

# Trends in health in the UK: implications for the NHS.



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Gresham College 2021

Time and space tell us a lot about what is likely, and what is possible, in health in the future.

- A previous lecture covered geographical variation in health.
- This one covers variation over time.
- Trends in health can be remarkably stable.



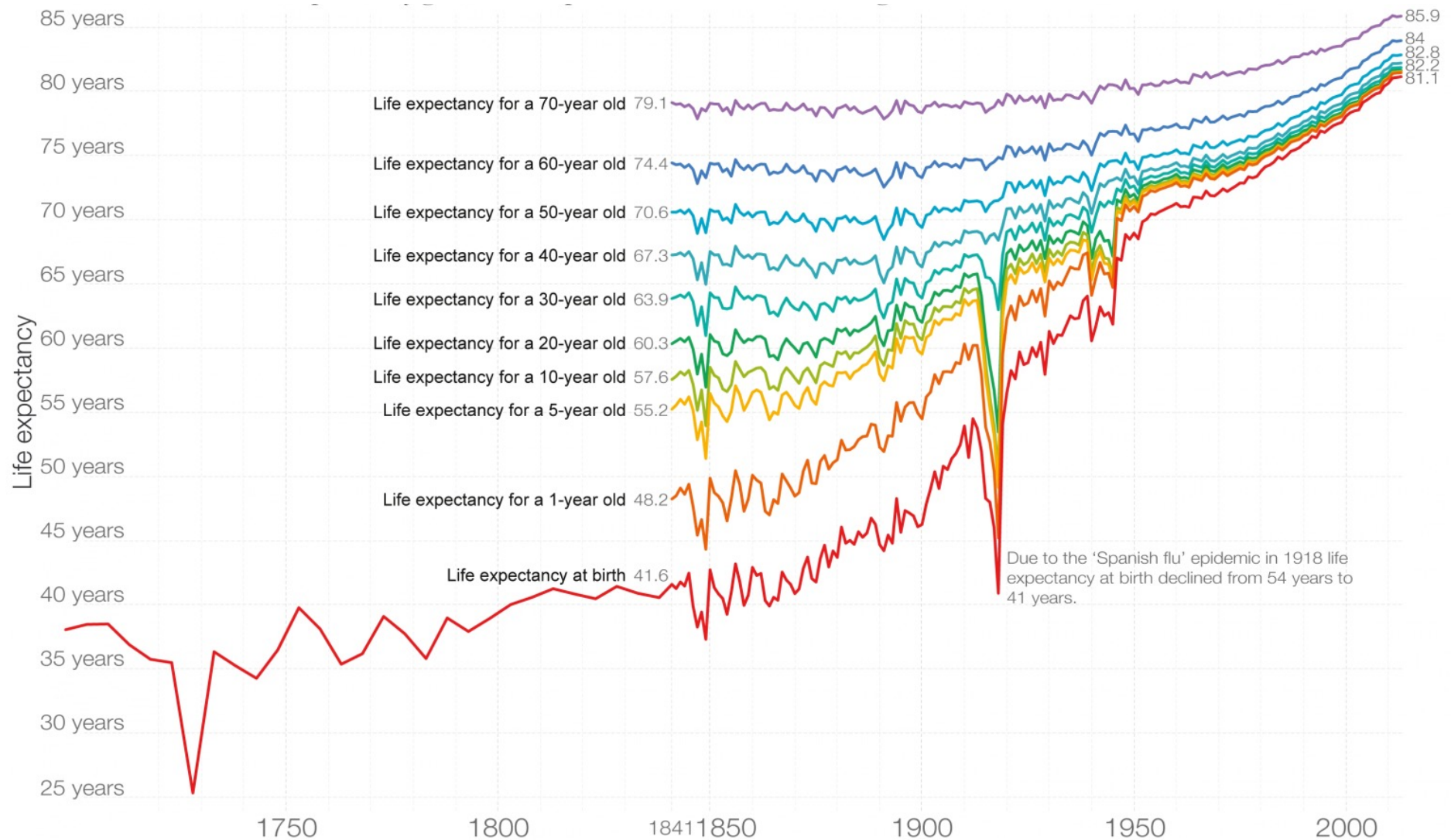
The last 170 years have been the most transformational for health in human history. This is continuing.



