MEDSCI 315 NOTES

Lecture 1: Nutritional Epidemiology

Learning Objectives

- Discuss the principles of nutritional epidemiology
- Understand the language of epidemiological research
- List the types of epidemiological studies used to investigate human nutrition
- Discuss the advantages and disadvantages for each type of study
- Briefly outline the interpretation of the findings from each type of study

What is nutritional epidemiology

The study of health in relation to nutrition

- It should be evidence bases and normally at a population level and may include:
  - The examination of the relationship between nutritional intake and the aetiology, progression and/or treatment of disease

- Relatively new discipline (<200) that is a branch of epidemiology

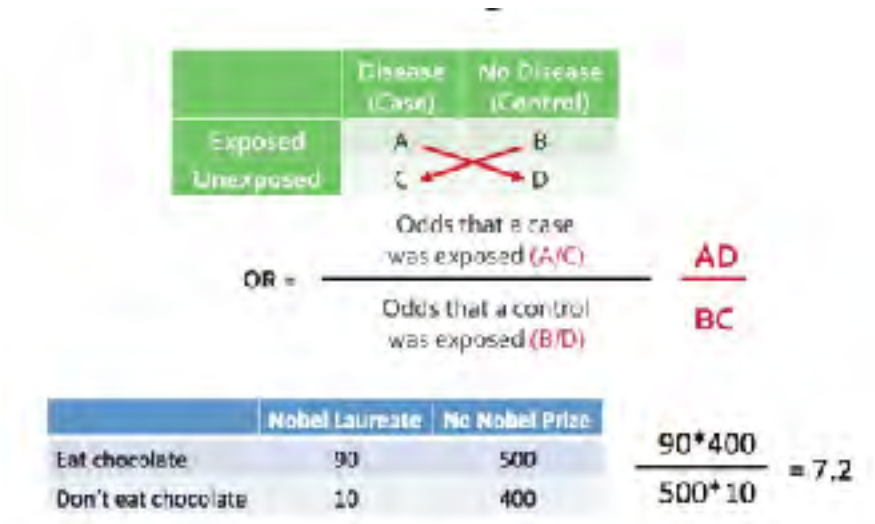
Important language

Prevalence: number of cases in a defined population at a given time
Prevalence rate: Number with disease/ Number at risk
Incidence: Number of **new** case raving in a given time with a defined population
  - Incidence proportion (cumulative incidence) - probability or risk
  - Incidence rate

True Incidence Rate: Number who get disease/ sum of lengths of time each person is at risk
Odds ratio (OR)
- Used to test for signification of an **association**
- Note: Association/ correlation ≠ causation (E.g. increase in forrest fires with increase in ice cream sales)
- Used for discrete variables (e.g. yes/no)
- Times more likely
  - OR <1.0 is reduced risk
  - OR >1.0 is an increased risk
  - OR of 3 = on average 3 time more people in the population will get the disease/condition (not the risk of an individual per sue)

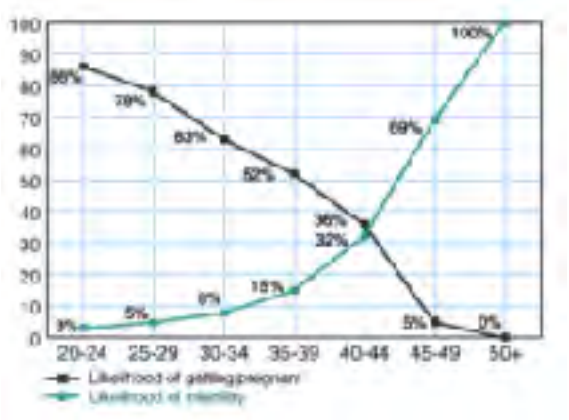
β coefficient
Similar to an odds ratio but used for continuous variables

Calculating OR's



	Nobel Laureate	No Nobel Prize
Eat chocolate	90	500
Don't eat chocolate	10	400

$$\frac{90*400}{500*10} = 7.2$$



Population risk ≠ individual predictability

- 86% of females aren't pregnant at 20-24
  - Contraception?
  - Male?
  - Will you be trying to get pregnant at 40?

