Chapter 11
Measurement and Data Collection

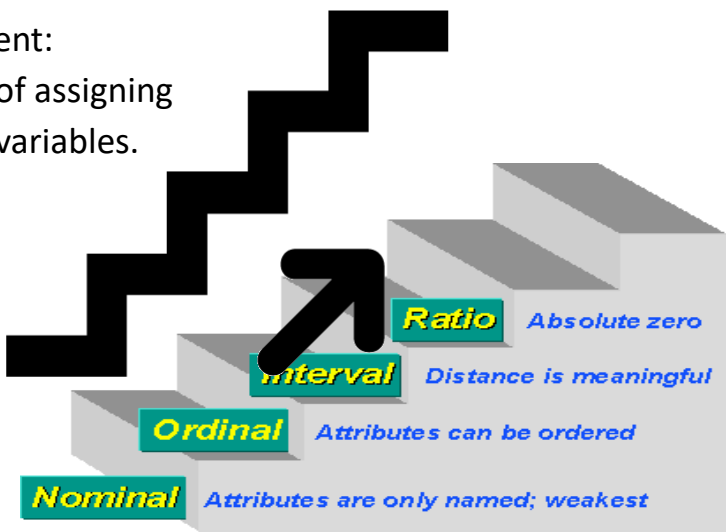**2023**

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Measurement

• Measurement:
the process of assigning
numbers to variables.

Ratio — Absolute zero

Interval — Distance is meaningful

Ordinal — Attributes can be ordered

Nominal — Attributes are only named; weakest

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Level of measurement

• **1. nominal level** (categorical): mutually exclusive category	• Gender
	  • 1. male
	  • 2. female
	• Religion
	  • 1. Muslim
	  • 2. Christian
	• Marital Status
	  • 1. Single
	  • 2. Married
	  • 3. Divorced

Your phone begins with
1. 079
2. 077
3. 078
4. 071
5. None of the above

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Level of measurement

• **2. ordinal: level**
 	
• obtained from measurements process indicate the **order rather than the exact quantity** of the variables.
	• Example:
	• Mild -moderate -severe
	• In general I classify my health as
	  • 1. poor
	  • 2. fair
	  • 3. good
	  • 4. very good
	  • 5. excellent
	• Or pain scale

PAIN FACE KNITTING SCALE

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Level of measurement

- **Interval level:** a level of measurement in which an attribute of a variable is ranked ordered on a scale that has equal distance between points

- Example
  - Monthly income
    - 100-200
    - 201-300
    - 301-400
    - 401-500

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Level of measurement

- **4. Ratio level**: highest level of data
- A level of measurement with equal distance between scores a true Zero.

- Example
  - Height_____
  - Weight_____
  - Monthly income___
  - Course grade_____

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Level of measurement

Data can be Converted from Ratio to lower level of measurement.

- Weight 95kg   **RATIO**
- **INTERVAL**
    Weight
  - 1. 60-70kg
  - 2. 71-80kg
  - 3. 81-90
  - 4. 91-100
- **ORDINALSS**
    Wight
  - 1. Within average
  - 2. Overweight
  - 3. Obese
- Wight   **NOMINAL**
  - 1. Obese
  - 2. Not obese

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Data Collection Process

- •<u>The Researcher must Determine</u>
- What data will be collected?
- How will the data will be collected?
  - Instrument
- Who will collect the data?
- Where the data will be collected?
  - Setting
- When will the data be collected?

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Data collection method

1. **Self report**
   A. **Questionnaire**
   B. **Interview**
2. **Observation**

   Research Instruments
   (Research Tools)

2. **Biophysiologic measures**

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Data collection methods
1. self report:

Self report
- A method of data collection that involves a direct report of information by the person who is being studied.

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Data collection methods
1. self report

- Data can be collected by
    1. Self administered questionnaire
    2. Interview (phone or face to face).
1. Questions
    1. Closed ended
    2. Open ended

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Data collection methods
1. self report types of closed ended question

- **Dichotomous question**
    - Do you have children
        - 1. yes
        - 2. no
- **Multiple choice question**
    - How do you describe your pain
        - 1. Burning
        - 2. Squeezing
        - 3. Stabbing
        - 4. Dull

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Data collection methods
1. self report types of closed ended question

• **Rank order question**
  • Which of the following persons is considered as most supporting you during your hospitalization. Please indicate their order by placing "1" beside the most, "2" the second and so on.
    • 1. ___mother
    • 2. ___father
    • 3. ___sister
    • 4.___brother
    • 5.___friend
    • 6.___nurse
    • 7.___physician

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Data collection methods
1. Self report types of closed ended question

• **Rating scale**
• On the scale from 1-5 where 1 means strongly satisfied and 5 means strongly dissatisfied.
• Are you satisfied with nursing research course.

