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# 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

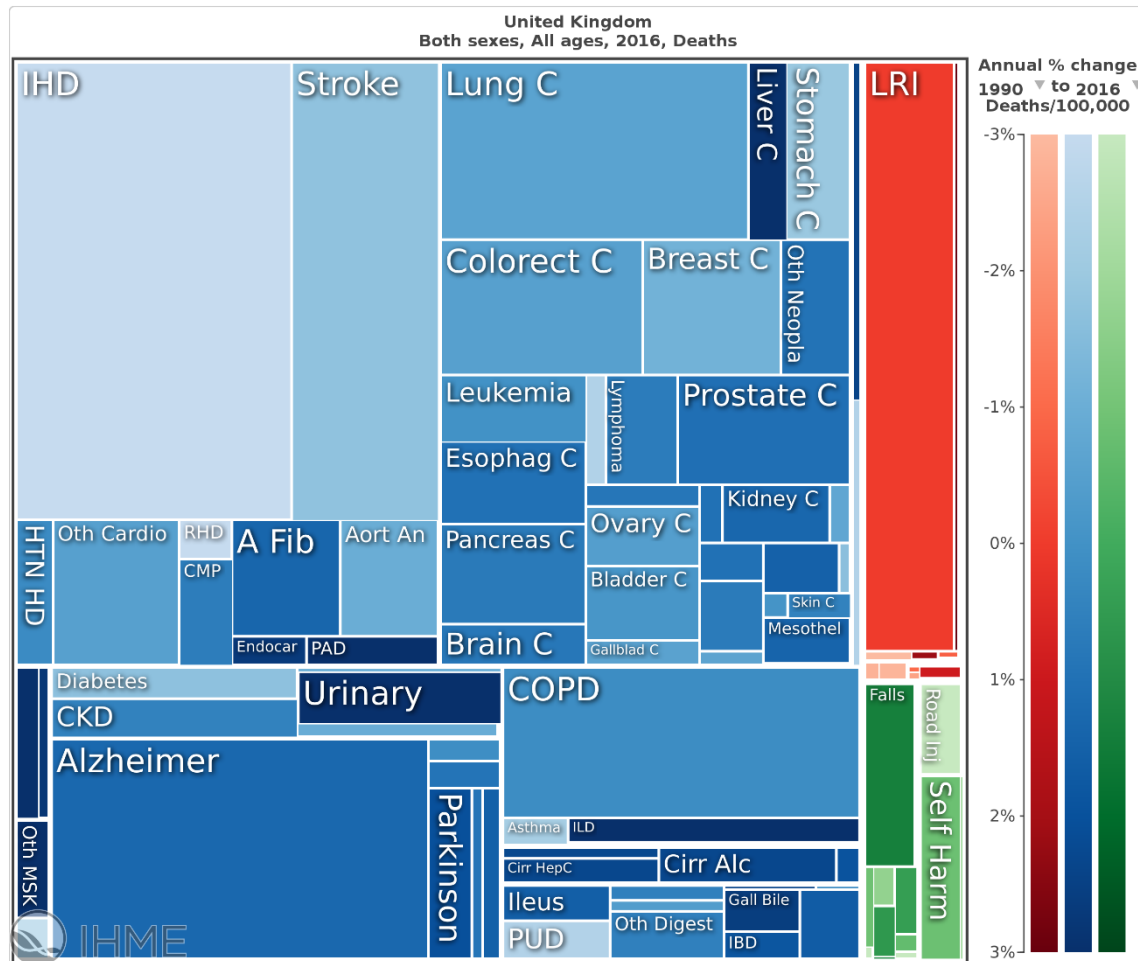


# The goal of the workshop

- ‘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/>



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# 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>



# 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.’



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# NICE guidance on statins for prevention of CVD

**NICE** National Institute for  
Health and Care Excellence



Cardiovascular disease: risk assessment  
and reduction, including lipid  
modification

