization.

A. Community Coronary Heart Disease Mortality Rates 1987-1992

CHD mortality in ARIC communities, women, 1990-1992

		1990		1991		1992	
Age	Mid-year Pop. 1990	Deaths	Rate*	Deaths	Rate*	Deaths	Rate*
35-44	14,108	2	0.14	4	0.28	0	0
45-54	7,777	5	0.65	3	0.39	1	0.13
55-64	6,027	17	2.82	25	4.15	25	4.15
65-74	4,929	19	3.85	25	5.07	13	2.64
Total	32,841	43	1.31	57	1.74	39	1.19

* per 1,000

1. In the above table, can the overall rates be compared without age-standardization?

   Yes, because the construction of the age groups was the same in each year. By using the mid-year population in 1990 as the denominator for the rates in each year, the "age factor" be definition is held constant and should not bias the comparisons made.

2. Calculate the age-specific and overall (crude) rates for 1991 and 1992 assuming that the population grew at an annual rate of 3% in all age groups, except that in 1992 there was a large migration of older people to the study areas, resulting in a 6% growth rate for that year in the oldest age decade.

CHD mortality in ARIC communities, women, 1990-1992

	1990				1991		1992
Age	Populat.	Projected pop.	Deaths	Rate*	Projected Pop.	Deaths	Rate*
35-44	14,108	14,531	4	0.28	14,967	0	0
45-54	7,777	8,010	3	0.37	8,250	1	0.12
55-64	6,027	6,208	25	4.03	6,394	25	3.91
65-74	4,929	5,077	25	4.92	5,382	13	2.42
Total	32,841	33,826	57	1.69	34,993	39	1.11

* per 1,000

3. In this scenario, can the overall (crude) rates be compared without age-standardization? Which method of standardization should be used?

   The crude rates could be compared, however the differences in the oldest age groups which usually have the highest death rates (although that is not true in this example) will distort the direct comparison of crude rates.

4. How does your knowledge of population growth over this period affect your interpretation of disease trends?

   Population growth is usually taken into account either by using annual survey data or interpolation of census figures that are available every 10 years. If you know the population is dynamic then to compare event rates across years is facilitated by computing standardized rates.

5. Using the estimated US population in 2000 as a standard (given in the table below), compute age standardized mortality rates for 1990 and 1992. Use the direct method with the following weights.

Estimated United States population distribution in the year 2000

Age group	Weight
35-44	36.1
45-54	29.9
55-64	19.4
65-74	14.6

YEAR	Crude	Age standardized
1990	1.31	1.35
1992	1.19	1.23

B. CHD Mortality in the cohort

A cohort of 16,000 person age 45-64 were selected in 1987 and followed until 1992.

1. What happens to the population base of the cohort as follow-up continued for a long period? How does this influence annual mortality rates and interpretation of trends in the cohort?

The cohort will age and therefore the structure of the age strata will change. Deaths and other loss to follow-up that occur along the way will also change the composition of the age groups.

2. From a follow-up of the cohort from baseline to 1992, the CHD mortality rates were as follows:

WOMEN	
Age	Deaths per 1,000 person years
45-54	1.2
55-64	3.1

Are the age-specific rates between the cohort and the community directly comparable? Why or why not?

Be careful when comparing rates from community surveillance studies that follow a set age window each year (35-74 in this case) with cohort studies that are dynamic. After 10 years of follow-up there will no longer be any individuals under the age of 55. Also, rates presented in the table above are for age at baseline, not age at event as in cross-sectional surveys like community surveillance.