1   2   3   4   5

Strongly satisfied   strongly dissatisfied

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Data collection methods
1. Self report types of closed ended question

- **Likert scale**

1.	been able to concentrate on what you're doing?			
	better than usual (0)	same as usual (1)	less than usual (2)	much less than usual (3)
2.	lost much sleep over worry?			
	Not at all	no more than usual	rather more than usual	much more than usual
3.	felt that you are playing a useful part in things?			
	more so than usual	same as usual	less so than usual	much less than usual

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TABLE 15.1 Examples of Closed-Ended Questions

QUESTION TYPE	EXAMPLE
1. Dichotomous question	Have you ever been hospitalized? 1. Yes 2. No
2. Multiple-choice question	How important is it to you to avoid a pregnancy at this time? 1. Extremely important 2. Very important 3. Somewhat important 4. Not important
3. Cafeteria question	People have different opinions about the use of estrogen replacement therapy for women at menopause. Which of the following statements best represents your point of view? 1. Estrogen replacement is dangerous and should be banned. 2. Estrogen replacement has undesirable side effects that suggest the need for caution in its use. 3. I am undecided about my views on estrogen replacement. 4. Estrogen replacement has many beneficial effects that merits its use. 5. Estrogen replacement is a wonder treatment that should be administered routinely to most menopausal women.

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4. Rank-order question	People value different things in life. Below is a list of things that many people value. Please indicate their order of importance to you by placing a "1" beside the most important, "2" beside the second-most important, and so on. ___ Career achievement/work ___ Family relationships ___ Friendships, social interactions ___ Health ___ Money ___ Religion
5. Forced-choice question	Which statement most closely represents your point of view? 1. What happens to me is my own doing. 2. Sometimes I feel I don't have enough control over my life.
6. Rating question	On a scale from 0 to 10, where 0 means "extremely dissatisfied" and 10 means "extremely satisfied," how satisfied were you with the nursing care you received during your hospitalization? 0 1 2 3 4 5 6 8 9 10 Extremely dissatisfied Extremely satisfied

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Self Report Questionnaire

• **Advantage**	• **Disadvantage**
1. Less Cost	1. Response rate may be low.
2. Anonymity.	2. Respondent may fail to answer some items.
3. Subject provide honest answers.	3. Respondents must be literate.
4. Avoid Interviewer bias.	
5. Less time consumer than interview.	

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Self report
Wording of the questions

1. **Avoid double barreled question**
   - The student nurse must <u>function within his scope of competences</u>, and <u>follow the hospital policy.</u>
     - 1. yes
     - 2. no

2. Avoid long sentences
3. Avoid using of "never, always, never, usually, generally, etc.

4. **Clarity**
5. **Reponses alternatives must not be too long**
6. **There should be a rationale for each alternative**
7. **Should be mutually exclusive**
   1. Age
      1. 12-13
      2. 13-14
      3. 16-17
8. **Avoid leading questions**

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Cover letter of a questionnaire

Dear _____ :

We are conducting a study to examine how women who are approaching retirement age (age 55 to 65) feel about various issues relating to health and health care. This study, which is sponsored by the State Department of Health, will enable health-care providers to better meet the needs of women in your age group. Would you please assist us in this study by completing the enclosed questionnaire? Your opinions and experiences are very important to us and are needed to give an accurate picture of the health-related needs of women in the greater Middletown area.

Your name was selected at random from a list of residents in your community. The questionnaire is completely anonymous, so you are not asked to put your name on it or to identify yourself in any way. We therefore hope that you will feel comfortable about giving your honest opinions. If you prefer not to answer any particular question, please feel perfectly free to leave it blank. Please do answer the questions if you can, though, and if you have any comments or concerns about any question just write your comments in the margin.

A postage-paid return envelope has been provided for your convenience. We hope that you will take a few minutes to complete and return the questionnaire to us—it should take only about 15 minutes of your time. To analyze the information in a timely fashion, we ask that you return the questionnaire to us by May12.

