Relating risk factors to health - Assignment

1. Give a one-sentence definition, in terms that you might employ in an article for the educated but non-professional public, of:

   a. Cumulative incidence ratio

   b. Incidence density ratio

   c. Odds ratio

2. The following data come from a study conducted at Group Health Cooperative of Puget Sound (Orleans CT, Schoenbach VJ, Wagner EH, Quade D, Salmon MA, Pearson DC, et al. Self-help quit smoking interventions. *J Cons Clin Psychol* 1991:59:439-448). Smokers wanting to quit were enrolled into a self-help, quit-smoking trial and were randomized into one of four groups (M=quitting manual, MS=M plus social support brochure, MST=MS + telephone counseling calls, and C[control]=annotated guide to existing quitting resources). Interventions were then mailed to participants, and abstinence from tobacco use (not even a puff for the past 7 days and no use of other tobacco in the past month) was measured by mailed questionnaire and/or telephone interview at approximately 8-, 16-, and 24-months after recruitment. The 16-month follow-up obtained smoking status information for 1877 participants; salivary cotinine was measured on a geographically-selected sample of self-reported abstainers.

```
GHFCA3C:  Free & Clear (Schoenbach/Orleans) - Live data
Quit rates (SFQUIT7) by randomization group(s)
2nd follow-up respondents           16:17 Wednesday, July 26, 1989
All subjects

TABLE OF SFQUIT7 BY RGP
SFQUIT7(Quit 7 days at FU2)     RGP(Randomization Group)
```

Frequency Percent Row Pct Col Pct	C	M	MS	MST	Total
0:Quit	84 4.48 25.38 18.06	71 3.78 21.45 15.20	67 3.57 20.24 14.23	109 5.81 32.93 23.00	331 17.63
1:Smoking	381 20.30 24.64 81.94	396 21.10 25.61 84.80	404 21.52 26.13 85.77	365 19.45 23.61 77.00	1546 82.37
Total	465 24.77	467 24.88	471 25.09	474 25.25	1877 100.00

a. Quit rates were measured as the proportion abstinent at the time of follow-up. What was the overall quit rate for the 1877 smokers?

b. Is this "quit rate" a cumulative incidence-type measure or an incidence density-type measure? Briefly explain the basis for your answer.

c. Give one or more reasons for which type of incidence measure (i.e., a cumulative incidence type or an incidence density type) is preferable given the study design.

d. Briefly describe the 16-month results of the study.

e. The MS and MST conditions received identical interventions except that the MST condition included the availability of a toll-free telephone "Quitline" and four counselor-initiated telephone calls during the first year of follow-up. Compare the quit rates for the MS and MST groups, and compute a CIR and an OR. Compare your calculations of the CIR and OR and briefly indicate the reason for the difference in them and which measure is preferred.

f. Compute and interpret an appropriate measure of impact of the telephone component.

3. Hepatocellular adenoma (HCA), a rare type of benign though potentially fatal liver tumor, is associated with long term oral contraceptive (OC) use, especially in older women. A case-comparison study showed that the effect of duration of OC use on the risk of developing HCA is marked:

Duration	Rate ratio
1 or less	1*
4 years	9
4-7 years	120
8+ years	500

* Reference level (includes none)

(Source: Armed Forces Institute of Pathology and Center for Disease Control. Increased risk of hepatocellular adenoma in women with long term use of oral contraceptive. *Morbidity and Mortality Weekly Report* 26 (36):293-294, September 9, 1977, cited in *Oral Contraceptives*, Population Reports Series A, Number 5, January 1979.)

Assuming that the incidence density (ID) of HCA for one year or less use of OC is 0.06/100,000 per year (i.e., 6 per 10,000,000 women-years), what are the attributable rate (rate difference) over baseline and the attributable rate proportion associated with each duration category of OC use? Interpret these measures and state what implications you might draw. (For this question, use the attributable risk formulas from the chapter even though the data are for rates.)

4. In a study of adverse effects of radiotherapy among immigrant children in Israel (Ron E, Modan B, and Boice JD. Mortality after radiotherapy for ringworm of the scalp. *Am J Epidemiol* 1988:127:713-25), 10,834 irradiated children were identified from original treatment records and matched to 10,834 nonirradiated, tinea-free comparison subjects selected from the general population. Follow-up was accomplished using the Israeli Central Population Registry, which enabled nearly all subjects to be followed forward in time (retrospectively) for a mean of 26 years following age at irradiation. Computation of person-years of observation began at the date of treatment for tinea capitis, or the equivalent date for the matched comparison subjects, and ended at the date of death for those who died or May 31, 1982 for those not known to have died. Person-years of observation were: irradiated subjects, 279,901 years; comparison subjects, 280,561 years. During the follow-up there were 49 deaths from cancer in irradiated subjects, and 44 in the nonirradiated population comparison subjects (data from table 3 in Ron et al.). (For these questions, use the attributable risk formulas from the chapter even though the data are for rates.)

   a. What are the rates of cancer death in the two groups?

   b. Calculate and describe in one sentence the incidence density ratio for cancer death comparing irradiated and nonirradiated subjects?

   c. Assuming causality, estimate how many cancer deaths per 100,000 person years of follow-up of irradiated subjects were attributable to radiotherapy.

   d. Again assuming causality, what proportion of cancer deaths in irradiated subjects were due to radiation therapy?

   e. If 10% of this population had received radiotherapy for tinea capitis, what proportion of all cancer deaths within the relevant age span (mean age 7 to 33 years) would be due to radiation therapy?

5. Algebraic calisthenics: There are various formulas for the population attributable risk proportion (PARP), including several given in the lecture handout. Demonstrate the algebraic equivalence of the PARP formulas in the text, i.e., derive each of the subsequent formulas from the one derived from the attributable risk diagram:

$$\frac{\text{"Attributable cases"}}{\text{All cases}} = \frac{(ID_1 - ID_0)n_1}{I_1n_0 + I_1n_1}$$

a. $\dfrac{I_{crude} - I_0}{I_{crude}}$ b. $\dfrac{p_1(RR - 1)}{1 + p_1(RR - 1)}$ c. $\dfrac{1}{1 + 1/[\, p_1(RR-1)]}$