

**We started studying
Co-relational research**

 Since yesterday

Variables to Measure

<p>Rukesh Suwal</p> <ul style="list-style-type: none"> • Effects of Cold <ul style="list-style-type: none"> A Diseases B Expenditure on Firewood C Time in collection • Coping Ways <ul style="list-style-type: none"> A insulation B C 	<p>RM Pandey</p> <ul style="list-style-type: none"> • Types of Public Transport <ul style="list-style-type: none"> A B C • Issues in Sustainability <ul style="list-style-type: none"> Envnal e1/e2/e3 Social Economic
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**Co-relational research
Key Characteristics**

- Focus on naturally occurring patterns
 - Real world variables – characteristics of physical features, of people, of activities or of meanings
- Measurement of specific variables
 - Measurement and quantification
 - Levels of measurement precision
 - Nominal/Categorical
 - Ordinal scales/ordering but the interval of difference not equal
 - Interval scale
 - Ratio scale, zero point
- Use of statistics to clarify the pattern of relationships
 - Descriptive statistics
 - Co-relational statistics

**Co-relational research
Key Characteristics - 3**

- Use of statistics to clarify the pattern of relationships
 - Descriptive statistics
 - Simply presents or describes important relationship among variables
 - Basic statistics eg no of plaza users in good weather, size of plaza
 - Co-relational statistics
 - **Strength and direction** of relationships between two or more variables
 - Strong and positive co-relation between community attachment, pedestrianism, social interaction and community identity and physical features considered.

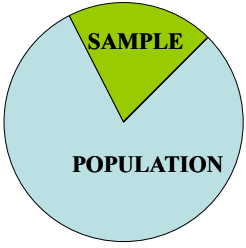
Co-relational research

Data collection Techniques: Sampling

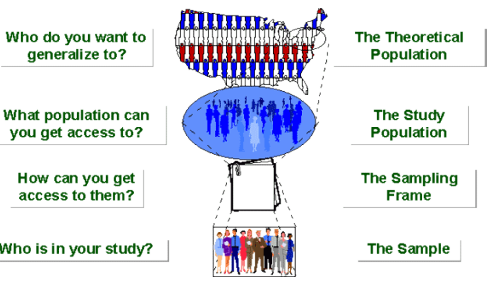
- Sampling
 - Since 'data field' options may be extensive, wide and varied, it is not only not possible to study the entire 'population', all of it may also not be particularly appropriate for the particular research objective
 - One needs to make a choice of a sample to investigate in terms of objectivity, appropriateness and manageability.
 - Although sampling is needed to be done in other research strategies also, for co-relational research this is of particular significance
 - A sample is a REPRESENTATIVE group based on which a generalization to the 'POPULATION' or even an 'UNIVERSE' may be attempted statistically.

SAMPLE: subset of a larger population

- Sampling Problems:
 - Definition of the population, size of the sample and representation of the sample.
- Sample Design = Sample Frame + Sample items + Sample size



Sampling Design



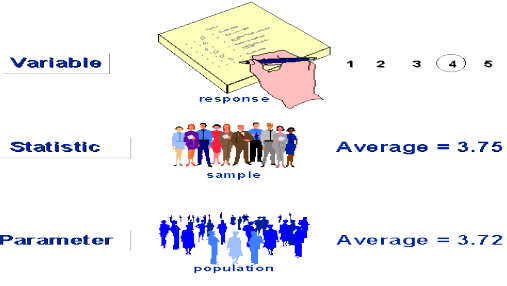
Who do you want to generalize to? | The Theoretical Population