Thank you very much for your cooperation and assistance in this endeavor. If you would like a copy of the summary of the results of this study, please check the box at the bottom of page 10.

Interview

• A method of data collection in which the researcher obtain responses from subjects in a face to face or through phone call.

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Interviews

• Interview schedule
• Interviewer training use a manual
• Interview setting
• Interview time

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Interview

Advantage of interview	Disadvantage of interview
• **Advantage of interview**	• **Disadvantage of interview**
• High Response rate	• Training program.
• Clarity	• Time consuming and expensive
• Depth of question	• Subject provide socially acceptable behavior.
• Less miss information	• Subject may influenced by researcher characteristics.
• Non verbal behavior can be observed	

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Example of unstructured interviews in a hermeneutic study:
Cohen, Ley, and Tarzian (2001) explored the experience of isolation in 20 patients who had bone marrow transplantation. Unstructured interviews were conducted in the patients' hospital rooms. The opening question for each interview was "What was it like to have a bone marrow transplant?" Common follow-up questions included, "What did that mean to you?" and "How did you feel about that?" (p. 595).

Example of a semistructured interview:
Åsbring and Närvänen (2002) studied women's experiences of stigma in relation to chronic fatigue syndrome and fibromyalgia. Their topic guide for semistructured interviews with 25 women included questions about such issues as the women's views of the illness, encounters with health care providers, and the consequences for daily life of encounters with health care providers.

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TABLE 14.1 Example of a Table of Contents: Training Manual for an Interview Study

I. Introduction
   A. Background and Purpose of the Study
   B. The Research Team/Organizational Structure
II. Initial Study Procedures
   A. Tracing and Locating Respondents
   B. Initial Contact With Respondents and Arranging Appointments
   C. Answering Respondents' Questions
   D. Privacy and the Research Setting
   E. Avoiding Refusals and Nonresponse
   F. Informed Consent
III. The Role of the Interviewer
   A. Establishing an Appropriate Interviewing Relationship
   B. Knowing the Interview
   C. Avoiding Bias
   D. Obtaining Full Responses
   E. Recording Information
IV. Instructions for Conducting the Study Interview
   A. Guide to the Use of the Study Instruments
   B. Conventions and Abbreviations Used in the Instruments
   C. Question-by-Question Specifications
   D. Concluding the Interview
V. Administrative Forms and Procedures
   A. Obtaining Interviewing Assignments
   B. Pledge of Confidentiality
   C. Editing Completed Interviews
   D. Submitting Completed Interviews to the Project Director
   E. Errors and Missing Information
   F. Time Forms and Payment
Appendices: Data Collection and Administrative Forms

Example of interviewer training:
In the survey of nearly 4000 welfare mothers that provided data for the report by Polit, London, and Martinez (2001), about 100 interviewers were trained in 4 research sites. Each training session lasted 3 days, and included a half day of training on the use of CAPI. During the training, several trainees were let go because they did not appear sufficiently skilled to master their assignments.

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Data collection methods
2. Observation

- Data collection through visual observation
- Researcher can observe
  1. Characteristic of the individual ex. Physical appearance, skin rash, etc.
  2. psychomotor skills ex. Injecting self by insulin, hand washing, elder functional ability.
  3. Personal habits ex. Eating behavior, smoking, aggression
  4. Non verbal communication ex. Facial expression, eye contact.
  5. Environment characteristic ex. Hospital noise, safety and hazards of homes

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Observation

•Relationship between observer (researcher) and the subject:
  •Non participant observer-overt
  •Non participant observer-covert
  •Participant observer-overt
  •Participant observer-covert

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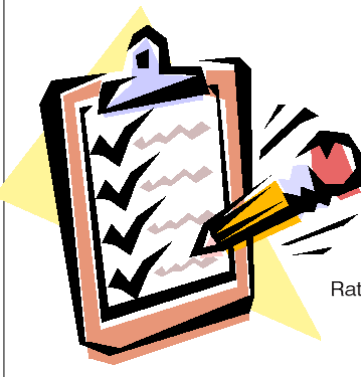**Example of a participant observation study:**
Pierce (2001) conducted a study focusing on expressions of spirituality by African-American family caregivers of stroke patients. Pierce interviewed 8 key informants on 3 occasions and 16 secondary informants once, and in all cases made observations. In addition, she conducted several participatory observation sessions of 4 to 6 hours each, during which time she assisted in the caregiving process.