Nutrition epidemiology: then and now

Past Questions:

- Protein energy malnutrition
- Iron deficiency anemia
- Goitre

- High rates with low intake (clear phenotype and cause)
- Short latency
- Quickly reversible

Can easily be reversed. If have anaemia just need more iron

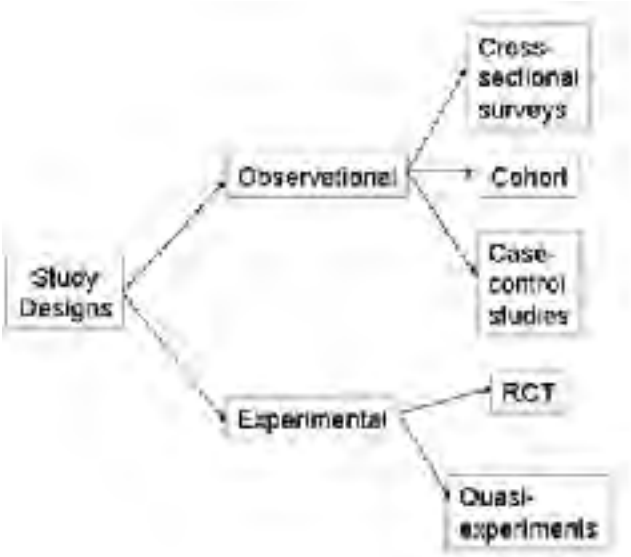
Now its more complex as there are multiple causes, long latency, not readily reversible, relatively low frequency, excess and insufficiently can cause (E.g. too much or too less can cause disease so fine balance)

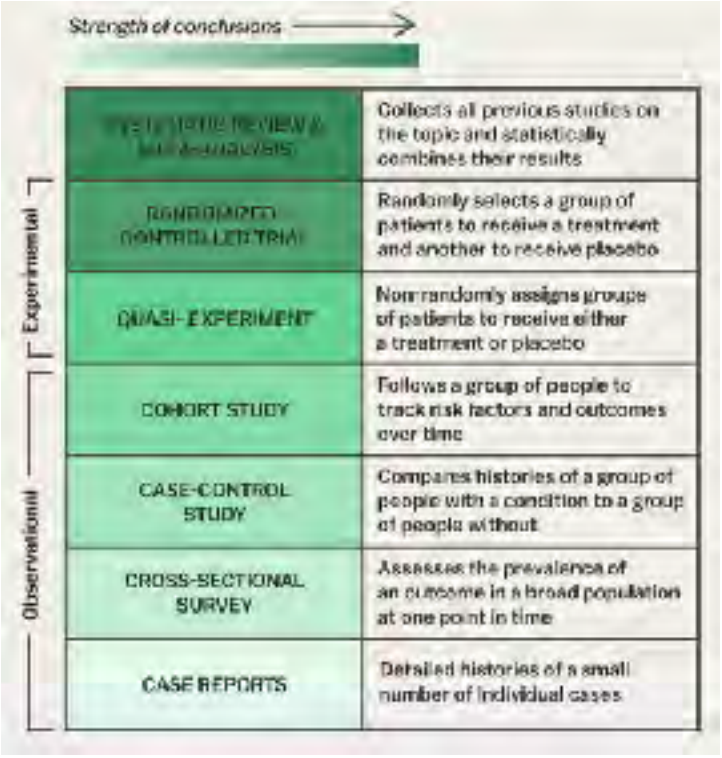
What is the major limitation to nutritional epidemiology research?

- Epidemiological so has to happen at a population level. This is expensive and time consuming.
- Needs to be fast, low burden, inexpensive and accurate measures of dietary intake

Study design

Must look at
- How strong conclusions/ results are
- Is study designed to test what they say it is
- Do conclusions match design (association vs. causation)





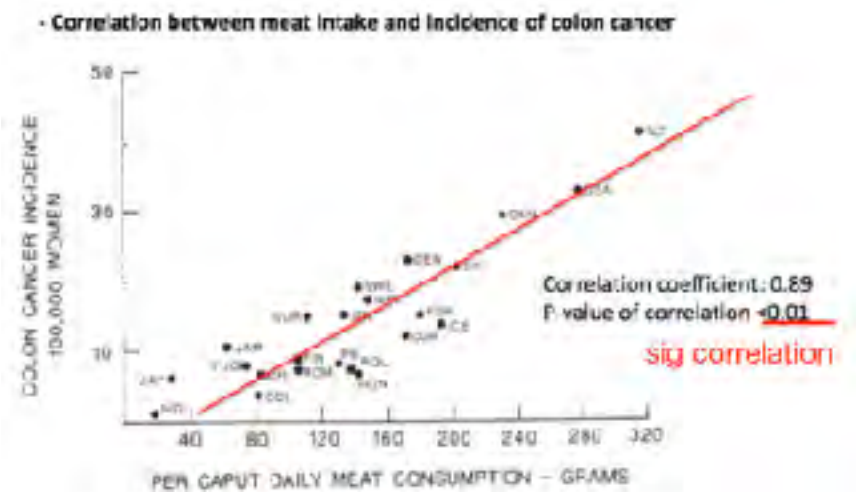
Cross-sectional (correlation/ ecological studies)

