

Measuring lifestyle factors in Epidemiological studies

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Examples of lifestyle factors

- Diet
- Physical activity
- Alcohol consumption
- Smoking
- ...

Lifestyle is complex

- Diet for example may depend on
 - What I like
 - What is available
 - Who cooks it
 - My occupation
 - Where I live
 - Who I am living with
 - My religion, my group
 - My understanding of what is « healthy »

Lifestyle is culturally sensitive

- Religion may influence dietary habits
- Beliefs
- Perception of sports by the community
- Being a farmer in the US and in Senegal does not mean the same

Lifestyle varies +++

- Seasonality
- Change in job
- Getting married
- Fashion
- ...

Why measuring lifestyle factors?



Lifestyle may influence biology

- Diet → serum lipids → cardiovascular risk
- Physical inactivity → fat accumulation → insulin resistance → diabetes
- ...

Lifestyle may influence health

- Inactivity → reduced fitness
- Physical exercise → sudden death?
- Smoking → lung cancer?

Understanding how lifestyle determines disease

Modifying lifestyle factors might improve health

- Would increase in exercise reduce colon cancer?
- Would a reduction of alcohol intake reverse liver cirrhosis?
- Would increase in exercise intensity / duration / frequency / type influence progression to diabetes?

How to measure lifestyle factors in relation to health and disease

What are the Pre-requisites



The science behind the hypothesis

- Observations suggesting the hypothesis
- Evidence driving / supporting the hypothesis
- Hypothetical mechanisms
- Relation with time and confounders
- Unanswered questions

The objective should be precise

Clearly state the question you wish to answer

- Identify the health-related outcome
- Identify the lifestyle factor you wish to study
- Identify the target population

The study design

- Is the study designed primarily to answer this question? 😊

Or

- Am I grafting this question to a pre-designed study? 😞

Feasibility

- Study setting
 - City centre vs remote rural area
- Study population
 - Children, elderly,
 - Literacy level, nomadism,
- Sample size
- Time
- Human resources / capacity
- Funding



The methods

Designing or
choosing an
instrument



Always have in mind

- Sociological / cultural factors affecting lifestyle
- The physiological implications of the lifestyle factor (short- and long-term)
- Is there a biological marker?
- Qualitative vs. quantitative evaluation

The method must be **VALID**

- The method (instrument) must measure what it is intended to measure

Do not forget

- Assumptions
- Context of validity (circumstances, population...)

The method must be **RELIABLE**

- The method (instrument) must consistently give the same results under the same circumstances

The method must be **ACCURATE**

- The method should achieve both validity and reliability

The method must be **PRACTICAL**

- The method must have acceptable costs to the investigator and to the participant

The method must be **NON REACTIVE**

- The method (instrument) should not alter the population or the behaviour it seeks to measure

Time factor

- It is necessary to measure a lifestyle factor over a defined period of time taking into account
 - The type of behaviour
 - Its frequency
 - Its duration
 - The changes over time

You need standardisation

- What does your data mean to others
- How comparable will your data be

Once you have selected the methods

- You may need re-validation in the study population
- You certainly need piloting in a sample of the target population



Some examples

Alcohol intake in relation with...

- Liver cirrhosis
- Cardiovascular events
- Neurological disorders (central or peripheral)
- Road traffic accidents
- Fetal development
- Sexual behaviours
- ...

Alcohol consumption 2

- Total intake over xx days/months or years?
- How often?
- Type of alcohol?
- Intake per session?
- Plasma levels?
- Where does drinking take place?

Focus on physical activity

An insight to the
complexity of a
lifestyle factor

Definition

Physical activity refers to any bodily movement produced by skeletal muscles that results in energy expenditure

Physical activity comprises biomechanical and biochemical processes leading to a complex set of responses in the body that have a variety of health- and performance-related dimensions

It is complex

- Mechanical classification
 - Isometric or static exercise
 - Isotonic or dynamic exercise
- Metabolic classification
 - Aerobic
 - Anaerobic

Concept 1. Exercise

- Exercise or exercise training is a subcategory of physical activity that may be defined as « physical activity that is planned, structured, repetitive and purposive in the sense that improvement or maintenance of one or more components of physical fitness is the objective »

