

340.721 Epidemiologic Inference in Public Health I

ACTIVITY: Surveillance Systems

Activities provide experience in applying epidemiologic methods, interpreting findings, and drawing inferences.

This Activity follows from the corresponding set of PRE-Activity Questions that should be completed prior to the start of the Activity. The PRE-Activity Questions prepare you for a productive and collaborative experience during the Activities.

Expectations for the Activities

1. *Individually, read the Activity and attempt to answer all the questions.*
2. *“Meet” with your group and discuss challenging concepts, questions and compare answers*
3. *Formulate group consensus of answers if possible (sometimes there is no right or wrong answer!)*
4. *Post questions to the Discussion Forum if there is disagreement in your group or if there is need for a clarification to answer the question.*
5. *If your group is presenting at the LiveTalk, review your answers with a TA by posting to the Discussion Forum in your Group’s Category/Topic by 12PM EST of the Tuesday preceding the LiveTalk*

Influenza Surveillance

Reference: Frost, WH. The Epidemiology of Influenza. *JAMA*, 73: 313-318, August 2, 1919 and *Public Health Reports*, 34:1823-1836, August 15, 1919.

TABLE 2. ANNUAL DEATH RATES PER 100,000 OF POPULATION FROM INFLUENZA AND PNEUMONIA (ALL FORMS) BY MONTHS FOR THE YEARS 1910-1918, INCLUSIVE, IN NEW YORK, SAN FRANCISCO, AND CLEVELAND

Years	Total	Months											
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
NEW YORK CITY													
1910....	229.3	327.8	300.2	343.3	303.5	225.4	162.1	125.5	108.0	126.9	154.7	211.6	365.9
1911....	217.7	321.3	325.5	359.0	338.7	237.2	137.2	115.8	97.2	107.6	145.0	195.0	240.8
1912....	198.6	266.5	294.5	287.9	254.6	238.3	153.5	112.3	99.0	94.9	157.8	178.5	251.6
1913....	199.7	265.0	353.0	342.2	242.7	225.1	158.9	113.5	101.9	100.6	118.4	172.9	213.3
1914....	184.3	247.3	293.0	319.4	241.8	211.1	131.6	92.5	86.1	88.1	110.0	162.9	234.3
1915....	202.7	253.7	232.2	325.4	344.5	212.1	172.0	103.2	89.2	90.8	120.4	167.1	324.4
1916....	189.7	402.5	261.7	252.0	210.9	194.6	133.1	113.7	100.5	87.7	116.4	154.0	242.1
1917....	191.9	417.9	316.3	237.3	221.2	202.4	122.8	72.6	78.4	89.5	127.6	185.5	237.7
1918....	636.4	348.4	339.0	548.0	432.1	201.4	105.4	81.3	71.8	136.2	3,516.0	1,259.6	549.8
SAN FRANCISCO													
1910....	128.6	199.9	134.0	168.9	148.2	132.3	101.6	109.8	112.6	87.3	118.2	110.5	118.2
1911....	135.7	207.3	150.0	135.6	68.6	91.2	150.0	88.5	83.0	135.0	132.7	144.0	270.9
1912....	126.0	236.3	191.6	182.0	131.9	86.9	47.7	51.6	67.9	92.6	84.2	137.5	198.3
1913....	139.6	261.7	192.1	194.9	143.5	122.8	91.0	66.8	72.1	99.3	125.5	110.4	194.9
1914....	122.6	191.7	130.8	178.5	132.9	107.6	84.1	78.8	63.0	103.1	70.9	97.7	231.0
1915....	133.2	214.6	137.4	118.8	125.4	113.6	101.4	90.4	111.0	138.7	116.2	117.4	211.8
1916....	133.2	243.9	165.6	162.6	144.3	101.6	84.0	88.9	71.1	76.1	88.9	144.3	221.0
1917....	127.5	210.0	185.4	130.0	121.4	125.0	72.3	80.0	77.5	118.8	100.0	144.6	167.5
1918....	713.0	231.3	204.3	278.1	310.2	152.6	139.8	78.7	73.8	117.0	3,534.0	2,069.8	1,331.0
CLEVELAND													
1910....	136.3	198.3	180.0	223.0	213.5	148.3	107.9	54.2	48.2	51.8	85.6	138.0	190.0
1911....	106.5	174.3	165.9	164.1	155.0	103.4	77.5	40.5	50.6	67.1	81.0	109.0	93.2
1912....	114.6	163.6	141.2	159.7	142.7	126.2	91.7	55.2	75.0	30.6	88.8	110.1	185.4
1913....	131.9	179.8	205.1	217.5	152.5	147.4	107.5	68.1	60.6	74.3	115.3	130.9	128.6
1914....	117.2	160.1	175.2	197.0	201.8	139.9	53.3	51.6	46.3	59.0	66.4	116.0	143.7
1915....	162.7	166.5	333.1	252.6	201.8	109.3	77.4	55.5	78.8	59.2	121.8	170.2	336.8
1916....	198.5	545.0	209.2	263.8	266.9	211.2	86.6	57.6	82.1	75.7	153.6	175.0	242.9
1917....	210.9	344.0	386.0	415.0	233.8	208.0	145.8	90.2	66.4	72.1	160.0	152.9	267.0
1918....	557.0	161.3	178.5	190.4	366.3	142.6	60.0	62.5	43.5	48.0	1,812.0	2,135.0	1,376.0

Data for years 1910-1916 compiled from Mortality Statistics, Bureau of the Census, for those years.

Data for 1917 from tables prepared for publication in 1917 Mortality Statistics; advance sheets furnished by the Bureau of the Census.