Clinical guideline  
Published: 18 July 2014  
[nice.org.uk/guidance/cg181](https://www.nice.org.uk/guidance/cg181)

- ‘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

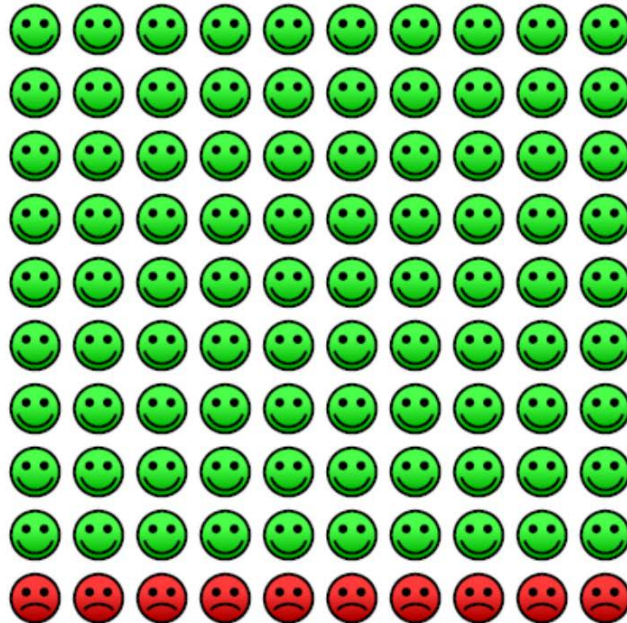


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# 10% risk of CVD without treatment

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).

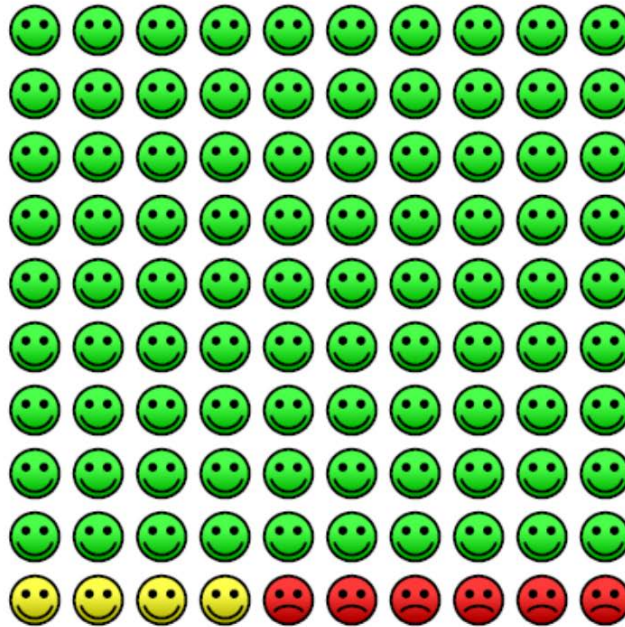
<https://www.nice.org.uk/guidance/cg181/resources/patient-decision-aid-pdf-243780159>



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# 10% risk of CVD with atorvastatin

Cardiovascular risk 10% over 10 years: taking atorvastatin



If all 100 people take atorvastatin for 10 years, over that time on average:

- 4 people will be saved from developing CHD or having a stroke (the yellow faces)
- 90 people will not develop CHD or have a stroke, but would not have done anyway (the green faces)
- 6 people will still develop CHD or have a stroke (the red faces).

<https://www.nice.org.uk/guidance/cg181/resources/patient-decision-aid-pdf-243780159>

Cholesterol Treatment Trialists' (CTT) Collaborators. Lancet. 2012; 380: 581–590



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# Our findings from observational data



## RESEARCH ARTICLE

### Survival Benefits of Statins for Primary Prevention: A Cohort Study

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## Abstract

### Objectives

Estimate the effect of statin prescription on mortality in the population of England and Wales with no previous history of cardiovascular disease.