England/UK life expectancy since 1600. (*Our World in Data*)

# Life expectancy by age England and Wales since 1700.

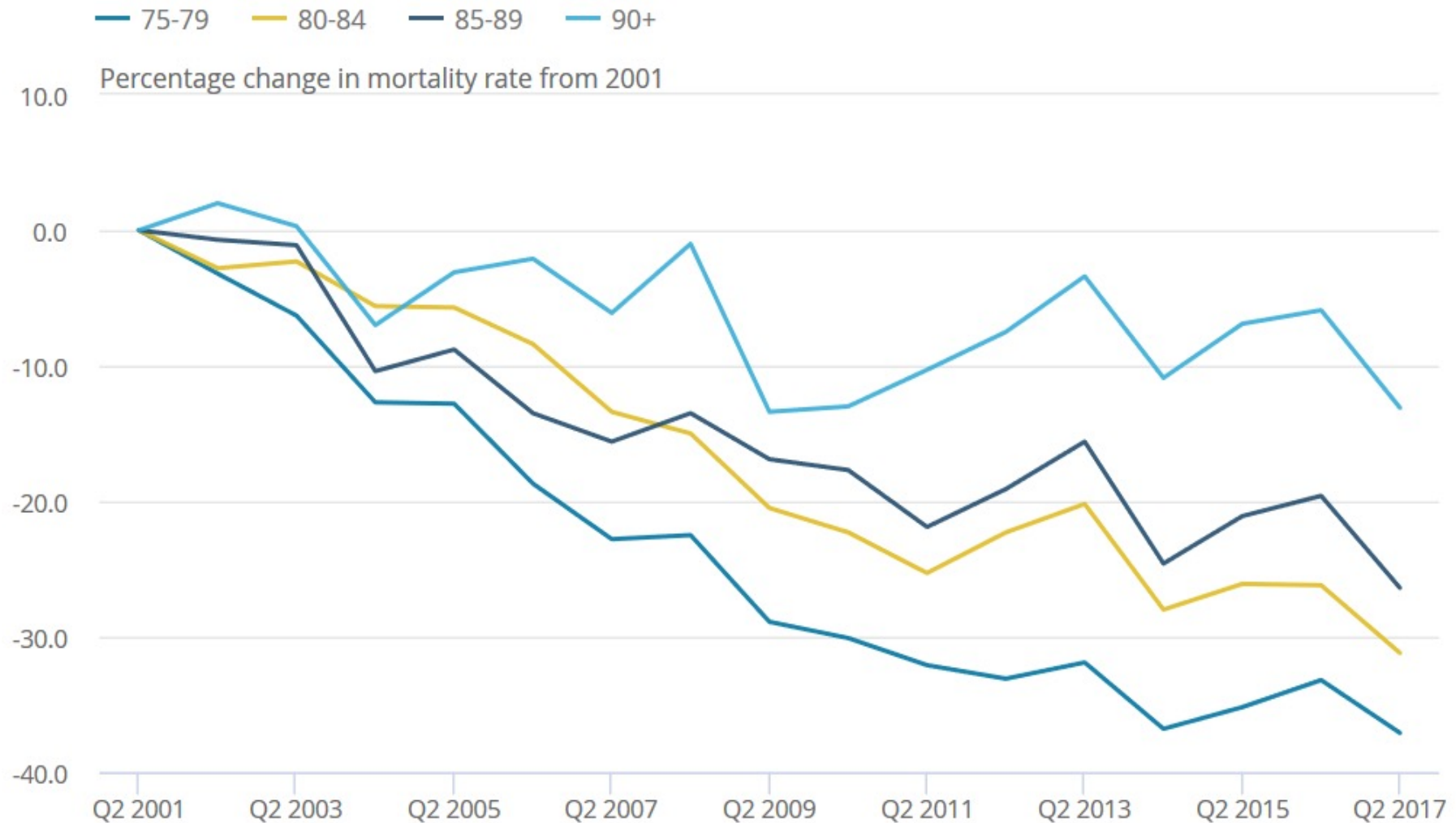
## Increasingly concentrated. (Our World in Data / M Roser 2020.)





