

Angry Temperament and Coronary Heart Disease

Instructions

1. Study Chapter 11 and associated materials, focusing on sections that address cohort studies.
2. Read the abstract and introductory paragraph of Williams, J.E., et al. (2001). Effects of an angry temperament on coronary heart disease risk: The Atherosclerosis Risk in Communities Study. *American Journal of Epidemiology* 2001; 154(3):230-235. Link to full text: <http://www.sjsu.edu/faculty/gerstman/eks/Williams2001.pdf>
3. Address the items and questions:

Background: The Atherosclerosis Risk in Communities Study (ARIC) is a multi-site epidemiologic project funded by the National Heart Lung and Blood Institute (NHLBI) of the National Institutes of Health (NIH) to study cardiovascular disease in the U.S. population. The study enrolled people in four communities, each studied by a different team of investigators, who worked under the direction of a steering committee for the study. People who enrolled in the study had thorough medical examinations and completed extensive questionnaires. Participants were re-examined after several years and again several years later. One of the examinations that participants underwent was measurement of the thickness of the walls of their carotid arteries, with B-mode ultrasound, a technique that was fairly new when ARIC began. Atherosclerosis in the carotid arteries serves as an indicator of atherosclerosis elsewhere in the arterial bed, so this measurement provided a non-invasive measure of subclinical atherosclerosis that could lead to coronary events and strokes. This study by Williams and coworkers (2001) used data from the ARIC study to look at angry temperament in relation to coronary heart disease risk.

Questions

1. Explain why it is impractical to conduct an experimental study to address the issues addressed in this study.
2. The subjects in this study was selected from the ARIC cohort who returned to visit 2 between 1990 and 1992. A total of 14,348 persons were examined at this second visit. A previous article by Williams and coworkers explains that these participants represented about 93% of those examined at the baseline (between 1987 and 1989). In addition, Williams et al. (2001) excluded 1,140 participants with a history of myocardial infarction (MI), coronary bypass surgery, or electrocardiographic evidence of MI, as well as an additional 222 participants most of whom were missing data on hypertension or the anger scale, leaving 12,990 participants for analysis.¹
 - (a) What is the reason for excluding the 1,140 participants with evidence of clinical coronary heart disease?
 - (b) How might losing 7% of the original cohort by the second visit affect the study results?
3. Table 1 (p. 231) presents selected characteristics of study subjects for each category of hypertension and anger. The primary differences between those with low and high anger

¹ The arithmetic does not quite work out, so perhaps several people listed as excluded in the earlier article were retained after all.

trait appear to be in gender (the proportions of males are greater in those with high anger trait), education (those with high anger trait are less likely to have completed high school), cigarette smoking (much greater among those with high anger trait), alcohol (substantially greater among those with high anger trait), plasma HDL cholesterol (the protective subtype - lower in those with high anger trait), and waist-to-hip ratio (a measure of obesity - greater in those with high anger trait).

- (a) What are the implications of these differences when comparing the cohorts?
- (b) Are there marked differences between those with low and high anger trait? If so, identify these differences.
- (c) Use data in Table 1 to determine the number of normotensive males with low anger-temperament. [Note: Multiple the percentage male time the n at the top of the column.]
- (d) Use data in the table to determine the percentage of hypertensives that are female. [Note: The percentage of hypertensives that are female would come from data in the two right-most columns of Table 1.]

4. Participants were followed from the date of their second clinic examination visit (“initiation exam”) through December 31, 1995. (a) Assuming an individual participant did not experience a CHD event, how many person-months would they contribute if the initiation exam visit took place on December 31, 1990? (b) What if the initiation exam occurred on June 30, 1991? (c) What if the initiation exam took place on January 31, 1992?

5. Table 3 (p. 232) shows the total number of participants by hypertension and Spielberger trait anger-temperament category at the time of the second examination visit. What was the incidence (average risk) of CHD within each of the for the four subgroups: (a) normotensive, low trait anger, (b) normotensive, high trait anger (c) hypertensive, low trait anger (d) hypertensive, high trait anger. (Carry four significant digits during calculations.)

Incidence proportion (average risk) of CHD events by anger-temperament and hypertension				
	Spielberger trait anger-temperament scores			
	Normotensive		Hypertensive	
	Low (≤ 8)	High (> 8)	Low (≤ 8)	High (> 8)
Population	8,021	456	4,231	282
No. with events	167	23	213	13
Incidence proportions	(a)	(b)	(c)	(d)

Does anything “jump out” at you when you look at these four risk estimates?

6. If participants who did not have a CHD event were followed for an average of 54 months and those who did have an event contributed an average of 27 months before the event, what would the total number of person-years have been for participants in each of the four groups identified in the previous problem? What was the incidence rate (incidence density) in each of the four groups? [Note: To calculate the person-years in the low anger, normotensive group:

Person-years = [(27 months)(167) + (54 months)(8,021-167)] / 12 months per year = 428,625/12 = 35,719 person-years.]

Incidence rate (density) of CHD events by anger-temperament and hypertension				
	Spielberger trait anger-temperament scores			
	Normotensive		Hypertensive	
	Low (≤ 8)	High (> 8)	Low (≤ 8)	High (> 8)
Population	8,021	456	4,231	282
No. with events	167	23	213	13
Person-years	(a)	(b)	(c)	(d)
Incidence density	(e)	(f)	(g)	(h)

7. What are the incidence rate ratios (RR) for high trait anger in (a) normotensive persons and (b) hypertensive persons? [Note: Rate ratio = rate in the exposed divided by the rate in the non-exposed.] What do these ratios show?

8. Compare the crude rate ratios you just calculated to the adjusted rate ratios (referred to in the paper as "hazard ratios") for CHD events combined, age-adjusted as reported in Table 3 (p. 232) of the article. Are the crude and adjusted rate ratios similar?

9. In the article, under Results (page 232, col 1), Williams et al. write: "There was a monotonic increase in CHD risk as a result of trait anger-temperament in the multivariate-adjusted models. Normotensive persons experienced a 68 percent greater risk of CHD." To what incidence rate ratio (or "hazard ratio") does a 68 percent increase correspond?

Hint: See the text, p. 157, paragraph 2 that starts "Relative comparisons can be expressed in various equivalent ways." Especially note point 3 in this paragraph. Then refer to p. 160 starting in paragraph 6 that begins "Relative Rate Difference." Notice, for instance, that a relative risk of 1.5 represents a 50% increase in risk (in relative terms). This because the baseline RR is 1.0, not 0. Discuss this point among yourselves, if necessary, as this method of discussing risk is extremely different in the lay and professional press.

10. Examine Figures 1 through 3 in the article. Besides providing an easy way to see the difference in CHD incidence in the groups being compared, what additional information do the figures provide that is not available from the tables?

11. Cohort studies are considered observational studies, whereas clinical trials are considered experimental. Could a randomized intervention trial be conducted to test the hypothesis that anger-temperament increases CHD risk? Would it provide stronger evidence for a causal relation?