### Methods

Primary care records from The Health Improvement Network 1987–2011 were used. Four cohorts of participants aged 60, 65, 70, or 75 years at baseline included 118,700, 199,574, 247,149, and 194,085 participants; and 1.4, 1.9, 1.8, and 1.1 million person-years of data, respectively. The outcome was cardiovascular mortality at any time before the participant

- 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

## OPEN ACCESS

**Citation:** Gitsels LA, Kulinskaya E, Steel N (2016) Survival Benefits of Statins for Primary Prevention: A Cohort Study. *PLoS ONE* 11(11): e0166847. doi:10.1371/journal.pone.0166847

**Editor:** James M. Wright, University of British

Gitsels et al. *PLoSOne* 2016  
doi: 10.1371/journal.pone.0166847



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# 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?

## Editorials

### Prescribing statins in general practice:

who decides?

GPs have been debating the pros and cons of statins for different patients since the 4S trial back in 1994 first showed that statins could reduce mortality from strokes and heart attacks in those with existing cardiovascular disease.<sup>1</sup> The whole country seemed to be debating them in September 2016, with Rory Collins explaining on BBC Radio 4's *Today* programme that the benefits were '100 times the harms'. Collins had led a new review of the statins trials which concluded that the evidence strongly supported the benefits of statins and showed very modest risks. The review argued that 'exaggerated claims about side effects' often based on

*"... even if new evidence fills all the evidence gaps at population level, there will always be huge uncertainties for the individual patient."*

Services Task Force's (USPSTF) recent guidance on statin therapy recommended 'initiating use of low- to moderate-dose statins in adults aged 40 to 75 years without a history of CVD who have 1 or more CVD risk factors (dyslipidemia, diabetes, hypertension, or smoking) and a calculated

huge populations of China, India, and Brazil, where there have been few statins trials.

#### EXPERTS' CONFLICT OF INTEREST

The controversy is about science, but also about conflicts of interest and transparency, as the science about statins has been

- **Yes** – for doctors and their individual patients
- **No** – for population science

Steel et al. *British Journal of General Practice* 2017  
doi: 10.3399/bjgp17X690953



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# 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’