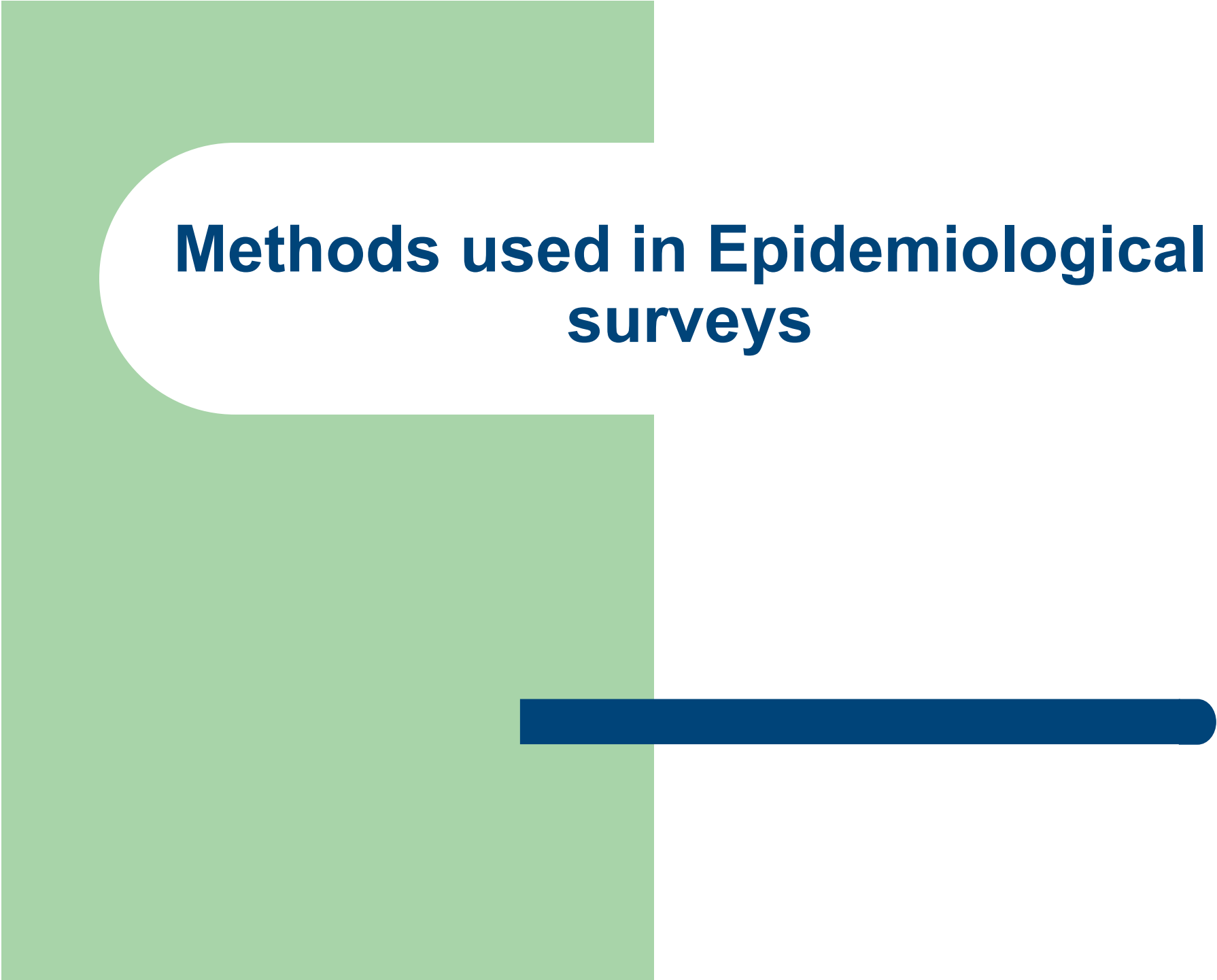
Concept 2. Physical fitness

- Physical fitness is a set of attributes that people have or acquire that relates to their ability to perform physical activity (performance- or health-related fitness)

Cardiorespiratory endurance, muscle endurance, muscle strength, flexibility

Concept 3. Energy expenditure

- Frequently measured
- It comprises
 - Resting metabolic rate
 - Dietary induced thermogenesis
 - Energy expenses of
 - Daily living activities
 - Physical activity
- All activities have a metabolic cost (in kcal or kJ, or in relative terms, as a metabolic equivalent or MET score)



Methods used in Epidemiological surveys

Self-reported physical activity

- Diaries
- Logs
- Recall questionnaires
- Global self reports
- Quantitative history