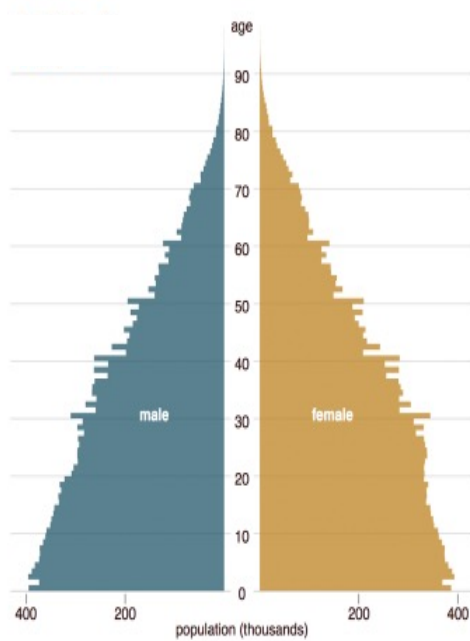
# Change in mortality 2001-2017 by age group.

90+, 85-89, 80-84, 75-79. (ONS)

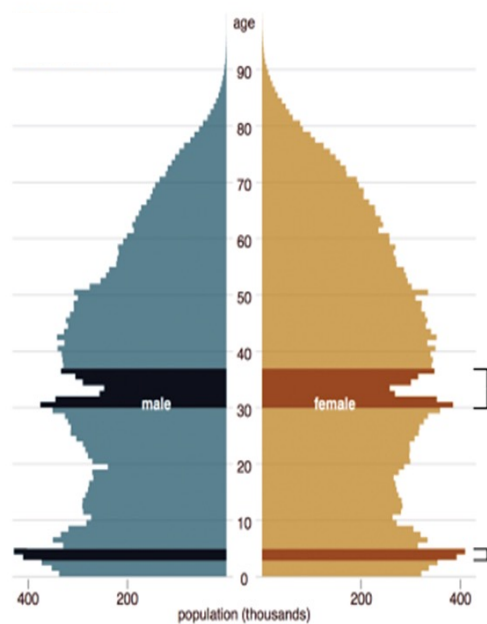


# Demographic pyramid for the UK over