Big Health and Actuarial Data: Case Study (health)

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Impact on medicine and public health

- Case study of statins
- Burden of cardiovascular disease
- NICE guidelines – lipids, multimorbidity
- Findings from randomised controlled trials
- Findings from observational data
- Should guidelines change?
- Access to medical interventions
- National variation in rates of heart disease
The goal of the workshop

• ‘to explore how various wide scale medical advances or health interventions, for example changes in NICE guidelines, may change longevity and necessitate therefore changes in population projections, and a variety of policies and business models, from public health to pensions and insurance products, and

• what is the role of observational data in assessing these changes?’
Public health case study: statins to prevent heart disease

Cardiovascular Disease 2016:

- 30% of UK deaths
- annual change -2%

https://vizhub.healthdata.org/gbd-compare/
Pathway to impact

- Impact on medical and public health policy is not linear.
- Eg NICE multimorbidity guideline:
  - ‘Predicting life expectancy:
  - Is it possible to analyse primary care data to identify characteristics that affect life expectancy and to develop algorithms and prediction tools for patients and healthcare providers to predict reduced life expectancy?’
- [https://www.nice.org.uk/guidance/ng56](https://www.nice.org.uk/guidance/ng56)
NICE multimorbidity guideline

‘Why this is important:

• Many people take preventive medicines. The ability to identify people with reduced life expectancy could provide healthcare professionals and people with information that could inform decisions about starting or continuing long-term preventive treatments.

• Because this information would be used most often in a primary care setting, the committee considered that a tool derived from information within primary care databases would be most useful.'
NICE guidance on statins for prevention of CVD

- ‘offer atorvastatin 20 mg for the primary prevention of CVD to people who have a 10% or greater 10-year risk of CVD’

- Four out of five men over 50, and most women over 60 in the UK
10% risk of CVD without treatment

Cardiovascular risk 10% over 10 years: no treatment

If 100 people at this level of risk take no statin, over 10 years on average:
- 90 people will not develop CHD or have a stroke (the green faces)
- 10 people will develop CHD or have a stroke (the red faces).

10% risk of CVD with atorvastatin


Our findings from observational data

- No reduction in all-cause mortality with a QRISK2 score <10% at any age
- No reduction in participants aged 60 at any level of risk assessed
- Mortality reduction was uncertain with a QRISK2 score of 10–19%
- HR was 1.00 (0.91–1.11) for statin prescription by age 65
- 0.89 (0.81–0.99) by age 70
- 0.79 (0.52–1.19) by age 75

Gitsels et al. *PLOSOne* 2016
doi: 10.1371/journal.pone.0166847
So...should we believe ‘real’ observational data or ‘true’ trial data?

**Randomised controlled trials:**
- Randomisation should remove confounding
- Accurate assessment of outcomes
- Highly selected trial participants, usually single condition, younger
- Short follow-up
- Baseline risk from control group
- Closed access to data

**Observational studies:**
- Longer follow up periods than the usual 3-5 years in trials
- Include data on the elderly and those with multiple conditions
- Generalisable to the general population
- Risk of unmeasured confounding including confounding by indication
Is there a problem with reasoning from the general to the particular?

• **Yes** – for doctors and their individual patients

• **No** – for population science
Do NICE guidelines need revising?

• Should reflect greater uncertainty about risks and benefits at low risk level coming from observational population data

• ‘Real progress will have been made when the BBC Today programme discusses the proportion of people who have made an informed decision about taking statins, rather than how many are failing to comply with expert advice’
Access to medical interventions

• Statins just one example

• Benefits (and risks…) from different interventions may be cumulative

• Context is substantial variation in heart disease rates nationally

• Receipt of interventions also varies
Life expectancy at birth, by sex, and fit of expected value based on SDI, 1970–2016
Ischaemic heart disease DALYs 2016
English local authorities

3-fold variation
Years of Life Lost to CVD, English local authorities 2016

Cerebrovascular disease age standardised rates

- 0.00211 - 0.00361
- 0.00362 - 0.00412
- 0.00413 - 0.00475
- 0.00476 - 0.00517
- 0.00518 - 0.00761

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Wealth is health
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