

Name: _____ Date: _____ Hour: _____

Coincidence or Murder?

Kristen Gilbert started working at the VAMC as a nurse in 1989. A proficiency report obtained by the Boston Globe described her as "highly skillful," calm and compassionate. She organized charity drives and collections for the needy, one of her defense attorneys said, and she once organized a memorial service for a colleague who died of cancer.

However, Gilbert did have a tendency to be nearby when patients died. Co-workers sometimes referred to her as the "angel of death," the Boston Globe reported.

Federal prosecutor Bill Welch said that death rates seemed to increase significantly during the shifts Gilbert was assigned to, according to the Globe. Eventually, her fellow nurses grew suspicious.

In particular, Gilbert's co-workers started to raise concerns about an increase in medical emergencies ("codes") and deaths in Ward C between August 1995 and February 1996, court records show. A criminal investigation was launched in February, and Gilbert left her job soon after learning she was the target of it.

According to a search warrant affidavit, a statistical analysis of codes and deaths in Ward C between January 1, 1995 and February 19, 1996 showed that Gilbert was present or on duty for 37 of them. Authorities determined the likelihood that her frequent presence during these emergencies was merely coincidental was _____.

Source:

<http://www.hlntv.com/article/2013/04/01/serial-killers-gilbert-angel-death-ward-c>

1. What other explanations might there be for why Gilbert had more deaths on her shifts?
could be coincidence. she works on harder unit. Night shift vs. Day shift.

2. What statistical information would we need to know in order to make a decision about whether the deaths on Gilbert's shifts were coincidental, or in other words, purely by chance?

How many deaths occurred during similar shifts? What proportion of deaths to shifts is normal when she is not there?

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An analysis of 1641 eight-hour shifts is presented below. Use the data to decide if there is an association between Gilbert's presence and death during a shift.

		Death during shift?		Total
		Yes	No	
Gilbert present?	Yes	40	217	257
	No	34	1350	1384
Total		74	1567	1641

3. What type of test will you use to analyze the data? Why?

χ^2 for Association

Important to be careful with someone's life.

4. Conduct the test below using the 4 step process.

State

H_0 : There is no assoc. b/w Gilbert's presence and death during shift.
 H_a : There is an assoc.

$\alpha = .01$

Plan:

χ^2 for Association

Random

Large Counts

All expected ≥ 5 ✓

Expected counts

11.59	245.41
62.41	1321.59

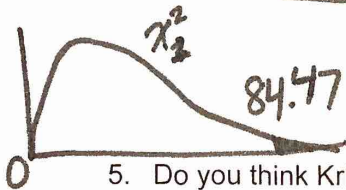
Do:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

$$\frac{(40 - 11.59)^2}{11.59} + \frac{(217 - 245.41)^2}{245.41} + \frac{(34 - 62.41)^2}{62.41} + \frac{(1350 - 1321.59)^2}{1321.59}$$

$$= 69.64 + 3.29 + 12.93 + .61$$

$$\chi^2 = 86.47 \quad df = 1 \quad P\text{-value} < .0005$$



CONCLUDE:

We have convincing evidence to reject the null.

5. Do you think Kristen Gilbert murdered her patients? Explain using the results of your study.

Yes, the p-value is sooooo small it is very unlikely to get these results purely by chance!