What population can you get access to? | The Study Population

How can you get access to them? | The Sampling Frame

Who is in your study? | The Sample

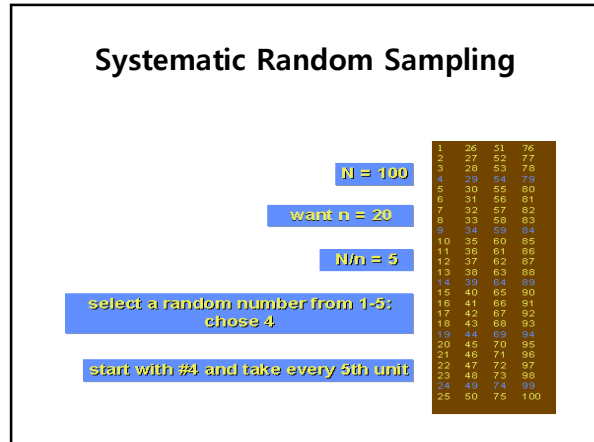
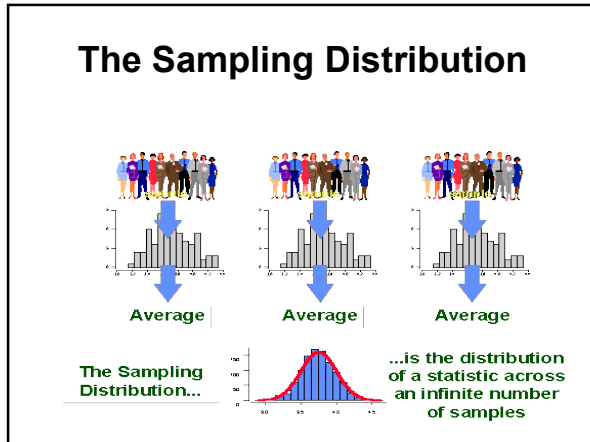
Sampling Design



Variable | response | 1 2 3 4 5

Statistic | sample | Average = 3.75

Parameter | population | Average = 3.72



Co-relational research Data collection Techniques

- Surveys – broad rather than in-depth information – many variables and wide population can be covered. Questionnaire needs to be properly designed
- Observation – camera, check-list, counting, etc.
- Mapping
- Sorting/ordering – preference ranking

Co-relational research Data Analysis Techniques

- Use of descriptive and inferential statistical analysis
 - Numbers are used to describe information, data or techniques used to calculate
 - Characteristics of groups of numbers representing information or data

Data Outputs Measures

- **Summary measures: Descriptive statistics**
 - Univariate analysis – single variable for distribution (categories, number & % or frequency distribution graphs), central tendency – mean, median and mode (simple & weighted, spatial ones), dispersion (range or variance and standard deviation)
 - Importance and interpretation of descriptive measures in research/inference

Descriptive Statistics

- **Statistic:** a measure obtained from a **sample**, such as the sample mean or standard deviation. (contrast with **parameter** which is a measure of the **population**)
- **Frequency graph:** a picture depicting the number of times an event occurred.
- **Bar graph** or **Histogram:** a frequency graph with number of blocks or length of bar representing the frequency of occurrence.

Descriptive Statistics

- **Mean/Arithmetic mean:** a number having an intermediate value between several other numbers in a group from which it was derived and of which it expressed the average value
- **Median:** the mid point in a set of ranked numbers
- **Mode:** the number which occurs most often in a group of numbers.

Co-relational research Data Analysis Techniques: Inferential Statistics

- **Range:** The difference in the highest score and the lowest score in a set of scores
- **Variance:** mean of squared deviations of individual numbers from the mean of the group of numbers ; the square of the standard deviation
- **Standard Deviation:** is a measure of the deviation of individual numbers from the mean of the group of numbers, it is the mean or average deviation of those numbers from the mean of the set of numbers
- Inferential statistical tools allow us to make computation and applications of correlations, significance, linear regression, etc. and draw meanings and inferences on the population.

15, 20, 21, 20, 36, 15, 25, and
15.

$$\sqrt{\frac{\sum(X - \bar{X})^2}{(n - 1)}}$$

where:

X = each score
 \bar{X} = the mean or average
 n = the number of values
 Σ means we sum across the values

- **Mean** **20.8750**
 - **Mode** **15**
 - **Std. Deviation** 7.0799
 - **Variance** 50.1250
 - **Range** 21.00
- Dem/Excel use!

