Lecture 3

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OUTLINE

- Basic definitions
- Type of medical variables
- Stages of scientific information/knowledge
- Quantification and accuracy

BASIC DEFINITIONS

- A characteristic can be classified in one of two ways:

  - **Quantitative:** it can be assigned a numeric value (such as 0, 1, 7.5, 17, or -¼)

  - **Qualitative***:* it cannot be assigned a compelling numeric value (such as name, birthplace, or gender)

- A characteristic is called a ***variable*** because its specific value or nature is not known before the item is examined.

- We determine a ***value*** for a characteristic or variable by making a ***measurement*** of it using an instrument (e.g. weight) or by making an ***observation*** of it by examining it (e.g. the color of the skin). The value for a characteristic of a specific item is called a ***datum***.

TYPES OF MEDICAL DATA ?

- Male / Female
- 1 = Male; 2 = Female; 3 = Transgender (Transgender is the state of one's gender identity (self-identification as woman, man, neither or both) not matching one's assigned sex (identification by others as male, female or intersex based on physical/genetic sex)).
- Married / Single
- Married / Single / Separated / Divorced / Widowed
- Smoker / Non-smoker
- Blood group: 0 / A / B / AB
- Index of Orthodontic Treatment Need (IOTN): 1-5 where 1 = the lowest need for treatment, 5 = the highest need for treatment.
- Number of visits to the dentist
- Number of episodes of mouth ulcerous

TYPES OF MEDICAL DATA

- Excellent / Good / Fair / Poor (oral hygiene)
- Mild / Moderate / Severe (periodontitis)
- Number of cigarettes lit in a day
- Number of pregnancies
- Number of teeth
- Height
- Weight
- Systolic blood pressure (mmHg)

STAGES OF SCIENTIFIC KNOWLEDGE

1. Description: describe the medical event

   - Case reports (detailed report of an individual patient) and case series (group of patients)

   - Cross-sectional surveys: reports a status of an individual with respect to the presence or absence of both exposure and disease assessed at one point in time.
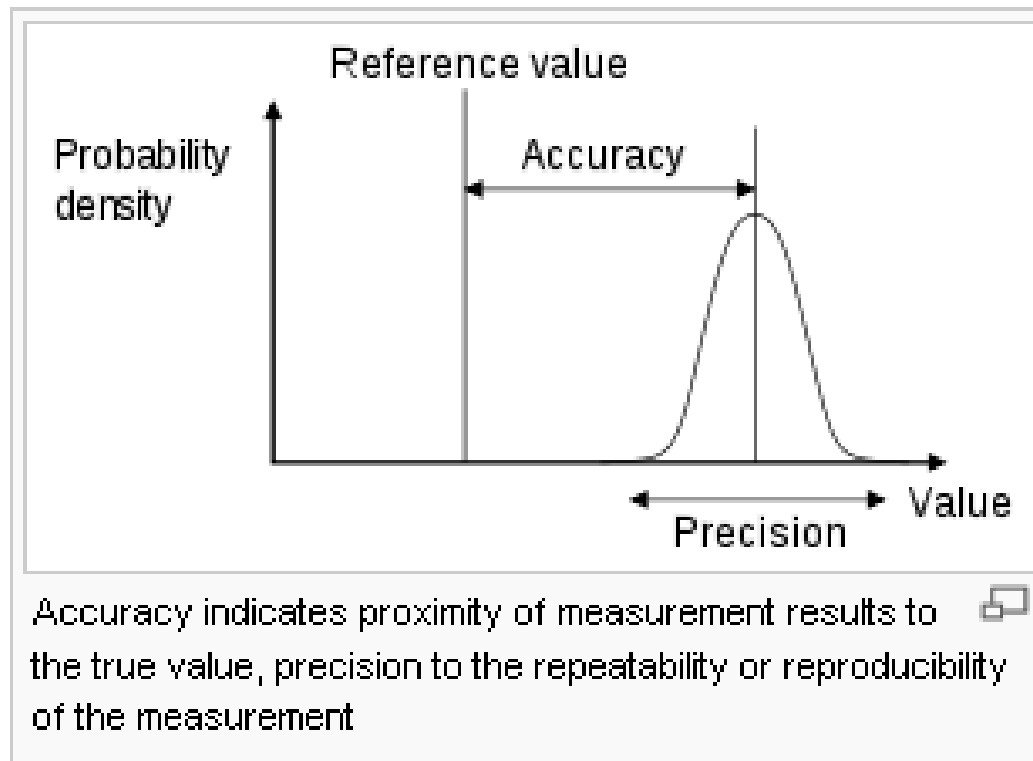
STAGES OF SCIENTIFIC KNOWLEDGE

