1. Basic Definitions

The **POPULATION** is the entire set of people (or animals, things) we wish to study.

A **SAMPLE** is a part of the population.

A numerical fact about a sample is a **STATISTIC**.

A numerical fact about a population is a **PARAMETER**.

Example, from the handout -- of the 1,023 adults surveyed as part of a random national sample, 40% said they open the mail more carefully now. The 40% is a statistic that describes the sample. Statistic is to sample what PARAMETER is to the population. If 40% is what the survey revealed, the people who conducted the survey hope that it is a close approximation of the true population PARAMETER, that is the percentage of all adults in America who have changed the behavior with regard to the U.S. Mail.

2. Problems

- A. Bias -- If a sample is "representative", then a statistic can be a good estimate of the parameter; but if the sample includes or excludes certain people systematically, the sample is BIASED. See examples of non-random samples...results from Vote.com
- B. Selection bias --- you include or exclude certain people
- C. Non-response bias --- people don't bother to answer you
- D. Response bias --- people answer, but they lie to you or they are manipulated by the way you asked the question
- E. Wording of question --- phrasing may not be neutral (e.g. a loaded question).

3. Design Issues

Statisticians are well aware of the problem of bias. Only in the last 50 years have survey organizations used probability methods to draw their samples. These Sampling Designs can help.

a. Simple random sample (SRS): every person in the population has an equal chance of getting into the sample with each draw. In practice this is drawing at random without replacement (because it would not make sense to select the same person or measure the same animal/thing twice).

b. Not every sampling scheme is simple random sampling; other sampling schemes include MULTISTAGE CLUSTER SAMPLING.

There is a good example of multistage cluster sampling on p.341, Figure 1

The idea here is that a large population (e.g. the US) is broken down into increasingly smaller areas at and each stage a single unit is drawn randomly until the unit of interest (e.g. households) is reached.

Note: these methods can be applied to things other than households. Examples might be estimating the corn harvest, sampling firms on hiring expectations, etc.

PRINCIPLE: Probability methods work well because they are impartial.



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Health Headlines

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Forty Percent Open Mail Carefully, Poll Finds

By Gary Langer <u>ABCNEWS.com</u>

Four in 10 Americans now open their mail cautiously, a new ABCNEWS poll finds.

Four in 10 Americans are exercising caution when opening their mail, and a third are gathering information on how to deal with an anthrax attack, according to new polling by ABCNEWS and *The Washington Post*. But far fewer — numbers in the single digits — are stockpiling antibiotics, calling doctors or avoiding crowds.

These results underscore what's been an essentially reasoned public approach to the anthrax scare — perhaps born of a recognition that the attacks thus far have targeted political figures and the news media, not people at random.

The most widespread personal precaution is to exercise care in opening mail: Forty percent of Americans are doing so. Nearly as many, 35 percent, say they've gathered information on what to do in case of biological attack. About 15 percent more say they're "seriously considering" taking either of those actions.

Other steps are far less common: Eight percent say they're avoiding crowded places such as shopping malls because of the risk of terrorism. Five percent have spoken with a doctor about anthrax. Two percent say they've bought antibiotics in case of biological attack. And 5 percent have done something else, with storing water the top response.

Interviews for this poll were conducted Wednesday through Sunday, before Monday's news of additional anthrax exposures in Washington, D.C. That report, however, did not move the focus of the attacks beyond the previously known targets — the news media and Washington officials, via the mail. Results were stable across interview days.

Last week, an ABCNEWS/ *Washington Post* poll also found a sober response to the anthrax situation, with barely over a quarter of respondents expressing a great deal of worry that they or a loved one might become infected.

Groups

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There are some differences among groups in response to the terrorism risk. More women than men are exercising caution with their mail — 46 percent of women, 33 percent of men. Also, more nonwhites than whites are using care with their mail, as are more people in the Northeast and South (where the attacks have occurred) than in the Midwest and West.

Verbatim

As noted, 5 percent of Americans say they've taken other steps to prepare for anthrax or some other biological attack. A quarter of those people mentioned storing water (as well as, in some cases, food and other items). Some other verbatim responses follow, to provide an impression of what these individuals are thinking:

"Increase my own awareness by keeping in touch with the media, via Internet, and spoke with firefighters in my area."

"We read our bible more."

"Family has sat and discussed."

"Bottled water, Band-Aids, three months food supply, bought a lot of ammunition and camouflage, leave gas tank three-quarters full, and I can pack up in 15 minutes and move away real quick."

"Clean my gun."

"Just being cautious."

"Have the right telephone numbers for fire department, Center for Disease Control, NYPD."

"Praying."

"Gas masks."

"I have a shelter."

"I've put non-perishables in the basement."

"I'm taking vitamins to build up my immune system."

"Gloves, bleach, wash hands always."

"I am a police officer so I have been training for it. On a personal note I have not, but work-wise we have done a lot to prepare and know what to do."

Methodology

This ABCNEWS/ *Washington Post* survey was conducted by telephone Oct. 17-21, among a random national sample of 1,023 adults. The results have a three-point error margin. Sampling, data collection and tabulation by TNS Intersearch of Horsham, Pa.