Co-relational research Data Analysis Techniques

- Use of descriptive and inferential statistical analysis
- Multivariate statistical procedures
 - Multiple regression
 - Relations between multiple variables and predictions
 - Strength and directions of relationship between variables, several independent variables and single outcome variable
 - Provides a mathematical equation that indicates the amount of variation that is contributed by each of the independent variables
 - Uses interval and ratio scale

Survey as a Data Collection Tactic

Survey as a Research Design

- Survey is a data collection process where data or statistics on a subset of the population of interest is collected by asking people questions
 - It brings three methodological areas together
 - Sampling – which we have already covered in previous lectures
 - Question design, and
 - Interviewing
- A Survey research may go badly in any of the three areas
 - Sampling assures external validity

SURVEY or QUESTIONNAIRE RESEARCH

❖ SURVEY AS A RESEARCH DESIGN

- ❖ Sampling: **Universe, Population, Sample, Random Sample**
 - ❖ Question design
 - ❖ Content, ethics, administering issues
 - ❖ Questionnaire based Survey
 - ❖ Mail survey
 - ❖ Group administered survey
 - ❖ Household-drop off survey
 - ❖ Interviewing
- ❖ ISSUES OF VALIDITY

Components of a Survey Research: A simple model

- Establish the goals of the study - What you want to research
- **Determine your sample** – From whom you will get your information > universe, population, sampling frame, sample, stratified sample
- **Choose your methods of survey** - How you collect the data
- **Create your questionnaire** - What you will ask
- **Pre-test the questionnaire, if practical** - Test the questions
- **Conduct data collection and enter data** - Ask the questions
- **Analyze the data** - Produce the reports

Components of a Survey Research

- **Choose your methods of survey**
 - There are two major types of survey
 - Questionnaire based surveys
 - Mail survey
 - Group administered survey
 - Household drop-off survey
 - Interview based survey recorded directly by interviewer during a personal interview
 - Regardless of the type, the quality of the survey results depends heavily on the quality of the questions

Components of a Survey Research

- Question Issues
 - What types of questions can be asked?
 - Ethical issues? Personal questions? How much detail expected in the answers?
 - How complex will the question be?
 - Split more complex ones into sub-questions?
 - Will screening questions be needed?
 - To determine if the respondent is qualified to answer a specific question/number of questions
 - Can question sequence be controlled?
 - Will lengthy questions be asked?
 - Will long response scales be used?

Components of a Survey Research

- Type of Questions
- Unstructured
 - Open-ended questions (response format is generally written text – written by respondent or interviewer)
- Structured
 - Require respondents to give concrete answers (usually from a list of choices)
 - Major response formats are
 - Dichotomous: two mutually exclusive choices eg Y/N, M/F
 - Nominal/categorical: labels
 - Ordinal: Ordering Choices with distances between choices irrelevant
 - Interval: Ordering choices with relevant distance between choices
 - Ratio: Actual number as responses
- Filter or Contingency questions

Examples of Structured Questions

- Dichotomous
 - Do you own a motorbike?
 - Yes
 - No
 - Please enter your gender:
 - Male Female
- Nominal
 - Please enter your occupational class
 - 1 = Farmer
 - 2 = Laborer
 - 3 = Other
- Ordinal
 - Rank the candidates in order of preference from best to worst
 - Madhav Kumar Nepal
 - Jhula Nath Kharel
 - Bidya Bhandari
- Interval
 - Do you agree that alcohol should be banned?

1	2	3	4	5
Strongly Disagree	disagree	neutral	agree	strongly agree

Examples of Structured Questions

- Ratio
 - How much are you willing to pay to improve Kathmandu's air quality by 5%?
 - Rs.
 - Please enter your gender:
- Filter or Contingency Questions
 - Are you currently a student?
 - Yes
 - No
 - If yes, how many hours do you spend studying outside class?
 - None
 - 1 to 2
 - 3 to 4
 - 5 to 6
 - more than 6

Decisions About Question Content

- Is the question necessary/useful?
- Are several questions needed?
- Do the respondents have the needed info?
- Will respondent answer truthfully?

