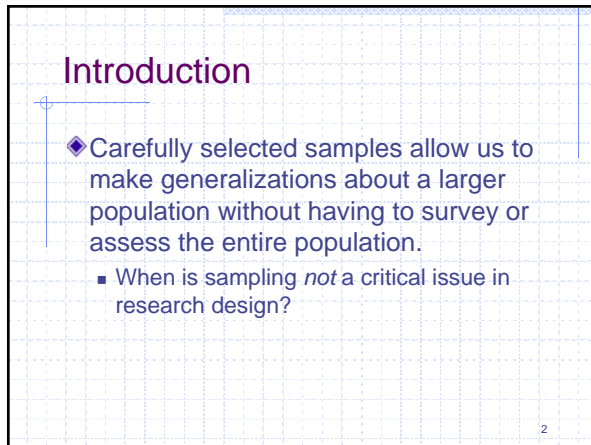


SACRAMENTO STATE
Leadership begins here.

Selecting a Sample

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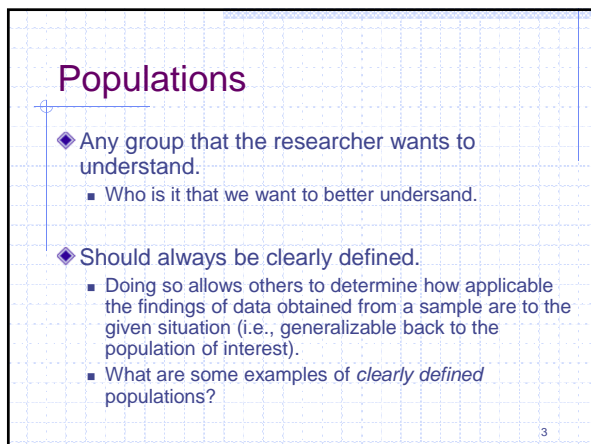
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Introduction

- ◆ Carefully selected samples allow us to make generalizations about a larger population without having to survey or assess the entire population.
 - When is sampling *not* a critical issue in research design?

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Populations

- ◆ Any group that the researcher wants to understand.
 - Who is it that we want to better understand.
- ◆ Should always be clearly defined.
 - Doing so allows others to determine how applicable the findings of data obtained from a sample are to the given situation (i.e., generalizable back to the population of interest).
 - What are some examples of *clearly defined* populations?

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Populations

- ◆ “Target population”
 - The ideal group to whom generalizations are to be made.
- ◆ “Available population”
 - The group from whom the sample can be feasibly drawn.
- ◆ How are these two groups different?
- ◆ Examples?

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Activity: Generalizability

- ◆ Target population: ADHD children
- ◆ Research Topic: Reading Achievement
- ◆ Sample:
 - Obtained from a university ADHD clinic.
 - 75% male; 25% female.
 - 25% lower SES, 25% middle SES, 50% upper SES.
 - 75% dominant culture; 25% minority culture.
 - Mean age, 10 years; Standard deviation 1.0.
- ◆ How generalizable are the study’s findings? How does the sample compare to the population?

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Activity: Generalizability

- ◆ Do clinic referred ADHD children differ systematically from the larger population? Are these differences important to reading achievement?
- ◆ What is the actual gender difference in the population? Is gender important to reading achievement?
- ◆ What is the cultural composition of the population? Does culture have an effect on reading achievement?
- ◆ Does SES have an effect on reading achievement?
- ◆ What age groups will the researcher have difficulty generalizing findings to?

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Activity: Generalizability Conclusion

- ◆ The generalizability of a specific research finding has a lot to do with whether the research sample/setting is similar to the sample/setting within which the research is applied.
 - A lot of Response to Intervention (RtI) research has been done in Iowa.
 - To what extent are the Iowa public schools similar/dissimilar to the California public schools?
 - In Iowa, RtI implementation was gradual, occurring over the course of several years.
 - How generalizable is this research to RtI implementation in California?