1. Explanation: explain these events
   - Analytic studied: had an appropriate comparison group → test a hypothesis

2. Prediction: predict the occurrence of these events
   - Measure of association → predict the occurrence of these events

QUANTIFICATION AND ACCURACY

- Knowledge gained from data are more informative and accurate if the data are quantitative.
- Statistics: development of probabilistic knowledge using observed quantities:
  - Counting the number of patients with heart disease
  - Is interested in the process that generate the data
- Quantification:
  - Quantitative form naturally.
  - Measurement base

MEASUREMENTS

- Accuracy: refers to how well the data-gathering intent is satisfied

- Precision: refers to consistency of measurement

Reference value

Probability density

Accuracy

Precision

Value

Accuracy indicates proximity of measurement results to the true value, precision to the repeatability or reproducibility of the measurement

MEASURING HEAD SIZE

- Instrument: flexible metal tape measure
- 2 groups of 1 volunteer to take measurements & 1 volunteers to be measured
- Methodology:
  - Wrap the tape snugly around the widest possible circumference - from the most prominent part of the forehead (often 1-2 fingers above the eyebrow) around to the widest part of the back of the head.
  - Try to find the widest way around the head

MEASUREMENTS SCALE: PROPERTIES

Nominal

- Identity: expressed the membership of an element to a category

- Suppose a classification of variable without indication an order or an quantity

- Could be noted with numbers (0-feminine; 1-masculine) BUT could NOT be processed in terms of quantity or ordered values. ordine.

Ordinal

- Data are classified in conformity with an order or preferences

- Could be compared in term of "greater than", "smaller than", or "equal"

Interval

- Quantitative data
- Identity and order
- Distance between two numbers has significance (allows comparison between numbers)
- 0 point is arbitrary chosen

Ratio

- Quantitative data
- Has an 0 absolute that means the absence of the characteristic

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Variables: Type & Scales of Measurements

- **APGAR score**: is a test used to measure the vital signs of a baby at birth

The Apgar score rates:

Respiration, crying

Reflexes, irritability

Pulse, heart rate

Skin color of body and extremities

Muscle tone

✿A.D.A.M.

1. Heart Rate:
   a. Absent heartbeat = 0.
   b. Slow heartbeat (less than 100 beats per minute) = 1.
   c. Adequate heartbeat (more than 100 beats per minute) = 2.

2. Respiration:
   a. Not breathing = 0.
   b. Weak cry, irregular breathing = 1.
   c. Strong cry = 2.

3. Muscle Tone:
   a. Limp, flaccid = 0.
   b. Some flexing or bending = 1.
   c. Active motion = 2.

4. Response to Stimulation (also called Reflex Irritability):
   a. No response = 0.
   b. Grimace = 1.
   c. Vigorous cry or withdrawal = 2.

5. Color:
   a. Pale or blue = 0.
   b. Normal color body but blue extremities = 1.
   c. Normal color = 2.

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Variables: Type & Scales of Measurements

- Bleeding (ml)

- Bleeding (yes/no)

- Trauma (absent / minor / major / extended)

- Fever (°C)

- Medication (yes/no)

- Periodontal pocket depth (mm)

- Alveolar bone height (mm)

- Infectious illnesses (measles / mumps / Parvovirus / rubeolla / etc.)

- Illegal drugs (A, B, C)

  Class A: Ecstasy, LSD, heroin, cocaine, crack, magic mushrooms, amphetamines (i.v.)

  Class B: Amphetamines, Cannabis, Methylphenidate

  Class C: Tranquilisers, some painkillers, Gamma hydroxybutyrate (GHB), Ketamine

INDEPENDENT OR DEPENDENT?

- Increase sugar intake increases numbers of carious teeth:
  - No carious: dependent
  - Sugar intake: independent

  - Dental treatment cost: ?
  - Amount of materials used: ?
- Breast cancer rates are higher in females than in males
  - Gender: ?
  - Breast cancer: ?

WHAT DOES IT MEANS?

- Xu WH, Guo CB, Wu RG, Ma XC. Investigation of the psychological status of 162 female TMD patients with different chronic pain severity. Chin J Dent Res 2011;14(1):53-7.

