PPGH 1st Year

Public health = the science and art of promoting and protecting health and wellbeing, preventing ill health and prolonging life through the organised efforts of society

How to formulate a good research question:

- FINER = feasible, interesting, novel, ethical, relevant
- PICOT = population (patients), intervention (for intervention studies only), comparison group, outcome of interest, time

▼ Epidemiology:

the study of the distribution and the determinants of disease in a population

▼ Qualitative data:

observed not measured

▼ Quantitative data:

observed and measured

▼ Numerator:

those affected at that given point in time

▼ Denominator:

total in that specific population/sample

▼ Incidence rate:

the number of **new cases** in a population

▼ Prevalence rate:

the number of **new and old cases** in a population **at a given time**

▼ Point prevalence:

the number of new and old cases at one point of time in a population

▼ Endemic:

this is a permanent disease in a region or population

▼ Epidemic:

this is an outbreak of disease that affects a higher number of individuals and spreads more than it should for a given time and place

▼ Pandemic:

this is a disease that spreads worldwide

▼ DALYS (disability adjusted life years):

- years of potential life lost due to premature mortality + years lived in disability or disease (YLL + YLD)
- measures disease burden and is often used in measuring chronic diseases

▼ QALYs (quality adjusted life years):

this is a measure of the state of health of a person/group in which the benefits or burdens are adjusted to reflect the quality of life

$$\text{Prevalence} = \frac{\text{Number of cases at a given time}}{\text{Number in population at that time}}$$

▼ Outbreak:

2 or more cases where the onset of illness is closely linked in time (weeks rather than months) and in space, where there is suspicion of, or evidence of, a common source of infection, with or without microbiological support

▼ Best way to investigate an outbreak?

case-controlled study

▼ Cluster:

2 or more cases that initially appear to be linked by space (e.g. residence; work), and which have sufficient proximity in dates of onset of illness (e.g. six months) to warrant further investigation

▼ Impairment:

- this is any abnormality of psychological, physiological or anatomical structure or loss in function
- e.g. losing a leg in an accident

▼ Disability:

- this is a restriction or lack of ability to perform an activity in ways that are considered normal for a human being

- e.g. being unable to walk
- ▼ Handicap:
  - these are limitations or preventions that put one at a disadvantage from performing their normal roles
  - e.g. losing your job as a driving instructor

Health improvement: enhancing the health of an entire population (local, regional, national)

Health promotion: enabling people to increase control over their health and its determinants and thereby improving their health

- ▼ Tannahill Model: a concept that describes health promotion as three overlapping activities...
  1. Health protection- legal and fiscal policies to protect health e.g. 'no smoking' ads
  2. Disease prevention (vaccination)
  3. Health education (educating people to make healthier choices; changing beliefs, attitudes & behaviours)

Disease prevention:
- ▼ Primary:
  these are actions taken to prevent disease from even happening in the first place; an example is immunisation, reducing salts in foods, stopping smoking to stop lung cancer
- ▼ Secondary:
  these are actions taken to catch a disease early and prevent progression; an example is screening, early detection of STIs
- ▼ Tertiary:
  these are measure taken to minimise suffering and improve quality of life (reducing disability); medication is an example of this

- ▼ Rose principle:
  large number of people exposed to small risk generates more cases than small number of people exposed to large risk

- ▼ Clinical iceberg model:
  - the apparent disease hides the bigger problem
  - a large percentage of a problem is subclinical, unreported, or otherwise hidden from view → only the "tip of the iceberg" is apparent

- ▼ Bradshaw's Taxonomy of health care needs; 4 types...
  - Felt – Individual perceptions of variations from normal health
  - Expressed – Vocalisation of need and how people demand for services
  - Normative – Based on professional judgement (ie: need for treatment)
  - Comparative – Based on professional judgements as to the relative needs of different groups in the population

- ▼ Maslow's hierarchy of needs: (5)
  1. Physical
  2. Security
  3. Social
  4. Ego
  5. Self-actualisation

  To progress to the higher level growth needs, one must first satisfy the lower level basic needs
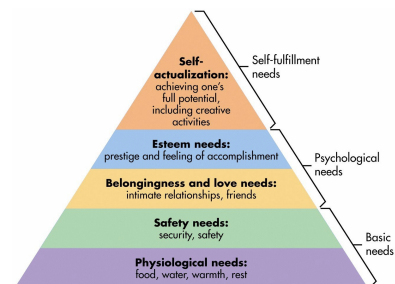
- ▼ Health needs:
  deficiencies in health that require health care from promotion to palliation
- ▼ What is a health needs assessment?
  a systematic method for reviewing the health issues facing a population, identifying unmet needs leading to agreed priorities and resource allocation that will improve health and reduce inequalities