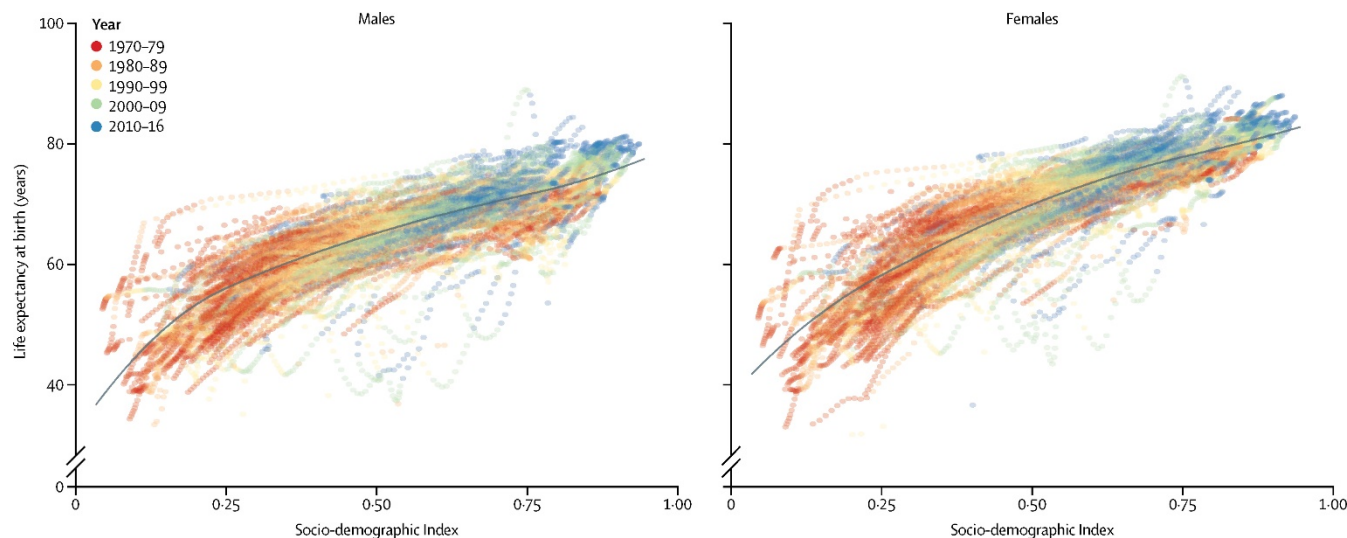
# Access to medical interventions

- 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



*The Lancet* 2017 390, 1084-1150 DOI: (10.1016/S0140-6736(17)31833-0)

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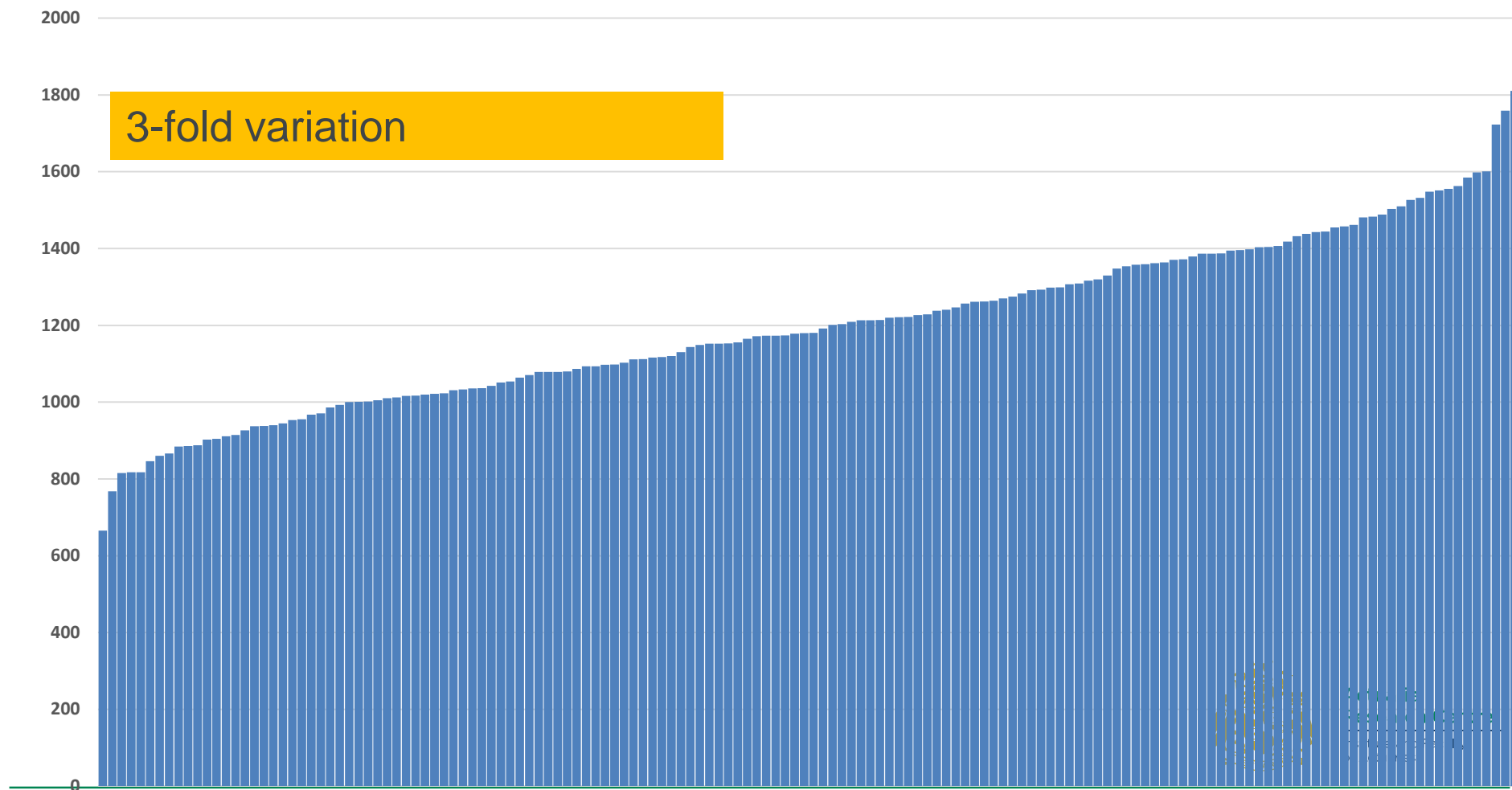


