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CONSTRUCTION ENGINEERING & MANAGEMENT DEPT.

CEM 599

RESEARCH METHODS IN CONSTRUCTION

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Outline

- When and how to select a sample
- When is sampling useful
- How large should a sample be
- The three steps in sampling
- Finding good lists
- Uncomplicated sample design
- How the survey method affects sampling frame
- Why use more complicated design

When and how to select a sample

- Sample is a set of respondents selected from a large population for the purpose of survey in order to save time and money.

- Three steps involved in sampling
 - ◆ Defining the survey population
 - ◆ Obtaining an adequate population list and
 - ◆ Selecting the sample



When is sampling useful

- It provides an ability to obtain information from a relatively few respondents to describe the characteristics of an entire population.
- When population is very small, efficiency is of no concern then sampling is not required.
- But sampling is recommended even for small population because of three reasons

When is sampling useful

- ◆ In telephone and face to face interview it leads to substantial amount of savings of time and money.
 - ◆ Regardless of the survey method used, if we can tolerate a higher sampling error, leads to smaller sample which results in cheaper survey.
 - ◆ If we expect the population to have less variation, our sample can be even smaller.
- The question whether or not to sample depends on survey method, population size and variation, and our need for precision.



How large should a sample be

- Sample size depends on
 - ◆ How much sampling error can be tolerated
 - ◆ Population size, if the population is small (and how “small” depends on how much precision is required)
 - ◆ How varied the population is with respect to the characteristics of interest
 - ◆ The smallest subgroup within the sample for which estimates are needed.

How large should a sample be

Population size	Sample size for the 95 percent confidence level					
	$\pm 3\%$ sampling error		$\pm 5\%$ sampling error		$\pm 10\%$ sampling error	
	50/50 split	80/20 split	50/50 split	80/20 split	50/50 split	80/20 split
100	92	87	80	71	49	38
250	203	183	152	124	70	49
500	341	289	217	165	81	55
750	441	358	254	185	85	57
1,000	516	406	278	198	88	58
2,500	748	537	333	224	93	60
5,000	880	601	357	234	94	61
10,000	964	639	370	240	95	61
25,000	1,023	665	378	234	96	61
50,000	1,045	674	381	245	96	61
100,000	1,056	678	383	245	96	61
1,000,000	1,066	682	384	246	96	61
100,000,000	1,067	683	384	246	96	61



The three steps in sampling

- If sampling is appropriate for your survey you have to do three things
 - ◆ **Identify the sample population:** It should be as precisely as possible and in a way that make sense in terms of the purpose of the study.
 - ◆ **Put together a population list:** There are many kinds of lists; Telephone directories, club membership lists, customer list from utility companies, and voter registration lists.
 - ◆ **Select the sample:** Sampling methods range from simple to extremely complex. Simple random sampling and systematic sampling are used for the surveys of small population.



Finding a good lists

- The very best list is one in which every member of the target population is listed once and only once i.e., coverage error is not a concern if the list is good one.
- An acceptable list for one survey may be out of the question for another.
- For a survey of small and specific population finding a list is easy.



Uncomplicated Sample Design

- The most basic method, Simple Random Sampling (SRS) gives each member of the target population an equal chance of being selected.
- Simple Random Sample can be selected in three ways
 - ◆ In a lottery, in other words, by picking out of a hat
 - ◆ Using a random number table
 - ◆ Using computer generated list of random numbers
- Random and systematic sampling are examples of probability designs.



Non probability Samples

- Non probability sampling depends on Subjective judgment. The surveyor selects a sample based on his convenience.
- Non probabilistic or purposive sampling is appropriate in
 - ◆ Exploratory research intended to generate new ideas that will be systematically tested later.
 - ◆ Survey conducted to organize communities, identify leaders, or build networks.
- If the goal is to learn about large population people avoid using judgmental or non probability sampling



Survey method affects Sampling

- Mail survey cannot be done without a good list. Coverage error can be a major problem if list have a significant number of omissions, duplicate entries or inaccuracies.
- Random sampling from telephone directory will provide you a systematic sample in less time, but coverage error can be a serious issue because people with unlisted or new listings have no chance of being selected.

Random Digit Dialing

- It is a technique commonly used to get around problems of unlisted phone numbers and out of date directories.
- Steps
 - ◆ Find three digit code used in study area
 - ◆ Generate 4 digit random number and use with three digit code and call
 - ◆ Non working and ineligible numbers are deleted from the list
- For general public survey in a large area, researchers can purchase list of telephone numbers that have been randomly generated by private firms



Face to Face Survey

- If you ask a survey statistician for advice on sampling for a face to face survey, he or she may say you should not even attempt it. Because it is very complicated and such samples are usually drawn in several stages and involve a process called clustering.



More Complicated Design

- Disproportionate sampling is used in conjunction with random or systematic designs.
- Two stage cluster sampling: In first stage a sample area is selected and in second stage, a sample of respondents is chosen from the first stage sample. The advantage of clustering like this is efficiency and it is used in conjunction with either random or systematic sampling.



More Complicated Design

- Determine the sampling rate at each stage and calculating sampling error within and among clusters is complicated.
- Using these techniques require professional help before designing your sample.



QUESTIONS