Applicable to large populations

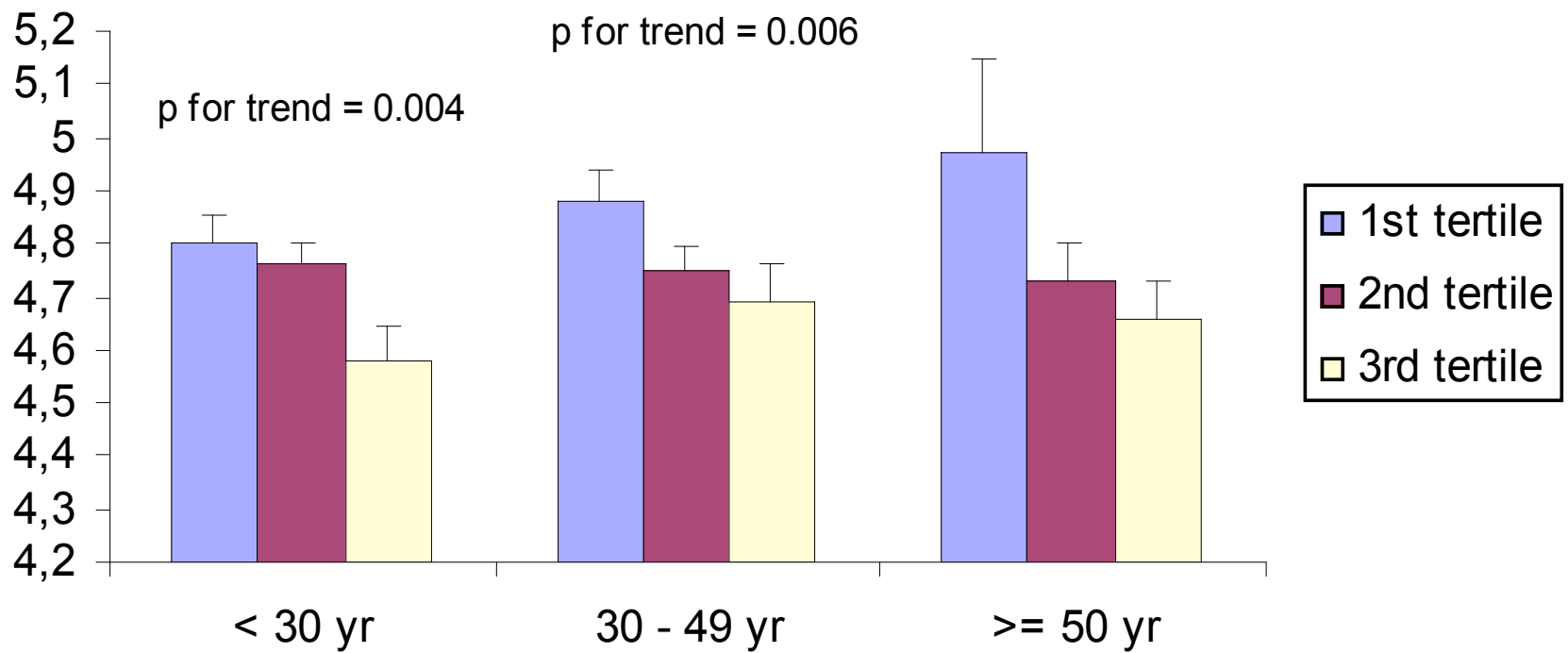
Low cost

Physical activity questionnaires

- Short vs. Long questionnaires
- Timeframe (lifecourse, one year, one month, one week?)

- Occupational activity
 - Leisure time activity
- And...
- Walking (as transportation means)

Fasting blood glucose (mmol.l-1)



Instrumental methods 1

- Direct methods: Motion sensors

- Accelerometers
- Pedometers / step counters

Reduce the bias from recall difficulties

Cost of good quality equipments

Instrumental methods 2

- Indirect methods: Heart rate monitors
 - Based on the relation between oxygen consumption and energy expenditure
- Combined methods
 - Motion sensor + heart rate monitor

Direct measures of energy expenditure

- Doubly labelled water
- Calorimetry

Measures of physical fitness

- Cardiorespiratory endurance
- Muscle endurance
- Muscle strength
- flexibility

Anecdotal experience in physical activity epidemiology

Bafut & Yaoundé,
Cameroon



Occupation examined by questionnaire

- What is your profession?
 - Unemployed
- But how do you earn your life?
 - « je me débrouille » (I struggle)
- May you explain ?
 - Early in the morning I carry goods in the market
 - Later I sell bananas until 4PM
 - In the evening I wash plates in a restaurant
 - At night twice a week I act as gateman in a night club



To conclude...

Quality of measurement 1

- **Validity**: does it measure what it is intended to measure
- **Reliability**: Does it give the same results under the same circumstances
- **Accuracy**: does it achieve both validity and reliability

Quality of measurement 2

- Practicality
 - Acceptable costs to the investigator
 - Acceptable costs to the participants
- Non reactivity
 - The instrument should not alter the population or the behaviour it seeks to measure

And...

- Potential confounders
- Cultural specificities
- Prospect for intervention