Introduction used, each element in the population

Business

Introduction toSampling The way in which we select a sample ofindividuals to be research participants is critical.

How we select participants(random sampling) will determine the population to which we may generalize ourresearch findings. The procedure that we use for assigning participants to differenttreatment conditions (random assignment) will determine whether bias exists inour treatment groups. Beforedescribing sampling procedures, we need to define a few key terms. The termpopulation means all members that meet a set of specifications or a specifiedcriterion.

For example, the population of the United States is defined as allpeople residing in the United States. The population of New Orleans means allpeople living within the city’s limits or boundary. A population of inanimateobjects can also exist, such as all automobiles manufactured in Michigan in theyear 2003. A single member of any given population is referred to as anelement. When only some elements are selected from a population, we refer tothat as a sample; when all elements are included, we call it a census. Dataderived from a sample are treated statistically. Using sample data, wecalculate various statistics, such as the mean and standard deviation. Thesesample statistics summarize (describe) aspects of the sample data.

These data, when treated with other statistical procedures, allow us to make certaininferences. From the sample statistics, we make corresponding estimates of thepopulation. Thus, from the sample mean, we estimate the population mean; fromthe sample standard deviation, we estimate the population standard deviation. Types of SamplingSimple Random

Sampling Researchers use two major sampling techniques: probability sampling and non probability sampling. With probability sampling, aresearcher can specify the probability of an element’s (participant’s) beingincluded in the sample. With non probability sampling, there is no way ofestimating the probability of an element’s being included in a sample. If theresearcher’s interest is in generalizing the findings derived from the sampleto the general population, then probability sampling is far more useful andprecise. Unfortunately, it is also much more difficult and expensive than nonprobability sampling.

Probabilitysampling is also referred to as random sampling or representative sampling. Theword random describes the procedure used to select elements (participants, cars, test items) from a population. When random sampling is used, each element in the population has anequal chance of being selected (simple random sampling) or a known probabilityof being selected (stratified random sampling). The sample is referred to asrepresentative because the characteristics of a properly drawn sample representthe parent population in all ways. Onecaution before we begin our description of simple random sampling: Randomsampling is different from random assignment. Random assignment describes theprocess of placing participants into different experimental groups. Step 1. Defining thePopulation Before a sample is taken, we must first definethe population to which we want to generalize our results.

The population ofinterest may differ for each study we undertake. It could be the population ofprofessional football players in the United States or the registered voters inBowling Green, Ohio. It could also be all college students

at a givenuniversity, or all sophomores at that institution. It could be female students, or introductory psychology students, or 10-year-old children in a particular school, or members of the local senior citizens centre. The point should be clear; thesample should be drawn from the population to which you want to generalize—thepopulation in which you are interested. Itis unfortunate that many researchers fail to make explicit their population ofinterest.

Many investigators use only college students in their samples, yettheir interest is in the adult population of the United States. To a largeextent, the generalizability of sample data depends on what is being studiedand the inferences that are being made. Step 2. Constructing a List Before a sample can be chosen randomly, it isnecessary to have a complete list of the population from which to select. Insome cases, the logistics and expense of constructing a list of the entirepopulation is simply too great, and an alternative procedure is forced upon theinvestigator. We could avoid this problem by restricting our population ofinterest—by defining it narrowly.

However, doing so might increase thedifficulty of finding or constructing a list from which to make our randomselection. For example, you would have no difficulty identifying femalestudents at any given university and then constructing a list of their namesfrom which to draw a random sample. It would be more difficult to identify female students coming from athree-child family, and even more difficult if you narrowed your interest tofirstborn females in a three-child family. Moreover, defining a population narrowly also meansgeneralizing results narrowly. Caution must be exercised in compiling a listor in using one already constructed. The population list from

which you intendto sample must be both recent and exhaustive. If not, problems can occur.

By anexhaustive list, we mean that all members of the population must appear on thelist. Voter registration lists, telephone directories, homeowner lists, andschool directories are sometimes used, but these lists may have limitations. They must be up to date and complete if the samples chosen from them are to betruly representative of the population. In addition, such lists may providevery biased samples for some research questions we ask. Step 3. Drawing the Sample After a list of population members has beenconstructed, various random sampling options are available.