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Generalizability: TN vs CA

- ◆ The Tennessee Class-Size Experiment - a large, multi-site randomized controlled trial involving 12,000 students - showed that a state program that significantly reduced class size for public school students in grades K-3 had positive effects on educational outcomes. For example, the average student in the small classes scored higher on the Stanford Achievement Test in reading and math than about 60 percent of the student's in the regular-sized classes, and this effect diminished only slightly at the fifth grade follow-up.

Source: US Dept. of Ed. (2003, December). Identifying and implementing educational practices supported by rigorous evidence. 8

Generalizability: TN vs CA

- ◆ Based largely on these results, in 1996, the state of CA launched a much larger, state-wide class-size reduction effort for students in grades K-3. But to implement this effort, CA hired 25,000 new K-3 teachers, many with low qualifications. Thus the proportion of fully-credentialed K-3 teachers fell in most CA schools, with the largest drop (16 %) occurring in the schools serving the lowest-income students. By contrast, all the teachers in the TN study were fully qualified.

Source: US Dept. of Ed. (2003, December). Identifying and implementing educational practices supported by rigorous evidence. 9

Generalizability: TN vs CA

- ◆ This difference in implementation may account for the fact that, according to preliminary comparison-group data, class-size reduction in CA may not be having as large an impact as in TN.

Source: US Dept. of Ed. (2003, December). Identifying and implementing educational practices supported by rigorous evidence. 10

Discussion: Generalizability

- ◆ When making use of any specific research to guide your educational practice you must always look carefully at the study's sample/setting to **determine if it applies to your students/school!!!**
- ◆ Question?
 - Your principal comes to you and says that a new curriculum (curriculum XYZ) has been shown to have "dramatic" effects in raising the reading achievement of first graders.
 - From this research report the principal is advocating for a complete overhaul of your school's instructional practices
 - What should you do?

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Random Sampling

- ◆ A group of procedures used to facilitate generalizations about a population from a sample.
- ◆ Involves...
 - a) *Identifying and defining a population*
 - b) *Determining the sample's size*
 - c) *Selecting the sample from the population.*

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Simple Random Sampling

- ◆ All individuals in the population have an equal and independent chance of being selected.
- ◆ All members of the population are given a number and then selected on a completely chance basis
 - e.g., a computer, random number table.

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Simple Random Sampling

- ◆ Advantages
 - Easy to conduct.
 - Requires minimum knowledge of the population.
 - ◆ The variability within a population will be accounted for by a large enough random sample
- ◆ Disadvantages
 - Not always practical.
 - The entire population needs to be identified.
 - Smaller samples may not be representative.
 - May not be able to reach the entire population.
 - The entire population needs to be willing to participate (when sampled/selected).

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Simple Random Sampling: The problem with small samples

- ◆ Because populations have many variables of importance to most research questions (e.g., education level, SES) small simple random samples may not capture the true nature of the population.
 - In a group comparison study, one group may be significantly different from another group.
 - How do you handle these differences?

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Stratified Random Sampling

- ◆ Breaking the population down into subgroups (e.g., SES, ethnicity).
- ◆ Subgroup break down is based upon factors judged important to the research
 - In most educational research which is more important eye color or SES?
- ◆ Randomly select participants from each of the subgroups.
- ◆ Number selected from subgroups can be either proportional or equal
 - **Proportional** facilitates generalizations to the whole
 - **Equal** facilitates generalizations to the parts

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Discussion: Proportional v Equal Sampling

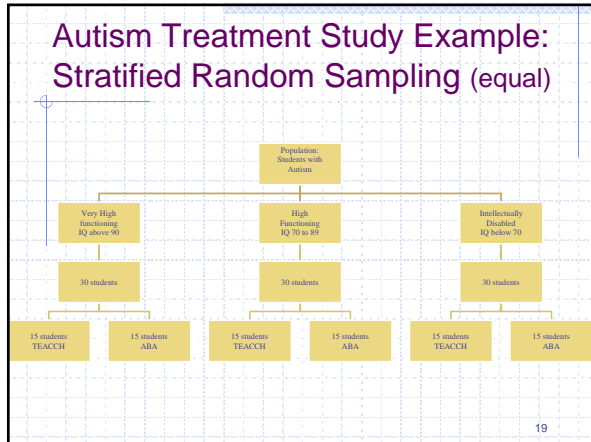
- ◆ Under what conditions would you use **equal** stratified random sampling?
 - Use the word "equity" in your response.
- ◆ Under what conditions would you use **proportional** stratified random sampling?
 - Use the word "diversity" in your response.