the last 100 years. *(ONS)*

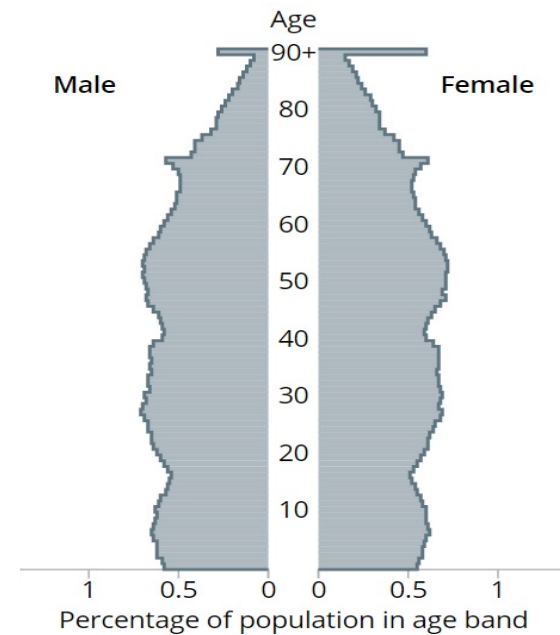
1911



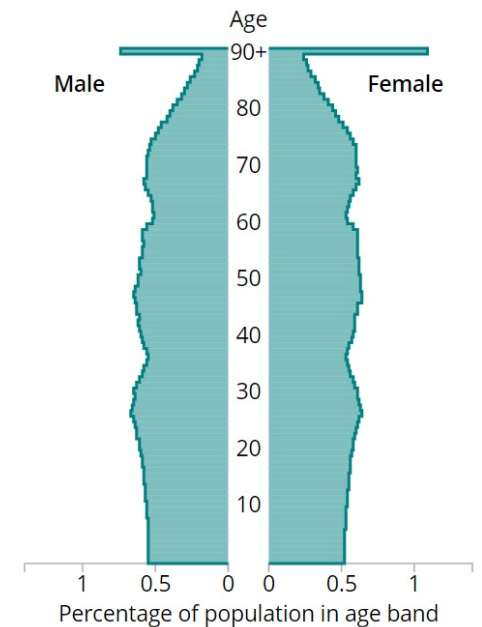
1950



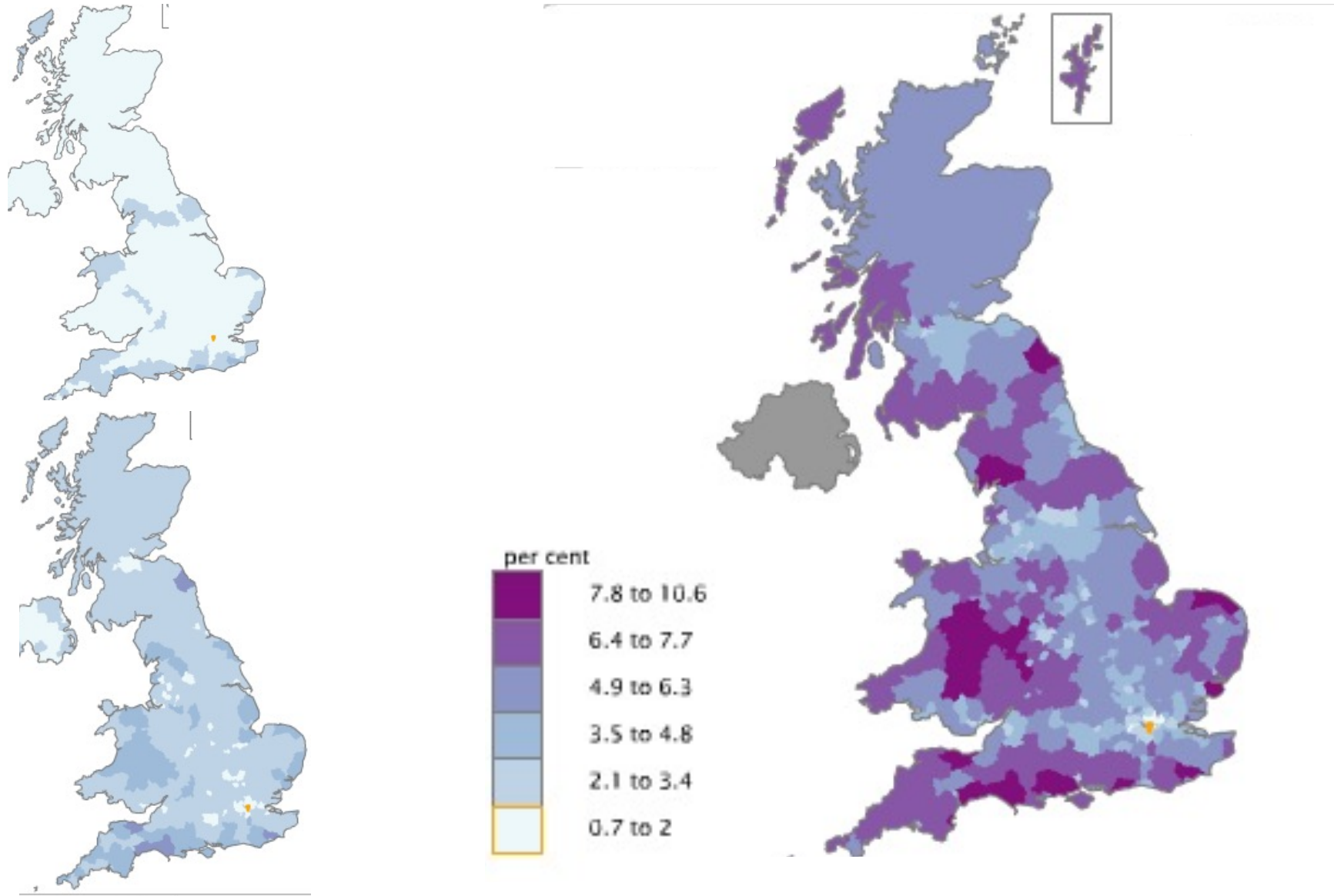
2018



2038



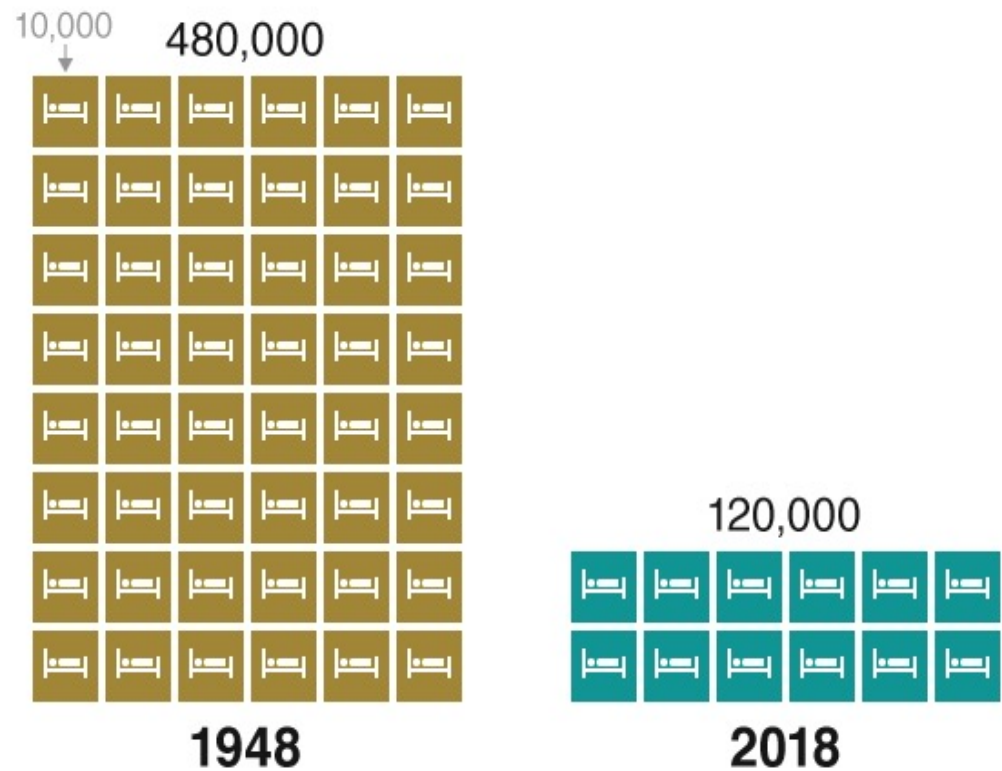