- Comaprisions of **disease rates** in populations with the **population per capita consumption** of specific dietary factions

Strengths

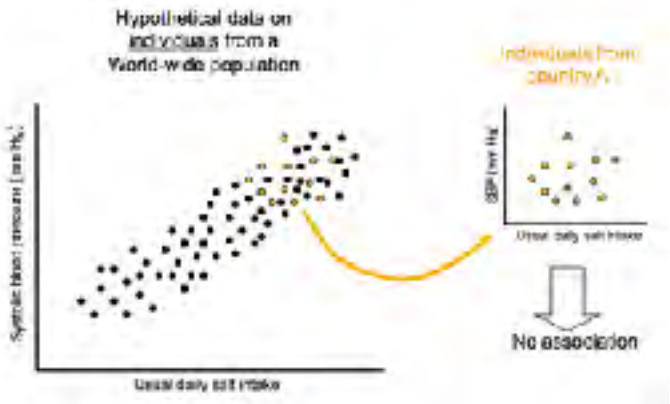
- Usually low participant burden and easily administered
- Low cost
- Great for population level studies

Correlation example



Association but doesn't mean meat causes colon cancer but hypothesis can be made and further testing can occur from this

Strength of the study can be increased by including large numbers and contrasting populations (ie international)

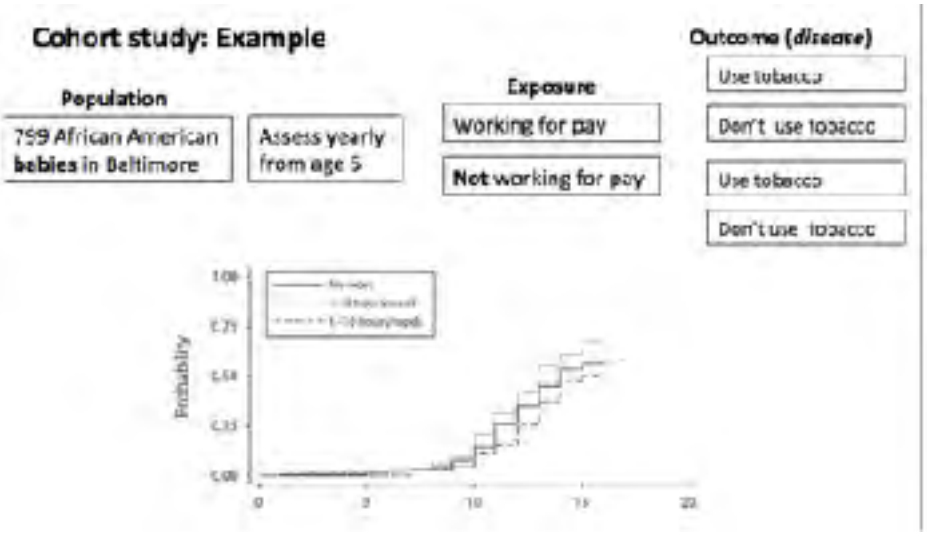


Limitations

- Large contrasts in dietary intake within and between populations
- The average of diets for persons in a country are more stable
- The disease rates of international studies usually derived from relatively large populations - subject to only small random errors.
- Accurate measure of food intake/consumption? Population style is often gathered through 'disappearance' data
    - Indirect and variable quality

Cohort Study

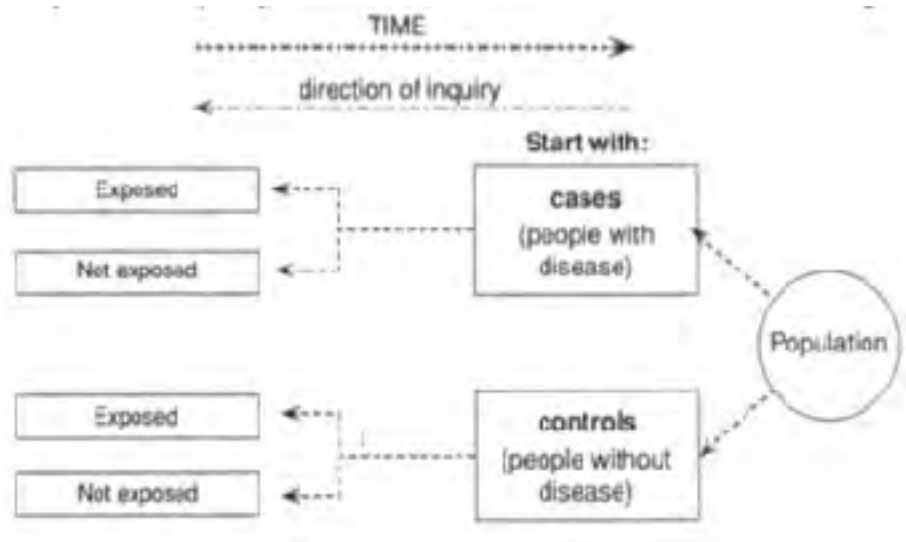
A population is folled over time so must be a manageable size



