Lesson 61: Work in groups on the discrimination study

First - Websearch: Why do symphonies hold blind auditions?

Statistical Evidence of Discrimination

Using the randomization test to show that variables are associated.

In 1972, 48 male bank supervisors were each given the same personnel file and asked to judge whether the person should be promoted to a branch manager job that was described as "routine" or whether other applicants should be interviewed. The files were identical except that half of them showed that the file was that of a female and half showed that the file was that of a male. Of the 24 "male" files, 21 were recommended for promotion. Of the 24 "female" files, 14 were recommended for promotion. (From B. Rosen and T. Jerdee [1974], "Influence of sex role stereotypes on personnel decisions," *J. Applied Psychology,* 59:9–14.)

Question

Is the opening example convincing evidence that the bank supervisors discriminated against female applicants, or could the difference in the numbers recommended for promotion reasonably be attributed to chance? That is, is it possible that there was no discrimination on the basis of sex: It just happened that 21 out of the 35 bank managers who recommended promotion got files marked "male."

Objectives

In this activity, you will learn how to use the randomization test to tell if the difference between two proportions is *statistically significant.* The randomization test will be a simulation of the situation under the hypothesis that there was no discrimination on the basis of sex. "Statistically significant" means that a difference as big as or bigger than that which occurred is unlikely to have happened without a cause other than random variation. When you have finished this activity, you should be able to use the randomization test to decide whether you can reasonably attribute the difference between two proportions to chance or whether you should search for some other explanation.

Prerequisites

You should have had some previous experience with simulation.

Activity One

1. Remove all four aces from a deck of playing cards. There will now be 24 red cards in the deck, which will represent "male" files, and 24 black cards in the deck, which will represent "female" files. Shuffle the cards at least seven times and then cut them.
   a. Count out the first 35 cards to represent the files recommended for promotion. How many males were in this pile?
   b. On a number line like that shown in Figure 1, place an X above the number of males you got in step 1a.

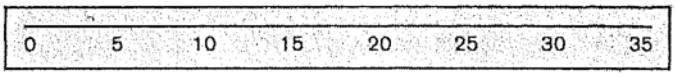

Figure 1

   c. In this simulation, what is the probability that a particular male will be promoted? A female? Does this simulation model the case of discrimination on the basis of sex or the case of no discrimination?
   d. Repeat the simulation with the cards until you have a total of 100 X's on the number line. You may want to combine results with other groups. (If you have 10 groups, each group would do only 10 simulations.)
   e. Use the results on your number line to estimate the probability that 21 or more of the 35 recommended for promotion will be male if there was no discrimination on the basis of sex.
   f. Do you believe your simulation provides evidence that the bank supervisors discriminated against females?

Activity Two

Few situations in real life are as clear-cut as that of the bank supervisors. In real life, the files are never identical. Education, experience, character, recommendations, and test scores vary. Statistics can tell us only whether the difference between two groups can reasonably be attributed to chance. If it cannot reasonably be attributed to chance, then further digging is required to determine whether the explanation is discrimination or a difference in qualifications.

In *Griggs v. Duke Power Company* (1971), the U.S. Supreme Court established the idea of "disparate impact." Disparate impact occurs, for example, when the pass rate of one group on an employment test is substantially lower than that of another. Such an employment test is illegal unless the employer can prove that the use of the test is a business necessity. For steps 2 and 3,

a. Design a simulation with cards to help you determine whether the difference in pass rates can reasonably be attributed to chance or whether there is clearly disparate impact on this examination.

b. Repeat your simulation 100 times, sharing the work with other groups. Place your results above a number line.

c. Write a paragraph explaining your conclusions.

Assessment Questions

1. Suppose that on the 1994 test for the fire department, 5 out of 10 women pass and 9 out of 10 men pass. Assume for a moment that the chance a man passes this examination is the same as that of a woman passing. Describe a way to simulate with cards the probability of getting a difference between the proportion of men who pass and the proportion of women who pass that is as large or larger than it was in 1994.

2. Suppose that on a hiring examination, 35 out of 40 women pass and 20 out of 40 men pass. Under the assumption that men and women are equally likely to pass, a simulation was performed 500 times. Table 2 shows the number of men who passed. Write a paragraph explaining what conclusion should be drawn from this simulation.

Number of Males	Frequency	Number of Males	Frequency
19	3	28	76
20	4	29	62
21	6	30	59
22	6	31	36
23	18	32	15
24	29	33	11
25	47	34	7
26	49	35	2
27	69	36	1

Table 2

3. In the previous question, what probability did we use in the simulation for the chance that a man would pass? Why does that probability make sense?