More about questions

- Easy opening questions, non-threatening questions, sensitive questions after trust is developed
- Keep questionnaire as short as possible!

Interviewers

- Role of interviewer
 - Enlist cooperation of respondents, motivate them, no prompting for answers
- Training interviewers
 - Describe entire study, explain target readers of research findings, teach about survey research, sample logic, interviewer bias, rehearse interview
- Identification
 - ID, cover letter, survey questionnaires
- Opening remarks, asking questions, probing for adequate responses, recording the response, use of equipments with permission, concluding remarks

Components of a Survey Research

- Pre-test the questionnaire, if practical - Test the questions
- **Conduct data collection and enter data** - Ask the questions
- **Analyze the data** - Produce the reports

True Score Theory in Measurement and the Concepts of Reliability and Validity

True Score Theory

- every measurement is composite of two components: true ability of the respondent on that measure; and random error.
- Or, $X = T + e_x$
 - But we can only see X, the observed score!

Systematic Error

- True score: foundation of reliability theory
- A measure that has no random error (i.e., is all true score) is perfectly reliable
- A measure that has no true score (i.e., is all random error) has zero reliability.
- Detailed observation of errors in human observations tell that error is not always random
- Systematic error >> error that tend to occur, say, across most or all of the members of a group.

$$X = T + e$$

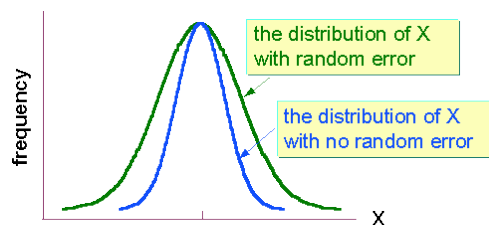
Two Components:

e_r • Random Error

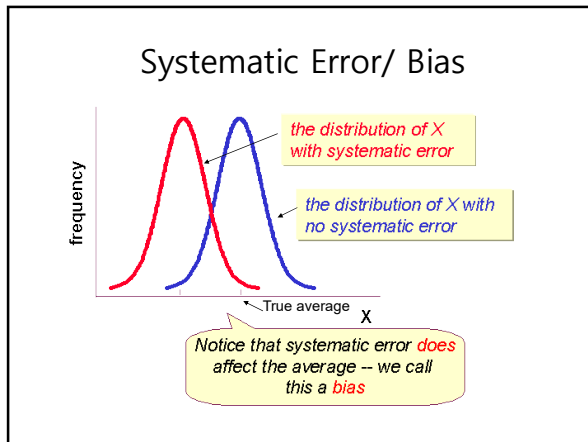
e_s • Systematic Error

$$X = T + e_r + e_s$$

Random Error/Noise



Notice that random error doesn't affect the average, only the **variability** around the average



Reliability is 'Repeatability'

- Reliability means dependable in a general sense, but, in research,
- Reliability is used more to mean "repeatability" or "consistency"
- Reliable measure would give the same result over and over again

Validity and Reliability

- Validity of Research methods does not give automatic reliability
- Error in measurements > Human observations
- Errors and the extent of variance > reliability of conclusions

Increasing Reliability

- Appropriate pilot testing of instruments of survey
- Training of interviewers and observers can reduce measurement errors, random or systematic
- Use of multiple measures of the same construct
- In multiple measures, if different measures don't share the same systematic errors, triangulation will give a more accurate sense

Strategies to ensure Validity

- *Triangulation*: Use multiple investigators, multiple sources of data, or multiple methods to confirm the emerging findings.
- *Member Checks*: Taking data and interpretations back to the people from whom they were derived and asking them if the results are plausible.
- *Long-term observations or repeated observations*: gathering data over a long period of time.
- *Peer examination*: asking colleagues to comment on the findings as they emerge.
- *Participatory modes of research*: involving participants in all phases of research from conceptualizing the study to writing up the findings.
- *Researcher's biases*: clarifying the researcher's assumptions, worldview, and theoretical orientation at the outset of the study.