





Basics of descriptive epidemiology

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What is epidemiology?

 "The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems"

Last. Dictionary of Epidemiology, 1988

 Concerned with describing and explaining the distribution of health and illness within and between populations

Objectives of epidemiology

- To describe the frequency of disease & of exposures (risk factors)
- To describe the natural history of disease progression
- To describe the prognosis of disease
- To identify the cause of disease
- To evaluate preventive or therapeutic measures
- To inform policy

Translating observation into preventive action



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Role of Epidemiology in the Public Health Response to Chronic Disease



Measuring disease

The trajectory of disease



Imprecise measurement of even the simplest variables is easier than you might think



How many legs does this elephant have?

Frequency Not diseased Diseased

Test result

Frequency



Test result

Descriptive epidemiology

Who gets ill, where and when?

Person









- More people die each year in London than in Cambridge
- If you want to live a long life you should move to Cambridge
- Do you agree?



- We need to consider: number of people living in each place.....and their age, sex, other characteristics
- We need a systematic approach



Mortality in England – reason for variation?



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Measures of frequency

Prevalence

number of cases at a specified time



incidence rate

number of new cases of the disease in a specified time period sum of the time each person in the population is at risk



Measures of frequency



prevalence = d/N (at time t)

risk = d/N (over time t)

odds = d/N-d (over time t)

incidence rate = d/Y

N-d

Ν

Measures of frequency



Prevalence = (at 4yrs)	2/10
Risk =	3/10
Odds =	3/7
Rate =	3/75 pyrs

Numerator and denominator errors

- Numerator errors
 - diagnosis/definition
 - incomplete identification of cases



Almost 3.7 million people have been diagnosed with diabetes in the UK



4.6 million people are living with diabetes in the UK



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- Denominator errors
 - migration
 - population structure changes
 - admin boundaries change

Cross-sectional studies

• All factors (exposure, outcome, confounders) are measured at the same time

- Advantages
- 'relatively' quick and easy compared with a cohort study
- good for descriptive analyses and hypothesis generation
- good for investigating many exposure and outcome variables
- Disadvantages
- time sequence of events difficult to ascertain
- can only measure prevalence not incidence
- not useful for rare diseases or exposures

Design of a cohort study



Design of a cohort study



Cohort studies

• A group of people are followed up over time to see who develops the health outcome of interest

- Advantages
 - <u>incidence</u> can be measured
- Disadvantages

WAIT FOR LECTURE ON AETIOLOGICAL EPIDEMIOLOGY ON TUESDAY 2ND APRIL



- Why? Usually cannot collect data on the whole population
- Need representative and well-defined sample
- Random: if large enough, representative
- Systematic: every xth person
- Stratified: to sample particular groups e.g. children elderly women
- **Purposive:** according to desired characteristics

Diabetes prevalence: Ethnic variation



London: Southall study; McKeigue et al, Lancet

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Combined influences: ethnicity / place



Age adjusted prevalence of diabetes and IGT

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Migration/Population shift



Incidence of diabetes

- Paucity of data
- Small studies
- Population follow up (cohort studies)
- Frequency of testing
- Cost, logistics
- Criteria /definition comparisons over time

Incidence of diabetes

Self-reported new cases, people aged 20 years or older, USA

2002: 1.3 million

2015: 1.5 million



National Diabetes Statistics Report, 2017 Estimates of Diabetes and Its Burden in the United States

Incidence of diabetes – cohort study

DIABETICMedicine

Incidence of Type 2 diabetes in England and its association with baseline impaired fasting glucose: The Ely study 1990–2000

N. G. Forouhi, J. Luan, S. Hennings and N. J. Wareham 2007

10-year cumulative incidence

7.3 per 1000 person years



Thank you for your attention





Prevalence and incidence

- Prevalence is useful for chronic and intermittent diseases/conditions (and exposures)
 - eg asthma, backpain, diabetes, obesity, smoking
- Incidence is useful for assessing risk of acquiring disease
- A mortality rate is an 'incidence' measure (incidence of 'death')
- Prevalence ~ incidence x duration
- Often we need rates that are specific to subsets of the population
 eq men and women, age groups, social classes
- Rates for the whole population are sometimes called `crude' rates
- If we 'adjust' for differences in age between samples rates are 'standardised'

Factors influencing observed prevalence rates

Increased	by
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Longer duration of disease

Prolongation of life of patients without cure

Increase in new cases

In-migration of cases

Out-migration of healthy people

In-migration of susceptible people

Improved diagnostic facilities

Decreased by

Shorter duration of disease

High case-fatality rate from disease

Decrease in new cases

In-migration of healthy people

Out-migration of cases

Out-migration of susceptibles

Improved cure rate of cases







Risk Level	Risk Indicators
Very High	2-hr glucose 180 A1c > 6.0% FPG > 120
High	2-hr glucose 140 A1c > 5.7% FPG > 110 GDM history
Moderate	A1c > 5.7% FPG > 100 BMI > 35
Average	1-2 risk factors
Low	No risk factor