# Population 85 and over: 1992, 2015, 2033. (ONS)



# Changes in doctors, nurses, beds over the first 70 years of the NHS.

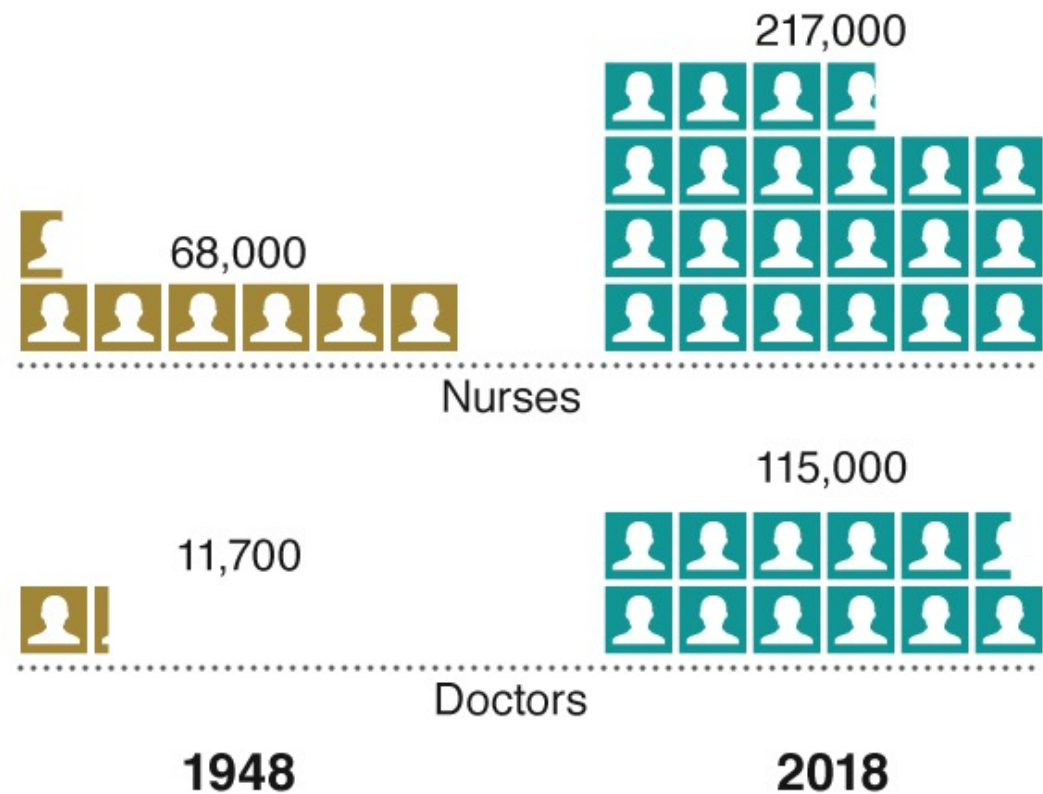
(BBC infographic)