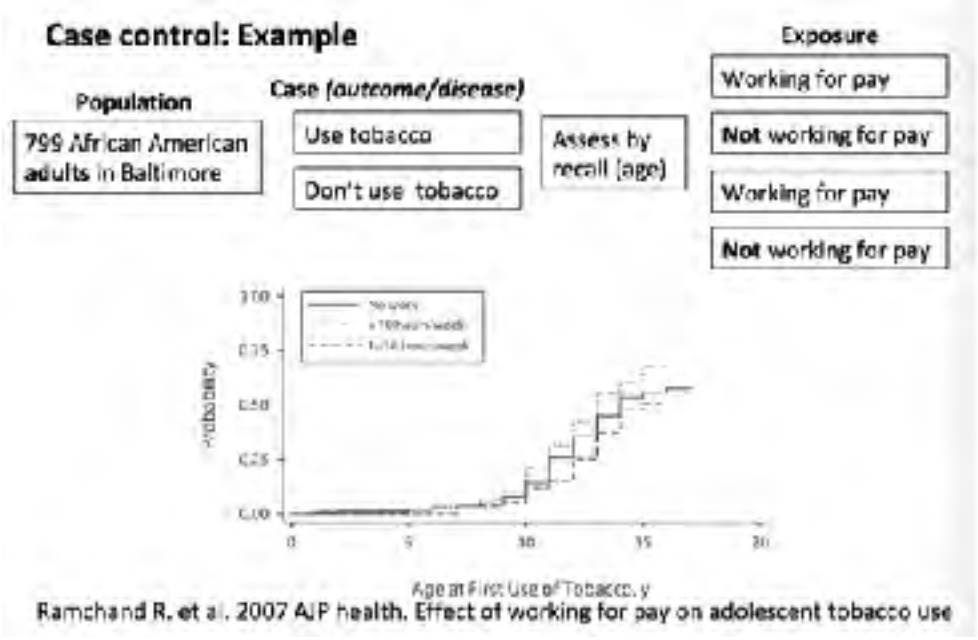
Strengths
- Avoids a lot of potential sources of methodological bias
- Information (ie diet) is gathered prior to diagnosis/progression of the disease, limiting recall bias.
- Can get repeated sample from participants (important for diet analysis)

Limitations
- Large numbers needed for enough for case and control (tens of thousands depends frequency of disease
- Loss people in follow ups

Case-Control Study



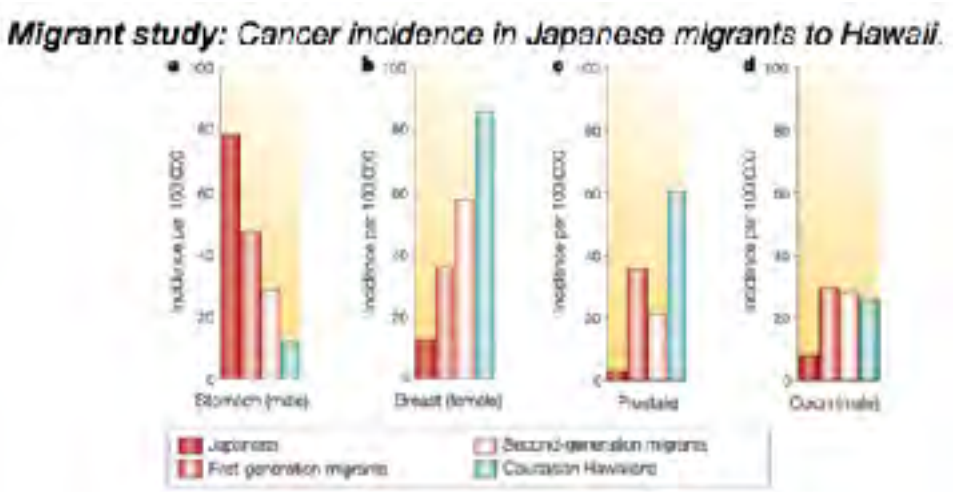
Opposite way of enquiry to cohort. Asks for recall



