**Ecologic/Cross-Sectional Studies**

**Case Study Questions**

**Readings, Required:**

**Fleegler EW, Lee LK, Monuteaux MC, Hemenway D, Mannix R. Firearm Legislation and Firearm-Related Fatalities in the United States. *JAMA Intern Med.* 2013;173(9):732-740.**

Optional:

Wintemute GJ. Invited Commentary: Responding to the Crisis of Firearm Violence in the United States. ***JAMA Intern Med.* 2013;173(9):740-2.**

**Bohannon J. Bold Plan, Uncertain Future for Gun Violence Research. *Science*. 2013;340:1273.**

**Lab Activity: Case Study**

**Pre-Lab Individual Work**

*Please complete the following questions* ***BEFORE*** *lab.*

For the study by Fleegler et al.:

1. What are the research questions this publication seeks to answer?

*Are more firearm laws in a state are associated with fewer firearm fatalities?*

*This was done by using state-level firearm legislation over 5 categories to create an aggregate “legislative strength score” for each state. The researchers then measured the association of this score with state firearm mortality rates.*

1. This study uses a cross-sectional ecologic study design. What characteristics make this an ecologic study?

*The unit of observation is at the state level, not individuals.*

*The exposure (state fire arm legislative strength score) is known only at the group (state) level. Also firearm mortalities are taken at the state level. All of the covariates are taken at the state level.*

*State\_firearm\_mortality=legislative\_strength\_score+age+sex+race+poverty+unemployment+college\_education+population\_density+nonfirearm\_deaths\_household\_firearm\_ownership*

Question 3 is based on this hypothetical situation: Suppose you wished to analyze the relationship between prevalence of individual-level gun ownership and history of firearm injury in North Carolina. To do this, you mailed a questionnaire to a sample of 100,000 adult residents across North Carolina. Of the 10,279 people who returned the questionnaire, 5,483 reported owning a gun (either themselves or someone in their household) and 175 had ever sustained a firearm injury. Of the 5,483 gun owners, 97 had ever sustained a firearm injury.

1. Organize these data into a 2x2 table, and calculate the following values (Note: be sure to show your work):

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Firearm injury* | *No firearm injury* | *Total* |
| *Firearm owner* | *97* | *5386* | *5483* |
| *No firearm* | *78* | *4718* | *4796* |
| *Total* | *175* | *10104* | *10279* |

* Total prevalence of history of firearm injury

Prevalance=existing # people w/ health outcome/ # people in study pop=175/10279=.0176925=1.77%

* Prevalence of history of firearm injury among firearm owners

97/5483=.01769=1.77%

* Prevalence of history of firearm injury among individuals without firearms

78/4796=.0162=1.62%

* Prevalence difference and prevalence ratio of relationship between current gun ownership and history of firearm injury. Include an interpretation in words for your PD and PR results.

*Prevalence exposed =97/5483*

*Prevalence unexposed = 78/4796*

*Prevalence difference= prevE-prevU=97/5483-78/4796=.0015=.15%*

*The prevalence is about the same in the gun owning group compared to the nongun owning group. Very slightly higher in the gun owning group*

*Prevalence ratio= prevE/prevU=(97/5483)/(78/4796) =1.088*

*The proportion of people sustaining firearm injuries is very slightly higher in the gun owning group.*

**In-Class Group Work**

*Please review your calculations above with your group. Work together to answer the following questions.*

4. This is a cross-sectional ecologic study. Do you think this is a good choice for answering the study question? (Refer to question 1 above)

5. Do you think there is a better study design for assessing whether **state** gun law “legislative strength” affects gun-related deaths that what was used in the paper? Explain your answer.

6. Suppose that you are instead interested in individual-level exposures. Describe a hypothetical individual-level study population for a closely related research question. What is your population? What is your question of interest? Describe any key advantages or disadvantages to this approach.

7.Fleegler et al. report rate differences (called “absolute rate differences”) and rate ratios (called “incident rate ratios”). How are they able to estimate these values in an ecologic study? Recall than most cross-sectional studies measure the prevalence of a specific outcome, and thus, common measures of association for cross-sectional studies include prevalence difference, prevalence ratio, and prevalence odds ratio.

*Hint:* What is the outcome? What is it about that outcome that is so unique and/or how many times can you “get” the outcome?

*8.* The optional readings [the commentary by Wintemute (2013) and **Bohannon (2013)]** for this case study describe the history of intentional limitation of research into gun violence in the US. What are your thoughts on how these limitations impacted public health knowledge in the field of firearm injuries and mortality? Do you think this limitation on firearm outcome research was justified? When is it appropriate to set limitations on public health research? What can researchers do in light of similar limitations?