Some common onesinclude tossing dice, flipping coins, spinning wheels, drawing names out of arotating drum, using a table of random numbers, and using computer programs. Except for the last two methods, most of the techniques are slow andcumbersome. Tables of random numbers are easy to use, accessible, and trulyrandom. Here is a website that provides a random number table, as well as a wayto generate random numbers. Step 4. Contacting Members of a Sample Researchersusing random sampling procedures must be prepared to encounter difficulties atseveral points.

As we noted, the starting point is an accurate statement thatidentifies the population to which we want to generalize. Then we must obtain alisting of the population, accurate and up-to-date, from which to draw oursample. Further, we must decide on the random selection procedure that we wishto use. Finally, we must contact each of those selected for our sample andobtain the information needed.

Failing to contact all individuals in the samplecan be a problem, and the representativeness of the sample can be lost at thispoint. Stratified RandomSampling This procedure known as stratified randomsampling is also a form of probability sampling. To stratify means to classifyor to separate people into groups according to some characteristics, such asposition, rank, income, education, sex, or ethnic background. These separategroupings are referred to as subsets or subgroups.

For a stratified randomsample, the population is divided into groups or strata. A random sample isselected from each stratum based upon the percentage that each subgrouprepresents in the population. Stratified random samples are generally moreaccurate in representing the population than are simple random samples. Theyalso require more effort, and there is a practical limit to the number ofstrata used. Because participants are to be chosen randomly from each stratum, a complete list of the population within each stratum must be constructed. Stratified sampling is generally used in two different ways. In one, primaryinterest is in the representativeness of the sample for purposes of commentingon the population.

In the other, the focus of interest is comparison betweenand among the strata. Stratifiedsamples are sometimes used to optimize group comparisons. In this case, we arenot concerned about representing the total population. Instead, our focus is oncomparisons involving two or more strata. If the groups involved in ourcomparisons are equally represented in the population, a single random samplecould be used. When this is not the case, a different procedure is necessary. For example, if we were interested in

making comparisons between whites andblacks, a simple random sample of 100 people might include about 85 to 90whites and only 10 to 15 blacks.

This is hardly a satisfactory sample formaking comparisons. With a stratified random sample, we could randomly choose50 whites and 50 blacks and thus optimize our comparison. Whenever stratarather than the population are our primary interest, we can sample in differentproportions from each stratum. Although random sampling is optimal from amethodological point of view, it is not always possible from a practical pointof view. Convenience Sampling Convenience sampling is used because it isquick, inexpensive, and convenient. Convenience samples are useful for certainpurposes, and they require very little planning. Researchers simply useparticipants who are available at the moment. The procedure is casual and easy, relative to random sampling.

Contrast using any available participants withrandom sampling, where you must (1) have a well-defined population, (2) constructa list of members of the population if one is not available, (3) samplerandomly from the list, and (4) contact and use as many individuals from thelist as possible. Convenience sampling requires far less effort. However, suchconvenience comes with potential problems, which we will describe.

Conveniencesamples are non probability samples. Therefore, it is not possible to specifythe probability of any population element’s being selected for the sample. Indeed, it is not possible to specify the population from which the sample wasdrawn. Example; In shopping malls or airports, individuals are selected as they pass acertain location and interviewed concerning issues,

candidates, or othermatters. Quota Sampling In many large-scale applications of samplingprocedures, it is not always possible or desirable to list all members of thepopulation and randomly select elements from that list. The reasons for usingany alternative procedures include cost, timeliness, and convenience. Onealternative procedure is quota sampling. Thistechnique is often used by market researchers and those taking political polls.

Usually, when this technique is used, the population of interest is large andthere are no ready-made lists of names available from which to sample randomly. The Gallup Poll is one of the best known and well conducted polls to use quotasampling. This poll frequently reports on major public issues and onpresidential elections. The results of the poll are syndicated for a fee thatsupports it. In this quota sampling procedure, localities are selected andinterviewers are assigned a starting point, a specified direction, and a goalof trying to meet quotas for subsets (ethnic origins, political affiliations, and so on) selected from the population. Although some notable exceptions haveoccurred, predictions of national elections over the past few years have beenrelatively accurate—certainly, much more so than guesswork. Withthe quota sampling procedure, we first decide which subgroups of the populationinterest us.

This, in turn, is dictated by the nature of the problem beinginvestigated (the question being asked). For issues of national interest (suchas abortion, drug use, or political preference), frequently used subsets areage, race, sex, socioeconomic level, and religion. The intent is to select asample whose frequency distribution of characteristics reflects that of thepopulation of interest.

