

Smoking.

21) Virginia public health officials claim that 18% of adults currently smoke cigarettes.

a. We start by selecting a few adults at random, asking each if he or she is a smoker.

Explain why these can be considered Bernoulli trials.

2 outcomes : smoker or non-smoker

b. How many people do you expect to have to ask in order to find a smoker?

Geometric: $\mu = \frac{1}{p} = \frac{1}{.18} = 5.5 \approx 6 \text{ people}$

c. Let X represent the number of smokers among a randomly chosen sample of 30 adults.

Find the mean and standard deviation of X.

Binomial

$$\mu = np = 30(.18) = 5.4$$

$$\sigma = \sqrt{npq} = \sqrt{30(.18)(.82)} \approx 2.10$$

d. What is the probability that there are at least eight smokers among our sample of 30 people?

binomial $P(X \geq 8) = 1 - P(X \leq 7) = 1 - \text{binomcdf}(30, .18, 7) = 1 - .842 = .158$

e. What is the probability that the first smoker, in our group of 30, is the fifth person we ask?

geometric: $\text{geomtr.pdf}(.18, 5) = .081$

Seatbelts.

- 22) Safety officials hope a public information campaign will increase the use of seatbelts above the current 70% level. Their efforts include running radio and TV ads, putting up billboards, having police officers appear on talk shows, and getting newspapers to indicate whether people injured in accidents were belted in. After several months they check the effectiveness of this campaign with a statewide survey of 560 randomly chosen drivers. 407 of those drivers report that they wear a seatbelt.

- a. Verify that a Normal model is a good approximation for the binomial model in this situation.

assume 10% conditions hold true. - Success/failure condition
 $np \geq 10$, $ng \geq 10$
 $(560)(.70) = 392 \geq 10$, $(560)(.30) = 168 \geq 10$ ✓ yes

- b. Does the survey result suggest that the education / advertising campaign was effective? Defend your opinion.

Q: Is 70% too low?

$$\mu = 392$$
$$\sigma = \sqrt{npq} = \sqrt{560(.7)(.3)}$$
$$\sigma = 10.84$$

$$392 + 2(10.84) = 413.68$$

≈ more than 413 people
needed to prove 70% too low

* Does not prove ad campaign was effective
"407 people" is within acceptable range