METHODS: One hundred and sixty-two female patients who came to the Center for TMD and Orofacial Pain of Peking University Hospital of Stomatology were randomly included in this study. SCL-90-R was used to assess the psychological status of the TMD patients. This instrument was also used to assess psychological status and pain-related disability in chronic pain patients and a seven-item questionnaire was used to grade chronic pain severity (GCP). Univariate analysis of variance and correlation analysis were performed to determine the association between psychological status and chronic pain severity.

temporomandibular disorders (TMD)

SAMPLE CHARACTERISTICS

- Representative for the population:
    - Size
    - Characteristics
- Sample size calculation:
    - The risk of rejecting the null hypothesis if it is corrected (significance level; alfa, α = 5% = 0.05)
    - The power of the study (probability of rejecting the null hypothesis when it is true)

SAMPLE SIZE: EMPIRICAL RULES

Size of population	Size of sample (% from size of population)
0 – 100	100
101 – 1000	10
1001 – 5000	5
5001 – 10000	3
> 10000	1

SAMPLING METHODS

Probabilistic

- Simple random sample
- Systemic random sample
- Stratified random sample
- Cluster sample

Non-probabilistic

- Convenience sampling
- Snowball sampling
- Purposive sampling
- …

? ? ? ? ?

Dental self-care and visiting behaviour in relation to social inequality in caries experience.

Brennan DS, Spencer AJ, Roberts-Thomson KF.

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Abstract

OBJECTIVES: To investigate associations of dental behaviour with social inequality in oral health.

METHODS: A random sample of 45-54 year-olds from Adelaide, South Australia was surveyed by self-complete questionnaire in 2004-05 (n = 879, response rate 43.8%). Oral examinations were performed by calibrated dentists on 709 persons (80.7% of participants).

RESULTS: The mean (SE) number of decayed teeth (D) was 0.4 (0.04), with 5.3 (0.2) missing teeth (M), 11.0 (0.2) filled teeth (F) and 16.6 (0.2) DMFT. The majority brushed their teeth 8 or more times per week (78.8%) and had made a dental visit within the last 12 months (63.7%). Nearly a quarter had a household income of under $30,000 (24.0%). Multivariate analysis showed a three-way interaction (p < 0.05, GLM) between income and brushing and visiting for decayed teeth, showing that the relationship between decayed teeth and dental behaviour varied across levels of income. Among those who had not made a dental visit in the last 12 months, those who brushed their teeth 8 or more times per week in the low income group had D = 0.7 (0.2) while those who brushed less often had D = 2.2 (0.5) compared to D = 0.3 (0.08) and D = 0.3 (0.2) respectively in the high income group.

CONCLUSION: Dental behaviour in terms of brushing and visiting was associated with social gradients in oral health for decayed teeth across income groups, with less favourable dental behaviour having a stronger negative association with oral health among lower income groups.
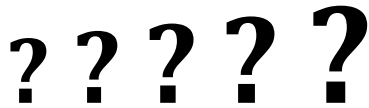
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Periodontal pathogen carriage, rather than periodontitis, determines the serum antibody levels.

Pussinen PJ, Könönen E, Paju S, Hyvärinen K, Gursoy UK, Huumonen S, Knuuttila M, Suominen AL.

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Abstract

AIM: We investigated in a nationally representative sample, how periodontitis modifies the association between the carriage of periodontal pathogens and serology.

MATERIALS AND METHODS: The population comprised 1586 dentate subjects who participated in an interview, clinical and radiological oral health examination, and saliva collection. Serum immunoglobulin A (IgA)- and IgG-class antibody levels against Aggregatibacter actinomycetemcomitans and Porphyromonas gingivalis and their salivary occurrence were determined in the whole population. The quantity of the pathogens was measured in a subpopulation.

RESULTS: In the univariate analyses, the corresponding antibody levels were higher in the pathogen carriers compared with the non-carriers, and clearly higher in the carriers with periodontal pockets compared with the carriers without. In the multi-variate analyses, however, all antibody levels associated strongly with age (p<0.001) and the carriage of the corresponding pathogen (p<0.001), but only weakly with the presence or number of teeth with periodontal pockets. In the subpopulation, the antibody levels and the numbers of corresponding bacteria in saliva had a positive association, which was not affected by the disease.

CONCLUSIONS: The carriage of A. actinomycetemcomitans and P. gingivalis is the strongest determinant of the systemic antibody response to these pathogens, and the extent of periodontitis has at most a modest modifying effect.

TASK

- Using the PubMed database identify
  - An article (you will need a full text) in which to fully present the applied randomization procedure.