

Discussion # 2

1. (Rosner, page 67) Estimates of the prevalence of Alzheimer's disease (cases per 100 population) are given in the following table,

Age	Males	Females
65-69	1.6	0.0
70-74	0.0	2.2
75-79	4.9	2.3
80-84	8.6	7.8
85+	35.0	27.9

Suppose an unrelated 77-year-old man, 76-year-old woman and a 82-year-old woman are selected from a community.

- What is the probability that all three of these individuals have Alzheimer's disease?
 - What is the probability that at least one of the women has the disease?
 - What is the probability that at least one of the three individuals has Alzheimer's disease?
2. (Rosner, page 68) Suppose that a disease is inherited via a sex-linked mode of inheritance. The implications of this mode are that each male offspring has a 50% chance of inheriting the disease whereas the female offspring have no chance of getting the disease.
 - In a family with one male and one female offsprings, what is the probability that exactly both sibling are affected?
 - What is the probability that exactly one sibling is affected?
 - What is the probability that neither sibling is affected?
 3. (Example, page 138, P & G). Among 1820 subjects in a study, 30 suffered from tuberculosis and 1790 did not. Chest x-rays were administered to all individuals; 73 had a positive x-ray - implying that there was significant evidence of inflammatory disease - whereas the results of the other 1747 were negative. The data for the study are presented in the table below. What is the probability that a randomly selected individual has tuberculosis given that his or her x-ray is positive?

X-ray	Tuberculosis (No)	Tuberculosis (Yes)	Total
Negative	1739	8	1747
Positive	51	22	73
Total	1790	30	1820

4. (Rosner, page 73). The Chinese Mini-Mental Status Test (CMMS) is a test consisting of 114 items intended to identify people with Alzheimer's disease and senile dementia among people in China. An extensive clinical evaluation was performed of this instrument, whereby participants were interviewed by psychiatrists and nurses and a definite

diagnosis of dementia was made. The table below shows the results obtained on the subgroup of people with at least some formal education.

CMMS score	Nondemented	Demented
0-5	0	2
6-10	0	1
11-15	3	4
16-20	9	5
21-25	16	3
26-30	18	1
	46	16

Suppose a cutoff value of ≤ 20 on the test is used to identify people with dementia.

- What is the sensitivity of the test?
- What is the specificity of the test?
- Suppose we consider changing the cutoff. What are the sensitivity and specificity if cutoffs of 5, 10, 15, 20, 25 or 30 are used, respectively?