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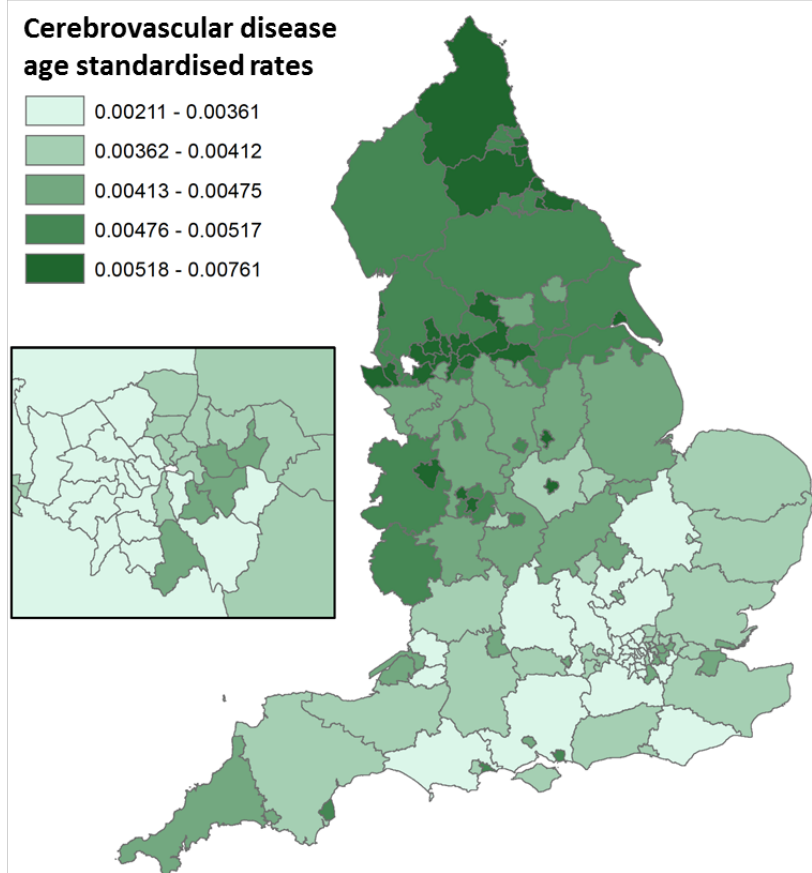