- ▼ GFR (general fertility rate):
  this is the ratio of live births to the number of women in childbearing years
- ▼ Total period fertility rate:
  this is the average number of children per woman that would be born to a group of women if they experienced the current years age specific fertility rates for each year of their childbearing years

- ▼ Birth rate:
 this is the number of live births per thousand population per unit of time
- ▼ Still birth rate:
  - number of stillbirths per thousand births
  - number of stillbirths / number of live births + stillbirths
- ▼ Neonatal mortality rate:

- ▼ Maternal death:

  this is the death of a woman whilst pregnant or within 42 days of the pregnancy

- ▼ Direct deaths (maternal):

  from obstetric complications of the pregnant state

- ▼ Indirect deaths:

  from previous existing disease or disease that developed that was not the direct result of pregnancy but was aggravated by the pregnancy

- ▼ Late deaths:

  maternal death 42 days to a year

- • number of neonatal deaths per thousand births (deaths within 28 days)
- • number of neonatal deaths / live births

- ▼ Perinatal mortality rate:
  - • deaths by seven days post birth
  - • still births plus neonatal deaths / number of livebirths + stillbirths

- ▼ Post neonatal mortality rate:
  - • the number of deaths after 28 days and up to a year
  - • number of post neonatal deaths / number of live births

- ▼ Infant mortality rate:
  - • number of infant deaths per thousand births
  - • number of infant deaths (deaths up to 1 year of age) / number of live

- ▼ Risk:

  this is the probability that an event will occur

- ▼ Absolute risk:

  this is the probability of an event under the study

- ▼ Relative risk (risk ratio):

  this is the ratio of the risk of a disease among the exposed to the risk among the unexposed

- ▼ Case fatality rate:
  - • the number of deaths from a disease
  - • calculated by dividing the number of deaths from a specified disease over a defined period of time by the number of individuals diagnosed with the disease during that time

- ▼ Transitions: (3)

  1. Demographic- from high birth rate and death rate to low birth and death rate
  2. Epidemiological- from communicable to non-communicable disease
  3. Ecological- shift in each individuals role or setting across the life course

- ▼ Statistical significance:

  the probability that an effect is not due to chance alone

- ▼ Null hypothesis:
  - • this is the hypothesis that suggests the opposite to what you are testing
  - • e.g. there is no significant difference between two variables
  - • this is the outcome you try to disprove

- ▼ p value:
  - • a measure of statistical significance
  - • this evaluates how compatible the data is with the null hypothesis
  - • it is the probability of obtaining the observed difference in the outcome measure, or a larger one, given that no difference exists between treatments in the population
  - • a **low P value** means your data is unlikely to be a true null (this is good); $p<0.05$ → reject null hypothesis → results are not due to chance
  - • a **high P value** indicates that your data is likely a true null; $p>0.05$ → accept null hypothesis → results are due to chance

- ▼ Type 1 error:

  the null hypothesis was true, but you are confident in your data and you reject it

- ▼ Type 2 error:

  the null hypothesis was false, but you are not confident, so you still accept the null hypothesis

- ▼ Infectious disease:
- ▼ Communicable disease:

  an infectious disease that can be transmitted from one individual to another

- ▼ Transmissible disease:

  a disease that can only be transmitted between individuals by unnatural routes

Surveillance: a systematic collection, collation and analysis of data with dissemination of the results so that appropriate control measures can be taken
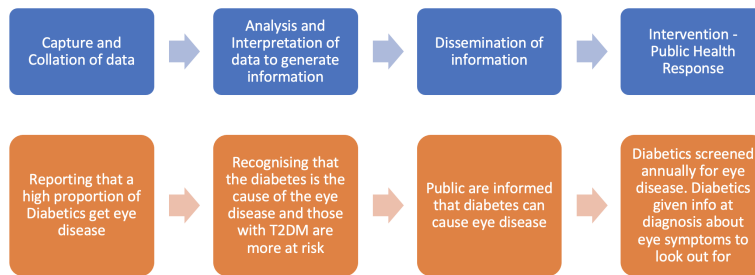
Types of surveillance:

▼ Active surveillance:

▼ Passive surveillance:

  data are collected from routine sources e.g. lab reports

▼ Sentinel:

  data from a sample of health care providers

▼ Syndromic:

  from telephones/GP consultations

▼ Enhanced:

  collects more detailed information than routine

▼ What determines if a test is suitable? (3)

  sensitivity, specificity, positive predictive values

▼ What is PPV (positive predictive values)?

  this is the proportion of people who test positive who are actually positive

▼ What is NPV (negative predictive values)?

  this is the proportion of people who test negative who are actually negative

$$PPV = \frac{True\ positive}{True\ positive + false\ positive}$$

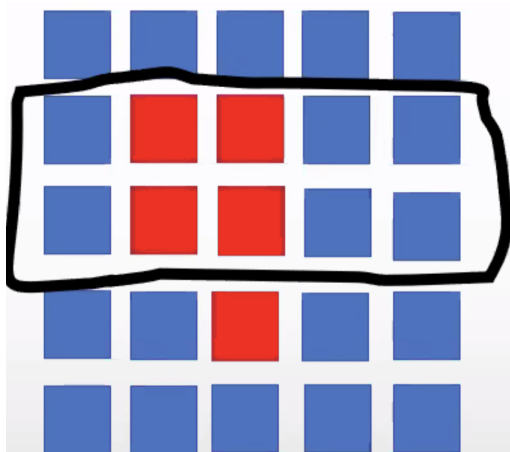$$NPV = \frac{True\ negative}{True\ negative + false\ negative}$$

▼ True positive:

  Testing identifies as having the disease; after further testing, this is confirmed

▼ False positive:

  this is when testing identifies as having a disease, but further tests say they do not actually have the disease

▼ True negative:

  testing says you don't have the disease and further tests confirm this

▼ False negative:

  testing says you don't have the disease, but further testing says you do

Sensitivity = TP/TP + FN
Specificity = TN/FP + TN
Positive predictive value = TP/TP + FP
Negative predictive value = TN/FN + TN

Sensitivity - how many people with the disease screening detects (should be 100% but never is)
Specificity - how many people without the disease the screening doesn't detect (should be 100%)

$$Sensitivity = \frac{True\ Positives}{True\ Positives + False\ Negatives}$$

$$Specificity = \frac{True\ Negatives}{True\ Negatives + False\ Positives}$$

Sensitivity = 4/5
Specificity = 14/20

- True positives = 4 red in the box

- False negatives = 1 red outside the box (given as negative when they're actually positive)

- True negatives = All blue outside the box

- False positives = 6 blue in the box

▼ Dahlgren and Whitehead social determinants of health: (5)