Strengths
- Confounding effects of other factors can be controlled
  - Design: matching
  - Analysis: multivariate modeling
- Individual data gained
- Smaller number of participants compared to cohort or correlation

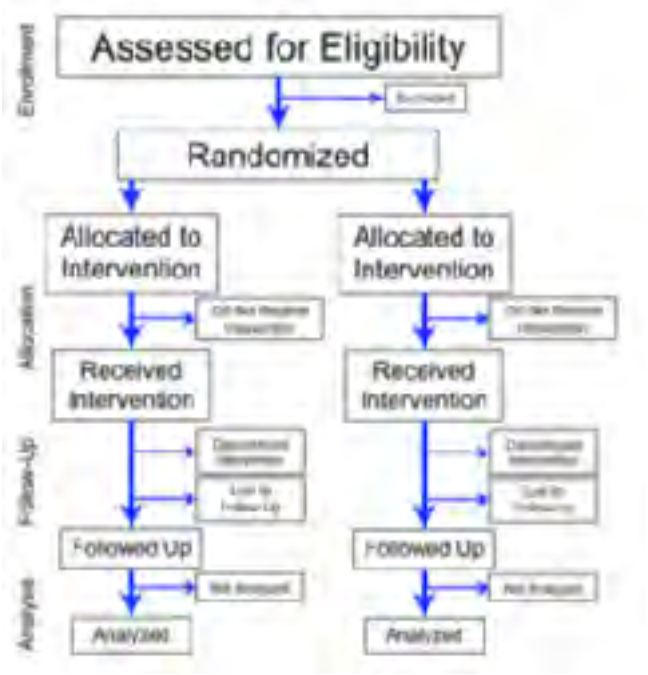
Limitations
- Methodological bias in selection
- How to select a control group?
  - Other disease group?
  - Healthy control
  - Randomized in population?

There are different kinds such as special populations or migrant studies



Environmental factor in japan thats causing stomach cancer, also genetic factor?

Experimental/ Control (RCT: randomised clinical trial and quasi)



Multiple forms
- Parallel
- Cross-over
- Pre-post

Always an intervention
Always a control
— Compare the effect

Diagram indicated a parallel design

Strengths
- Can be tightly controlled
- Best way to show causation (change only 1 variable)
- Information can be gained on time course and effect size

Limitations
- Generalisability? Effect is on a select and tightly controlled group
- Compliance
- Cost and time commitment (participant and researcher)

Summary
- It is important to understand the terminology and study design to be able to interpret results of nutritional epidemiological research
- The major limitation of nutritional epidemiological research is the methods for dietary intake assessment
- There are a number of different study designs and each has its strength, weaknesses and purpose. The study design selected should be is driven by the research question.
- Think about what the study really tests for yourself!!

Lecture 2: Omics — Nutrigenomics and Epidemiology

Overview
- What is epidemiology?
  - Provide an example
- What is genetic epidemiology?
  - Provide an example
- What is nutrigenetics?
  - A simple definition
  - An easy to understand example
- What is a biomarker?
  - Provide an example
  - What makes a good biomarker?

What is epidemiology?

Epidemiology is the study of patterns of health and illness and associated factors at the population level. It is the cornerstone method of public health research, and helps inform evidence-based medicine for identifying risk factors for disease and determining optimal treatment approaches to clinical practice and for preventive medicine.

What does that mean?
- "The study of what is upon the people"
- What makes people sick, and how can we prevent or treat this, at the population level?

Cholera

What is it?
- Primary symptoms are profuse diarrhea and vomiting of clear fluid
- An untreated person with cholera may produce 10 to 20 litres of diarrhea a day
- Severe cholera, without treatment, kills about half of affected individuals

What causes it?
- The bacterium Vibrio cholera

Cholera Epidemic 1854 - Jon Snow

- Map of a district in london. Crosses = cholera cases. Circles = water pumps
- Shows the correlation between cholera and water

What was making people sick?
- Specific agent not known
- Location of cases suggested something in a particular water pump (not "bad air")
- Proposed microbial vector
- Vibrio cholerae from water contaminated with faecal matter

How to prevent the sickness?
- Turn off that particular water pump

Lesson
- Don't drink faeces-infested water