# Ischaemic heart disease DALYs 2016

## English local authorities



# Years of Life Lost to CVD, English local authorities 2016



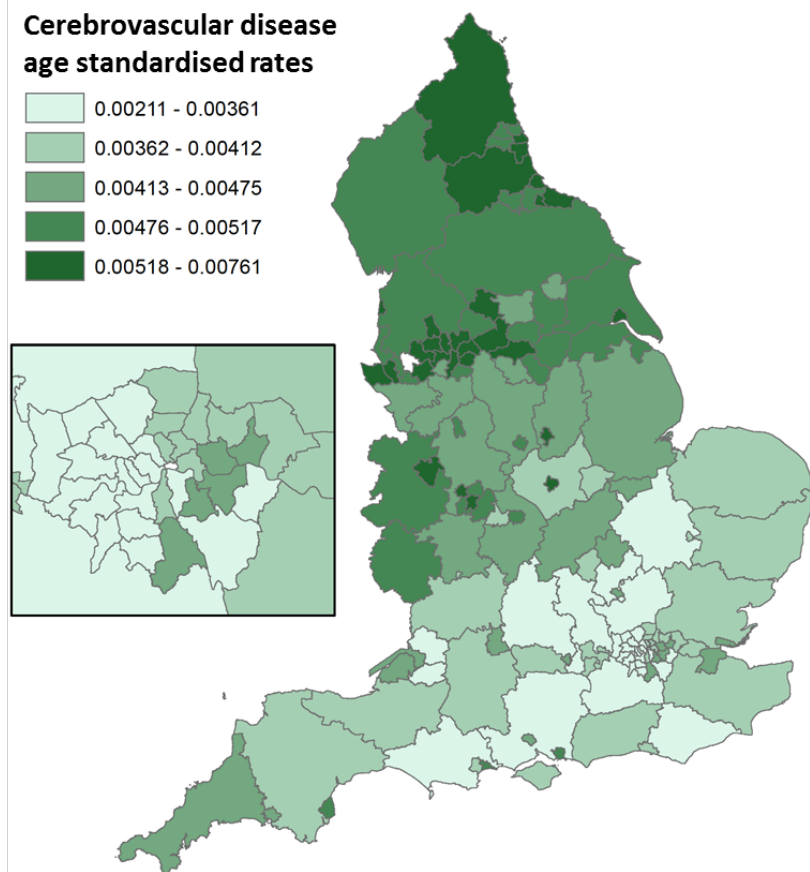
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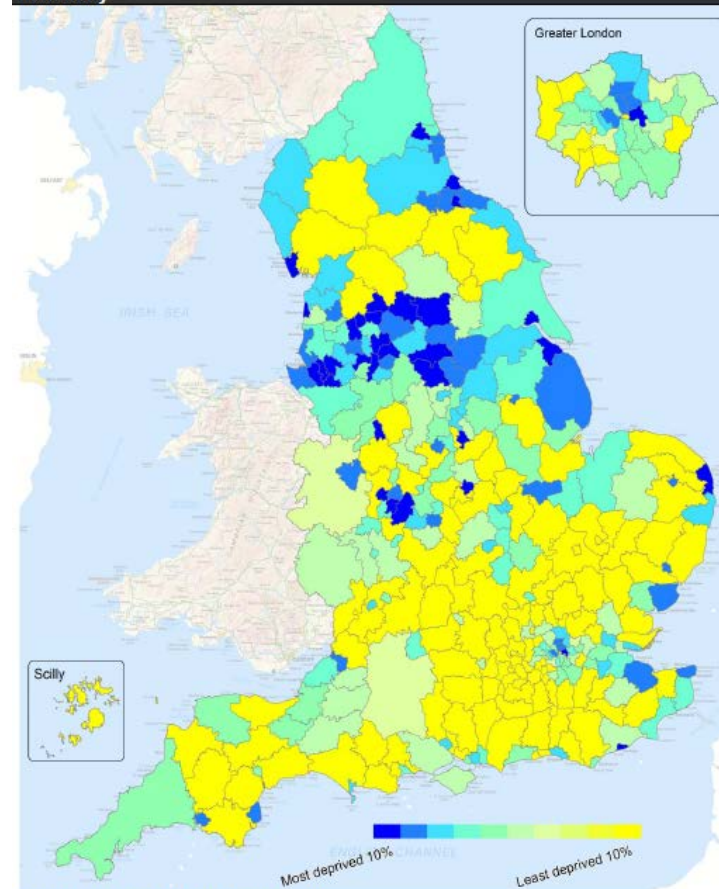
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# Wealth is health



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**Map 2: The Index of Multiple Deprivation 2015 among local authority districts based on the proportion of their neighbourhoods in the most deprived decile nationally**



Contains OS data © Crown copyright (2015)

*Note: there are 127 districts with no neighbourhoods in the most deprived decile nationally. These are shown in the least deprived decile.*

# Questions

# Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.