**EPID 573A HW3: Measures of Excess Risk**

**Measures of Excess Risk:**

A. You are the epidemiology consultant to a cotton candy making factory. Because of some suspicion on the part of local physicians, you conduct a study of the occurrence of respiratory disease among the workers and obtain the following results:

i) Incidence of respiratory disease among workers exposed to the cotton candy = 200 per 100,000 per year.

ii) Incidence of respiratory disease among workers not exposed to cotton candy = 20 per 100,000 per year.

iii) Incidence in general population = 21 per 100,000 per year.

1. What are the rate ratio (RR), attributable rate (AR), and population attributable rate percent (PAR%)?

2. How can you account for the low PAR% in view of the high AR and high RR?

3. Based on the high RR and other available information, you believe that the association between occupational cotton candy exposure and the incidence of respiratory disease to be a causal one.

a) If an exposed worker develops respiratory disease, what is the likelihood that the disease occurred as a result of his employment?

b) in making your recommendations to management and labor concerning the desirability of extra protection for the workers, which measure of excess risk would you use? Why?

B. The following is excerpted from a recently published article.

We have identified 13 asbestos workers with lymphoplasmacytic neoplasms: six with chronic lymphocytic leukemia, four with IgG myeloma, two with IgA myeloma, and one with histiocytic lymphoma. The subjects' occupations were varied, but all had experienced protracted asbestos exposure (ranging from 3-37 years). Tumor latency periods were similar to other known asbestos-related malignancies and ranged from 16-41 years. Stigmata of asbestos-related pulmonary disease were evident in 12 subjects . . . . It has been speculated previously that asbestos may be a lymphoid system carcinogen. Our findings strongly support this view.

Do these results support the hypothesis that asbestos is a lymphoid system carcinogen? If yes, in what way? If no, why not?

C. Here are some measures of disease frequency. For each, name the kind of measure being described.

1. Percentage of 16‑year‑old driver's license applicants who are found to have visual acuity impairment severe enough to require corrective lenses while driving.

2. Percentage of University of Iowa students aged 18‑21 with an intact appendix at the start of 1996 and enrolled continuously during 1996 who undergo appendectomy for acute appendicitis during the year.

3. Number of sudden infant deaths occurring in Johnson County during 1996, divided by the estimated number of live infants residing in the county at mid‑year.

4. Percentage of Iowa State babies born during 1996 who have congenital limb deformities at birth.

5. Proportion of patients with chronic glomerulonephritis who eventually die of that disease.

D. If a hen and a half lay an egg and a half in a day and a half, how many eggs can one hen lay in three days?

E. Answer the following questions. Note, that the outcome is mortality instead of incidence, but this does not change the calculation of RR, AR, AR%, PAR, or PAR%. When answering the following questions consider the appropriate measure and include calculations when appropriate.

|  |  |  |
| --- | --- | --- |
|  | Cause-specific mortality rate\* | |
| **Smoking category** | **Heart Disease** | **Lung Cancer** |
| Non-smokers | 7.32 | 0.07 |
| Heavy smokers\*\* | 9.93 | 2.27 |

\*Deaths per 1000 person-years at risk

\*\*25 or more cigarettes smoked per day

1. Do these data provide stronger evidence of a causal link between heavy smoking and heart disease or between heavy smoking and lung cancer?

(Assume for the remaining parts that both diseases are causally related to smoking.)

2. According to these data, what proportion of lung cancer deaths occurring among physicians who smoked 25 or more cigarettes/day could have been prevented if these physicians had not smoked at all? (What is the measure and calculate it)

3. Assuming that study participants were representative of all British physicians in the respective smoking categories, what proportion of heart disease deaths among British physicians could be attributed to cigarette smoking?

4. Would avoidance of smoking among heavy-smoking British physicians have prevented more deaths due to heart disease or more deaths due to lung cancer?