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Recording of Observation

• Checklist	• Rating scale
	• Rate how relaxed the child pre operative.

Rating scale table:

Extremely Relaxed	neutral	extremely tense
1	**2**	**3**

Rate how tense or relaxed the nurses in this unit were:

1	2	3	4	5	6	7
Extremely relaxed			Neither relaxed nor tense			Extremely tense

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Example of observing personal charac-teristics:

Whittington, Patrick, and Roberts (2000) reported on a national study of pressure ulcer prevalence and incidence in acute care hospitals. Some 17,560 patients in 116 hospitals were observed and assessed by RNs for stage I to stage IV pressure ulcers.

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Example of observing nonverbal communication:

Butt and Kisilevsky (2000) studied the behavioral effect of music on preterm infants' recovery from heel lance. Infant pain was assessed based on observations of such nonverbal behavior as facial expressions.

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Example of observing environmental characteristics:

Kisida, Holditch-Davis, Miles, and Carlson (2001) observed unsafe environmental hazards and unsafe caregiving practices in the homes of premature children at 3 years of age.

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Biophysiologic measures

- Collection of physical data from subjects
  - Example: ECG, sphygmomanometer, MRI, blood tests, blood culture, X rays.
- Accurate
- objective
- Precise
- No bias

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Example of a study using physiologic measures:

George, Hofa, Boujoukos, and Zullo (2002) studied the effect of three body positions (supine, lateral with allograft lung down, and lateral with native lung down) on oxygenation, ventilation, and blood flow in single-lung transplant recipients.

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Example of a study of physiologic outcomes:
Jellema and colleagues (2000) investigated the hemodynamic changes induced by manual lung hyperinflation (MLH) in patients with septic shock. Their intent was to assess if the changes were sufficiently adverse to warrant prohibition of MLH as a routine procedure in caring for these patients.

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Example of an evaluation:
Wong, Lopez-Nahas, and Molassiotis (2001) evaluated the effectiveness of music therapy in decreasing anxiety in ventilator-dependent patients. Mean blood pressure and respiratory rate were used to assess anxiety.

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Data quality
Reliability and Validity

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Selection of a Data-Collection Instrument

- Conduct a literature review
- Or develop new instrument
- But it is a challenging task
  - Constructing the instrument
  - Performing a pilot study (a small version, or trial run, done in preparation for a major study)
  - Considering time, cost and availability for pilot
- Determine measurements on the instrument
  - Practically
  - Reliability
  - Validity

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Practicality of the Instrument

- Cost
- Appropriateness
- Questions to consider
- Practicality before reliability or validity

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Reliability of an Instrument

- **Reliability**: The degree of consistency or dependability with which an instrument measures the attributes it is designed to measure.
- It is the Accuracy
- Reflect true scores
  - Consistency
  - Stability of the instrument
- Measurement by correlational procedures

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Three Types of Reliability

- **Stability:** It is the ability of an instrument to give similar results on two separate administration.
  - Can be evaluated by test-retest reliability.
  - High correlation coefficient—close to 1.00
- **Equivalence**
  - Interrater (inter-observer) reliability
    - Having 2 or more trained observer watching an event at the same time, and independently collect data.
    - High correlation coefficient – close to 1.00
- **Internal Consistency**: the extent that the instrument measure the same trait
  - Use split half technique (odd and even).
  - Cronbach's alpha
  - Spearman-Brown prophecy formula

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Validity

- **Validity:** ability of an instrument to measures what it is intended to measure

- Types of validity
  - Face
  - Content
  - Criterion
  - Construct

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Types of validity

- 1. Face: "Face" appears to measure desired construct
  - Experts review instrument to validate it
- 2. **Content**: the degree to which an instrument has an appropriate sample of items for the construct being measured.
  - Comparison with literature
  - Panel of experts in subject area
  - Test blueprint designed for content and level
- 3. **Criterion**: Scores are correlated with external criterion
  - Concurrent validity
  - Predictive validity
- 4. **Construct**
  - Does the instrument measure the construct
  - Factor analysis

Reliability and Validity

- Close association
- Reliability a condition for validity
- An instrument cannot be valid unless it is reliable
- Reliability tells nothing about degree of validity
- An instrument can be very reliable but with low validity