

Student Number: _____
Midterm Exam

Feb 3, 2005
Due Feb 4 at Noon

Ground rules:

- Breathe!
 - **DO NOT WRITE YOUR NAME ON THE MIDTERM**—write your student number. If you're worried about losing the first page, write your student number on each page.
 - You can use your notes or books, a calculator or a spreadsheet, but you may not communicate with other people about this midterm nor the material covered by it.
 - In order to receive as much credit as possible, please show all of your work. Showing that you understand the question and know how to set up the solution correctly is more important than arriving at the exact answer.
 - Read each question carefully and answer all parts of each question.
 - Good luck!
 - When you are done, please put it in my box in 208 Parrington (the Dean's office) or email it to me. If you put it in the box, please email me to let me know you have done so.
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1. Locally, the city of Seattle used the Boost program to try to improve its record in contracting with woman-owned businesses. Passed in 1998, I-200 prevents the use of affirmative action in local contracting (among other things). The Boost program gave incentives to prime contractors to use small businesses in their work on seven major projects locally (including the new City Hall and Central Library). Since most women's businesses are small, the idea was this was one way to approach the limitations of I-200. Prior to I-200, women made up 20% of city contracts. After (even with the BOOST program) women make up 3.75% of city contracts.

Let's take a look at what we know about the small businesses and woman owned-businesses nationally to see we can come up with a plausible explanation of why this policy did not work. Nationally, women own 30% of businesses in the U.S. 98% of women's businesses have revenues less than \$1 million, so most are small businesses. Furthermore, small businesses make up 80% of companies nation-wide.

- a. Nationally, what's the probability of being a woman-owned business and being a small business?

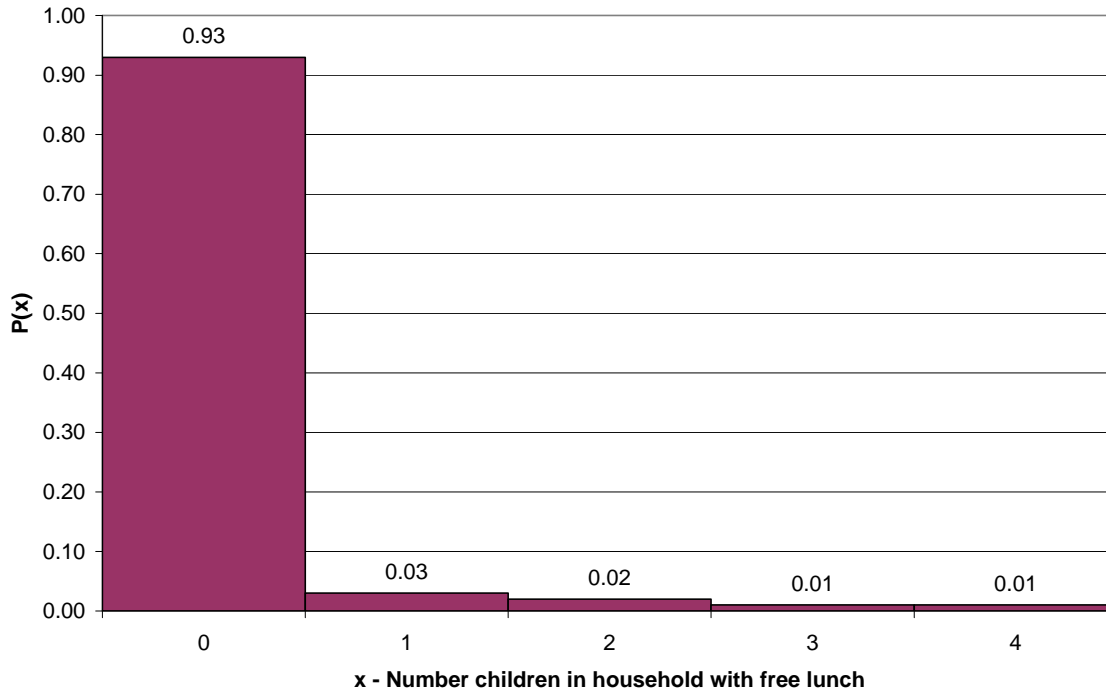
- b. What's the probability of being a women-owned business or being a small business nationally?

c. What's the probability that if one owns a small business the owner is a woman?

d. Are being a small business and being a woman-owned business independent? Make sure to show your work.

- e. Write a paragraph interpreting your results and using what you've learned about small and woman-owned businesses nationally to talk about why the Boost program may not have worked as intended. Write for a non-technical policy audience.

2. The March 2004 Current Population Survey asked households in the U.S. how many children in their household received free lunch at their schools. The chart below presents the probability distribution for 112,116,531 U.S. households in March 2004. The free program is part of the National School Lunch Program to provide nutritionally balanced low-cost or free lunches to children below the age of 18.



- What's the probability of randomly selected household having no children in the free lunch program?
- What's the probability that at least one child in a household is in the free lunch program?

c. What's the average number of children who receive a free lunch in a household?

d. What's the standard deviation of the number of children in a household who receive a free lunch?

e. Based on the information presented, what does the free lunch program cost the federal government? Reimbursements for the free lunch program are \$2.24 a child.

f. Write a paragraph explaining your results to a non-technical policy maker.

3. Serum cholesterol is an important risk factor for coronary disease. Epidemiologists have shown that when you take the natural log (usually written \log_e or \ln) of serum cholesterol, it is normally distributed with mean 5.39 and standard deviation 0.23. Suppose the clinically normal range for cholesterol is 150-250 mg%/mL. [note, $\ln(150)=5.01$ and $\ln(250)=5.52$]

a. What proportion of the population has normal levels of cholesterol?

b. What proportion of people has abnormally low levels of cholesterol?

c. What proportion of people has abnormally high levels of cholesterol?

Some investigators feel that only cholesterol levels over 300 mg%/mL indicate a high risk of heart disease. [Note, $\ln(300)=5.70$]

d. What proportion of the general population do those with levels over 300 mg%/mL represent?

e. What proportion of those with abnormally high levels of cholesterol do those with levels over 300 mg%/mL represent?

f. Write up and interpret your results in 3a-e for a non-technical audience.