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Stratified Random Sampling

- To summarize...
- ◆ Number selected from subgroups can be either **proportional** (which facilitates generalizations back to the whole population) OR **equal** (which facilitates generalizations back to each subgroup).
 - Which would you use in a study of reading instruction that focuses on issues of equity (wherein you are wondering if an instructional approach works equally for all ethnic subgroups)?
 - Under what conditions might a study of reading instruction use proportional random sampling?

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- ### Stratified Random Sampling
- ◆ Advantages
 - A more precise sample.
 - Gives some control regarding the type of generalizations to be made (i.e., to either the population or subgroups within the population).
 - ◆ Disadvantages
 - Not always practical.
 - The entire population needs to be identified.
 - All subgroups need to be identified
 - May not be able to reach all groups within the population
 - ◆ e.g., homeless populations
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- ### Cluster Sampling
- ◆ Randomly selecting the sample from units or groups (not individuals) of a progressively smaller size.
 - ◆ For example, with a target population of U.S. public school students.
 1. Randomly select “#” states in the Union.
 2. Randomly select “#” districts from selected states.
 3. Randomly select “#” classrooms from selected districts.
 4. Randomly select “#” students from selected classrooms.
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Cluster Sampling

- ◆ Advantages
 - Efficient, more practical.
 - Don't need the entire population's names
- ◆ Disadvantages
 - Fewer clusters = lower generalizability.

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Systematic Sampling

- ◆ Selection of every n th name from a list of all members of the population.

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Systematic Sampling

- ◆ Advantages
 - Sample selection is very simple.
- ◆ Disadvantages
 - All members do not have an equal chance of being selected.
 - Placement of names on the list may vary systematically according to some variable that may influence results.
 - ◆ e.g. an alpha list of last names is not random

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Sample Size

- ◆ All other things being equal, the larger the sample, the more generalizable the study's conclusions.
 - With **small** populations ($N = 100$ or less) **don't sample**. Include the entire population.
 - With **larger** populations the smaller the percentage of the population is required to be considered representative.
- ◆ The larger the sample is, the more like the population it becomes.
- ◆ There are no hard and fast rules about sample size.

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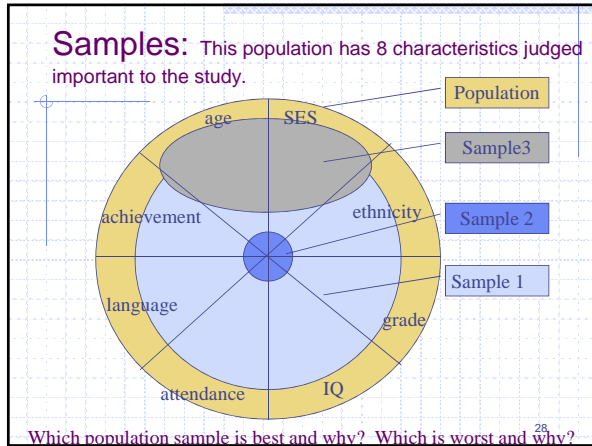
Sample Size for Descriptive Research

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	342
95	76	270	159	750	254	2600	335	100000	348

Sample Size for Descriptive Research

- ◆ Sample size calculator
 - <http://www.surveysystem.com/sscalc.htm>

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Sample Size Recommendations

- ◆ 30 for correlational, or group comparison studies (this could mean 30 schools in a quasi-experiment).
- ◆ 10 to 20% of the population for descriptive research.
 - However, for populations larger than 5,000, the sample size is almost irrelevant and a sample size of 400 would be considered adequate.