Data for 1918 from special reports rendered to Director of the Census by city registrars.

Populations used are Bureau of the Census mid-year estimates.

Question 1

In the PRE-Activity Questions, you were introduced to Table 2 from Frost's article, The Epidemiology of Influenza. (*JAMA*, 73: 313-318, August 2, 1919) and asked to examine the data in Table 2 for trends by season and by year. In addition to the data in Frost's Table 2, what additional information would you like to have to examine trends in influenza mortality during this period? What other factors might be important? Why?

In the PRE-Activity Questions, you completed the following table of mortality rate ratios:

City	September	October	November	December
New York	1.55	i.) ?	8.18	2.27
San Francisco	1.54	39.75	ii.) ?	6.02
Cleveland	0.63	11.80	12.2	iii.) ?

Question 2

Compare the ratios among the cities. What trends do you observe? What could account for differences in the ratios?

Question 3

In his paper, Frost mentions that the “increased mortality of March and April 1918, was the consequence of a beginning and largely unnoticed epidemic of influenza” that developed into the great pandemic in the autumn. What is the evidence he considered? Why is it important to identify influenza epidemics early with respect to health implications, prevention and treatment of influenza epidemics?

Question 4

What are the implications of combining influenza and pneumonia?

Question 5

In establishing a surveillance system, what indicators could be used to identify a case of influenza? In what settings would you use these indicators?

Special Case: Avian Influenza

In the PRE-Activity Questions, you were introduced to some WHO surveillance data for avian influenza.

Cumulative Number of Confirmed Human Cases of Avian Influenza A/(H5N1)
Reported to WHO¹ (As of 28 June 2005)

Date of onset	Viet Nam		Thailand		Cambodia		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Dec 26, 2003- Mar 10, 2004	23	16	12	8	0	0	35	24
Jul 19, 2004- Oct 08, 2004	4	4	5	4	0	0	9	8
Dec 16, 2004 - to June 2005	60	18	0	0	4	4	64	22
Total	87	38	17	12	4	4	108	54

Notes

Total number of cases includes number of deaths.

WHO reports only laboratory-confirmed cases.

Question 6

Describe the trends of avian influenza infection in the table above. What are some possible explanations for why there were 0 avian influenza cases and deaths in Cambodia from December 2003 – October 2004 and in Thailand from December 2004 – June 2005?

¹ http://www.who.int/csr/disease/avian_influenza/country/cases_table_2005_06_28/en/print.html

Question 7

Imagine that you have been invited to develop a human avian influenza surveillance system for the government of Laos.

- a. Based on the data provided by the WHO (in the above table) and your understanding of the origins of avian influenza, how would you build the system? What populations would you target? What would you define as an “event”?
- b. How would this system differ from a system for the United States? What considerations would go into your choices?

Obesity and Diabetes Surveillance

In the PRE-Activity Questions, you were told about two different surveys in the United States that have collected data on diabetes and obesity prevalence over time.

Table 1: Diabetes and Obesity Prevalence in the NHIS and BRFSS

Year	Diabetes Prevalence (NHIS) ²	Diabetes Prevalence (BRFSS) ³	Obesity Prevalence (BRFSS) ⁴
1990	2.7	-	11.6
1991	2.8	-	12.6
1992	3.0	-	12.6
1993	3.0	-	13.7
1994	3.2	-	14.4
1995	3.1	4.4	15.8
1996	3.2	4.5	16.8
1997	3.8	4.8	16.6
1998	3.9	5.4	18.3
1999	4.1	5.6	19.7
2000	4.4	6.1	20.1
2001	4.7	6.5	21.0
2002	4.8	6.7	22.1

- No data available on BRFSS website

Question 8

How useful is the information gathered from these survey questions on diabetes and obesity? Will it vary from population to population? Is it likely to change over time? Is it likely to be accurate?

² <http://www.cdc.gov/diabetes/statistics/prev/national/tableage.htm>

³ <http://apps.nccd.cdc.gov/brfss/index.asp>

⁴ <http://apps.nccd.cdc.gov/brfss/Trends/trendchart.asp?qkey=10010&state=US>

Question 9

What is the reason for conducting surveillance on diabetes in the United States? What is the reason for conducting surveillance on obesity in the United States? What is the difference between the two?

Table 2: Crude and Age-Adjusted Prevalence of Diagnosed Diabetes per 100 Population, United States, 1980-2003⁵

Year	Crude Rate	Age-Adjusted Rate⁶
1980	2.5	2.8
1981	2.5	2.8
1982	2.5	2.7
1983	2.5	2.8
1984	2.6	2.8
1985	2.7	2.9
1986	2.7	3.0
1987	2.7	2.9
1988	2.7	2.9
1989	2.6	2.8
1990	2.7	2.9
1991	2.8	3.0
1992	3.0	3.1
1993	3.0	3.2
1994	3.2	3.3
1995	3.1	3.2
1996	3.2	3.3
1997	3.8	4.0
1998	3.9	4.1
1999	4.1	4.2
2000	4.4	4.5
2001	4.7	4.7
2002	4.8	4.9
2003	4.9	4.9

⁵ <http://www.cdc.gov/diabetes/statistics/prev/national/tableage.htm>

⁶ Adjusted using 2000 U.S. Population as the standard.

Question 10

Why are there both crude and age-adjusted prevalence estimates of diabetes prevalence in Table 2 from the NHIS? Compare the crude and adjusted rates. What would you conclude if the age-adjusted rates were much lower than the crude rates?

Question 11

Based on these data, what could you conclude about the relationship between obesity and diabetes? What are the strengths and limitations of these surveillance systems in tracking disease?