Obviously, it is necessary to know the percentage ofindividuals making up each subset of the population if we are to match thesepercentages in the sample. For example, if you were interested in ethnic groupssuch as Italians, Germans, Russians, and so on, and knew their populationpercentages, you would select your sample so as to obtain these percentages. Withineach subset, participants are not chosen randomly. This is simply because thereare usually no ready-made lists from which the researcher can select randomly. Often individuals are selected in the sample on the basis of availability. Forthis reason, quota sampling is less expensive. It would not be so if lists ofthe population of interest had to be constructed. However, if exhaustiveready-made lists were conveniently available for the population of interest, then choosing participants randomly would be possible and preferable.

In theabsence of such lists, it is much more convenient to select quotas by knockingon doors, telephoning numbers, or sending mailings until the sample percentagesfor subsets match those of the population. Obviously, even though the quotasmay be achieved and the sample may match the population percentages in terms ofsubsets, the sample may still not represent (reflect) the population to whichwe wish to generalize. Ofteninterviewers, for sampling purposes, concentrate on areas where large numbersof people are likely to be. This could bias the findings.

As we noted earlier, samples taken in airports may over represent high-income groups, whereas thoseat a bus or rail depots may over represent low-income groups. Samples at eitherplace may under represent those who seldom travel. Also, people who are homeduring the day, and are therefore

available for house-to-house interviews ortelephone calls, may be quite different in important ways from those who are nothome.

In this respect, quota sampling and convenience sampling are similar. Inspite of these difficulties, the quota system is widely used and willunquestionably continue to be so for economic and logistic reasons. Table No. 1 Sampling Technique Advantages Limitations Simple Random Sampling Representative of the population. May be difficult to obtain the list. May be more expensive. Stratified Random Sampling Representative of the population.

May be difficult to obtain the list. May be more expensive. Convenience Sampling Simple Easy Convenient No complete member list needed.

May not be representative of population. Quota Sampling Simple Easy Convenient No complete member list needed. May not be representative of population. Sampling Error Error can occur during the sampling process. Sampling error can include both systematic sampling error and random samplingerror. Systematic sampling error is the fault of the investigation, but randomsampling error is not.

When errors are systematic, they bias the sample in onedirection. Under these circumstances, the sample does not truly represent thepopulation of interest. Systematic error occurs when the sample is not drawnproperly, as in the poll conducted by Literary Digest magazine. It can alsooccur if names are dropped from the sample list because some individuals weredifficult to locate or uncooperative.

Individuals dropped from the sample couldbe different from those retained. Those remaining could quite possibly producea biased sample. Political polls often have special problems that makeprediction difficult. Random sampling error, as contrasted to systematicsampling error, is often referred to as chance error.

Purely by chance, samplesdrawn from the same population will rarely provide identical estimates of thepopulation parameter of interest. These estimates will vary from sample tosample. ConclusionWhenwe conduct research, we are generally interested in drawing some conclusionabout a population of individuals that have some common characteristic. However, populations are typically too large to allow observations on allindividuals, and we resort to selecting a sample. In order to make inferencesabout the population, the sample must be representative.

Thus, the manner inwhich the sample is drawn is critical. Probability sampling uses randomsampling in which each element in the population (or a subgroup of thepopulation with stratified random sampling) has an equal chance of beingselected for the sample. This technique is considered to be the best means ofobtaining a representative sample. When probability sampling is not possible, nonprobability sampling must be used. Convenience sampling involves usingparticipants who are readily available (such as introductory psychology students). It is the easiest technique but the poorest from a methodological standpoint.

Quota sampling is essentially convenience sampling in which there is an effortto better represent the population by sampling a certain percentage

ofparticipants from subgroups that correspond to the prevalence of thosesubgroups in the population. By their very nature, samples do not perfectlymatch the population from which they are drawn. There is always some degree ofsampling error, and the degree of error is inversely related to the size of thesample. Larger samples are more likely to accurately represent characteristicsof the population, and smaller samples are less likely to accurately representcharacteristics of the population. Therefore, researchers strive for samplesthat are large enough to reduce sampling error to an acceptable level. Evenwhen samples are large enough, it is important to evaluate the specific methodby which the sample was drawn. We are increasingly exposed to informationobtained from self-selected samples that represent only a very narrow subgroupof individuals.

Much of such information is meaningless because the subgroup isdifficult to identify.