Other Issues in Sampling

- ◆ Sampling Bias and Sampling Error
 - What does "bias" mean?
 - What does "error" mean?
- ◆ Sample Mortality
 - What does "mortality" mean?
- ◆ Sample Return Rate
 - What is a "rate of return?"

Sampling Bias & Sampling Error

- ◆ Sampling Bias
 - The fault of the researcher. A mistake in sample construction.
- ◆ Sampling Error
 - Beyond the control of the researcher. A reality of random sampling that a sample will not perfectly reflect the population it was drawn from.
- ◆ Affect generalizability of findings to the larger population.

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Sample Mortality (a “confound”)

- ◆ Consider a randomized controlled trial of a school voucher program, in which students from disadvantaged backgrounds are randomly assigned to one of two groups
 - A. An intervention group, whose members are offered vouchers to attend private school
 - B. A control group that does not receive voucher offers.
- ◆ It's likely that some of the students in the intervention group will not accept their voucher offers and will choose instead to remain in their existing schools.
 - Suppose that, as may well be the case, these students as a group are less motivated to succeed than their counterparts who accept the offer.

Source: US Dept. of Ed. (2003, December). Identifying and implementing educational practices supported by rigorous evidence. 32

Sample Mortality

- ◆ If the trial then drops the students not accepting the offer from the intervention group, leaving the more motivated students, it would create a systematic difference between the intervention and control groups - namely, motivation level.
- ◆ Thus, the study may well over-estimate the voucher program's effect on educational success, erroneously attributing a superior outcome for the intervention group to the vouchers when in fact it was due to the difference in motivation.

Source: US Dept. of Ed. (2003, December). Identifying and implementing educational practices supported by rigorous evidence. 33

Sample Return Rate

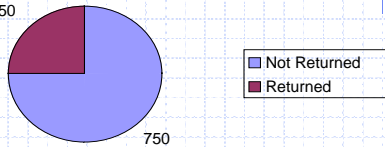
- ◆ Affect generalizability of findings to the larger population.
- ◆ Response rate
 - Improve by making phone calls, writing follow up letters, talking to supervisors.
- ◆ Use of volunteers
- ◆ Selection procedures
 - e.g., using a phone book as the list of names

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Sample Size and Return Rate:

Which is more important?

Sample A: 1,000 questionnaires (tests) mailed to K-12 teachers, 250 returned.



Sample B: 400 questionnaires (tests) mailed to K-12 teachers, 200 returned.



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Optional Portfolio Activity: Generalizability

- ◆ Target population: ADHD children
- ◆ Research Topic: Reading Achievement
- ◆ How might you construct a sample?

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Nonrandom Sampling

- ◆ Convenience Sampling
 - Because they are there.
- ◆ Purposive Sampling
 - Sampling based upon the researcher's own knowledge of or experience with the population (e.g., sampling students from RSP classrooms to study students with mild learning disabilities).
- ◆ Quota Sampling
 - Sample is comprised of individuals who have specific predetermined characteristics (e.g., gender, age, ethnicity, SES, etc.).
 - Less accessible individuals are underrepresented.

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Sampling in Qualitative Research

- ◆ Samples are relatively small (when compared to quantitative research).
- ◆ Purposive sampling techniques often used.
 - Intensity sampling
 - Homogeneous sampling
 - Criterion sampling
 - Snowball sampling
 - Random purposive sampling
- ◆ Requires detailed explanation of sampling methods.

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Next Week

- ◆ Week 5: Gathering Research Data
 - ◆ Read *Educational Research* Chapter 7.
 - ◆ Portfolio Element #4 Due
 - Identify 3 standardized measures relevant to your areas of research interest.
 - "In this section of the portfolio students will include the following information for each measure: (a) the name, publisher, and cost of the measure; (b) a brief description of what the measure purports to measure, (c) a brief summary of the measure's reliability and validity data."

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