1. Socioeconomic, cultural and environmental conditions

2. Living and working conditions

3. Social and community networks

4. Individual lifestyle

5. Age, sex and constitutional factors

The broad social and economic circumstances that together determine the quality of the health of the population are known as the 'social determinants of health'
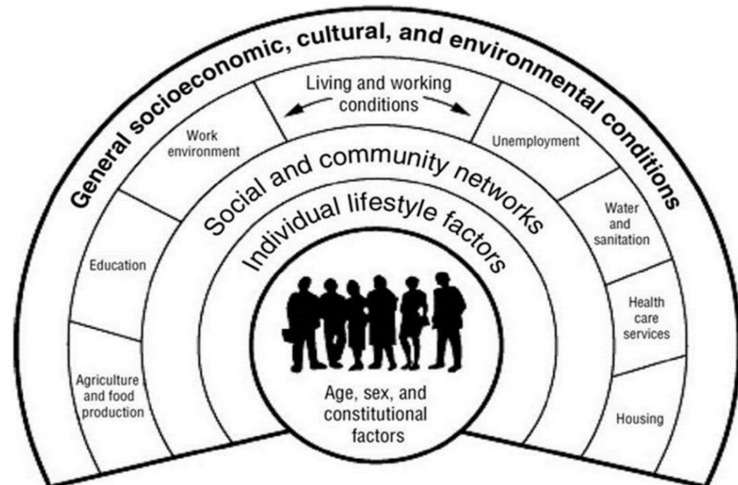
The demographic transition in 5 stages
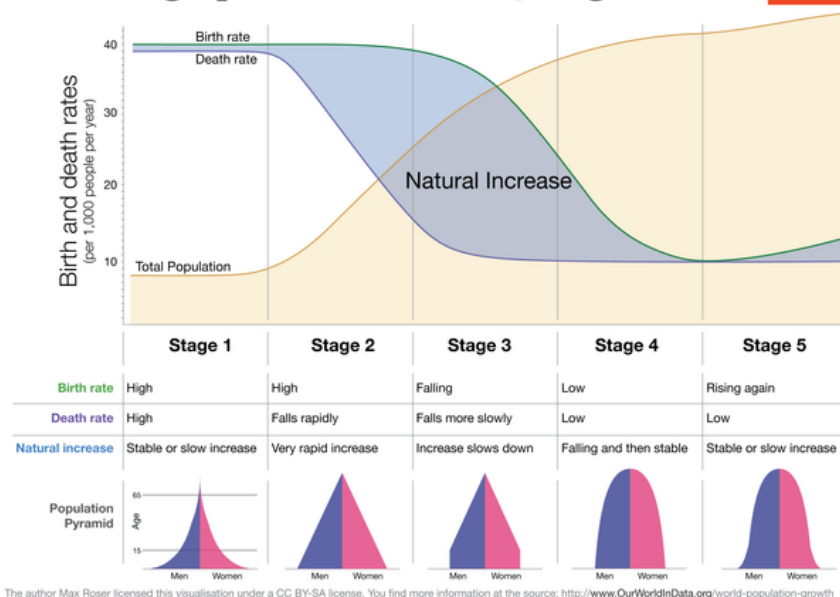
▼ Maxwell's dimensions of health quality: (EEEAAA)

1. Effectiveness

2. Efficiency

3. Equity

4. Acceptability

5. Appropriateness

6. Accessibility

▼ Population case series:

these are a collection of subjects; with common characteristics used to describe some clinical pathophysiological or operational aspect of a disease, treatment, exposure or diagnostic procedure

▼ How often is the UK census?

every 10 years

▼ What is a limiting long term illness?

- ▼ NNT (number needed to treat):

  this is the number of people who are needed to be treated in order to prevent more events. IT is 1/ absolute risk reduction

- ▼ How many days do you have to register your baby?

  42 days from birth

- ▼ Structure of the NHS: (5)

  1. Parliament (secretary of state for health and social care)- Matt Hancock
  2. Department of health
  3. NHS England- Simon Stevens
  4. CCGs or clinical commissioning groups- purchase hospital and GP services for their local area. They deal with secondary care services too, e.g. rehab and emergency case and community health services
  5. Public Health England- update for 2020, might be getting scrapped

- ▼ Social inequities of health:

  these are systematic differences in health status between different socioeconomic groups; they are unfair

- ▼ Equity in heath:

  this implies that ideally everyone could attain their full potential and that no one should be disadvantaged from achieving this potential because of their social position or other socially determined circumstances

- ▼ What are the area-based measures of socioeconomic status? (3)

  - Index of multiple deprivation
  - Townsend score
  - Carstairs index

  These are prone to ecological fallacy

- ▼ What are health inequalities?

  these are systematic, preventable, unfair and unjust differences in health across population groups

- ▼ Case definition:

  this is a set of uniform criteria used to define a disease for public health surveillance; they enable public health to classify and count cases consistently across reporting jurisdictions

- ▼ Hypothesis testing:

  this is a statistical method that uses sample data to evaluate a hypothesis about a population parameter; it helps researchers to differentiate between real and random patterns in the data

- ▼ Inference:

  this is using a random sample to learn something about a larger population

- ▼ Hypothesis:

  an assumption about the population parameter

- ▼ Confidence Interval:

  an interval between two numbers where there is a specified level of confidence that a population parameter lies

- ▼ Confidence interval calculation:

  population estimate +/- 1.96xstandard deviation

- ▼ Risk:

  this is the probability that an event will occur

- ▼ Absolute risk:

  this is the probability of an event under the study

- ▼ Relative risk (risk ratio):

  this is the ratio of the risk of a disease among the exposed to the risk among the unexposed

when your day-to-day activities are limited because of a health problem or disability

- ▼ Paradigms:

  this is a world view underlying the theories and methodology of a particular scientific subject

- ▼ McKeown Hypothesis:

  - the population changed due to increased child survival
  - the deaths mainly due to infectious diseases with nutrition and other environmental issues as major determinants
  - the environmental, political and social measures caused drop in number of deaths, not therapy

- ▼ What are the individual measures of socioeconomic status? (3)

  - educational attainment
  - occupation
  - income

- ▼ A confounder:

  this is a known risk factor to the outcome, associated with the exposure under study but it is not on the causal pathway between exposure and outcome

- ▼ Bias:

  this is a systematic error in design or conduct of a study that results in an incorrect estimation of the association between exposure and health-related event

- ▼ Lead time bias:

  the length of time between the detection of a disease and its usual clinical presentation and diagnosis

- ▼ Selection bias:

  this occurs when there is a systematic difference between either those who participate in the study and those who do not or those in the treatment arm of a study and those in the control group

- ▼ Information bias:

  this results from systematic differences in the way data on exposure or outcome are obtained from various study groups

▼ Case fatality rate:

this is the number of deaths from a disease

▼ Prevention paradox:

a preventive measure that brings large benefits to the community but may offer little to most participating persons

▼ Ecological fallacy:

bias that may occur because of an association observed between variable on an aggregate level doesn't represent the association that exists on an individual level

▼ What are the health care evaluation elements? (3 E's)

1. Efficacy
2. Effectiveness
3. Efficiency

▼ Describe the **Bradford Hill criteria**: (9) this is used to establish a causal relationship rather than just a correlation

1. Does the cause come before the effect- **Temporality**
2. If the cause is removed does the effect go away? - **Reversibility**
3. Does greater exposure lead to greater incidence of the effect? And vice versa? **Dose response relationship/biological gradient**
4. How strong is the association between the cause and the effect? **Strength**
5. There should be a plausible mechanism between the cause and effect? **Plausibility**
6. If the study were replicated in a different time and place would the same association be observed? **Consistency**
7. Does the evidence come from a strong robust study? **Study design**
8. A single cause produces a single effect. **Specificity (weakest criterion)**
9. Applying accepted evidence from another area of study (**Analogy)**

▼ What is the Wilson-Junger criteria? This is a criterion that should be applied before implementing a potential population screening programme. It involves: (9)

1. The condition should be an important health problem
2. The history of the condition should be understood
3. There should be a recognizable latent or early symptomatic stage.
4. There needs to be a suitable test for it
5. Is the treatment accepted
6. Is the treatment more effective when started early?
7. There needs to be a policy on who should be treated
8. Is diagnosis and treatment cost effective
9. Case finding should be a continuous process

▼ Donabedian's framework

1. Structure- the context in which care is delivered
2. Process- the sum of all actions that make up healthcare
3. Outcome- the effect of healthcare on patients and populations

Rank of the studies:

1. Meta-Analysis
2. Systematic review
3. Randomised controlled trials
4. Cohort studies
5. Case Control studies
6. Cross sectional study- this measures prevalence at one time in point
7. Case series/ Case reports- This is when an individual case or a number of similar cases are studies
8. Animal research

Measuring associations:

Study type	Approach	Method	Timing	Uses	Problems
Ecological study	Observational	Study of groups and population using routinely collected data	Usually retrospective	Data of distribution of disease across population groups	No data about individuals
Cross-sectional study	Observational	Special health survey of individuals	One point in time	Measure prevalence	Cannot measure incidence
Case-control study	Observational	Longitudinal study of individuals	Retrospective	Common exposure and rare outcomes Quick and cheap	Recall and selection bias No proof of temporal relationship
Cohort study	Observational	Longitudinal study of individuals	Prospective or retrospective	For rare exposures Demonstrates a temporal relationship Measure incidence	Large sample sizes needed Time consuming
Randomized Control Trial	Intervention	Clinical Trial	Prospective	Gold standard for proving the effect of an intervention	Expensive Time consuming
Meta-analysis	Overview	Statistical review of numerical results of other studies.	Retrospective	Summarizes all relevant research	Hard to include all published and unpublished data Time consuming

Principles of the NHS: Core values of the NHS:

1. Free at the point of delivery
2. For the needs of everyone
3. Based on need not wallet
4. Based on excellence and professionalism
5. Based on integrated working across organizational boundaries
6. Best value and sustainable
7. Accountable to the public
8. Patient centred

1. Working together
2. Respect and dignity
3. Commitment to quality care
4. Compassion
5. Improving lives
6. Everyone counts

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