## Hospital beds in England and Wales



## Hospital doctors and nurses

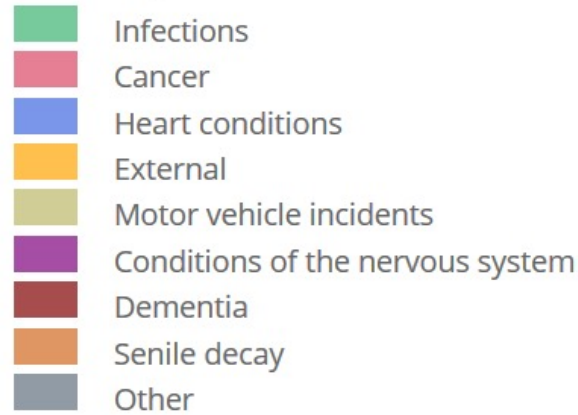
Full time employees in England and Wales



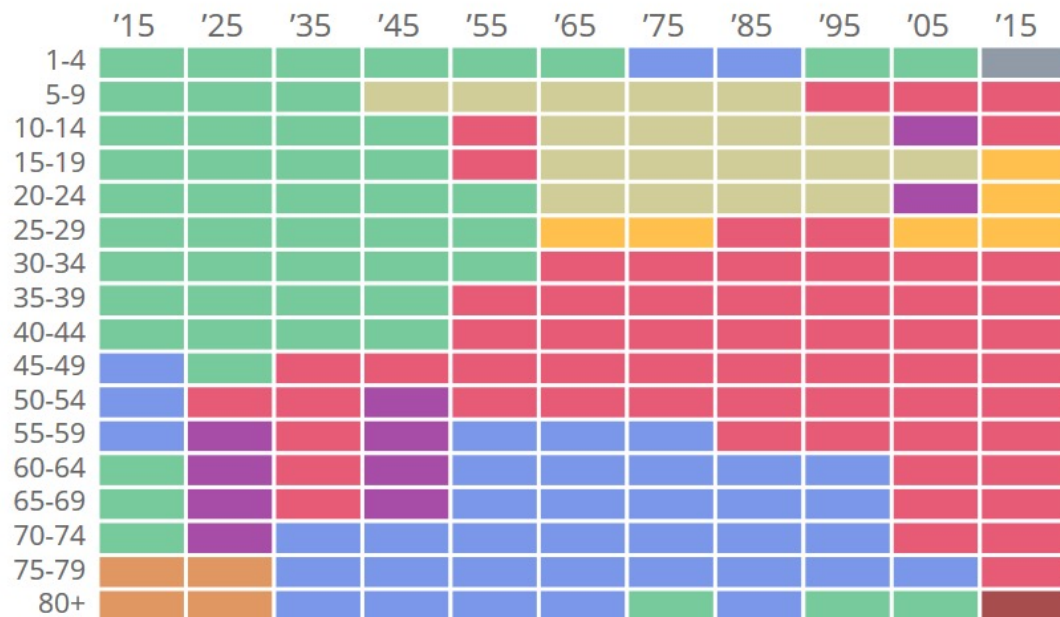


# Principle cause of mortality over the last 100 years by age.

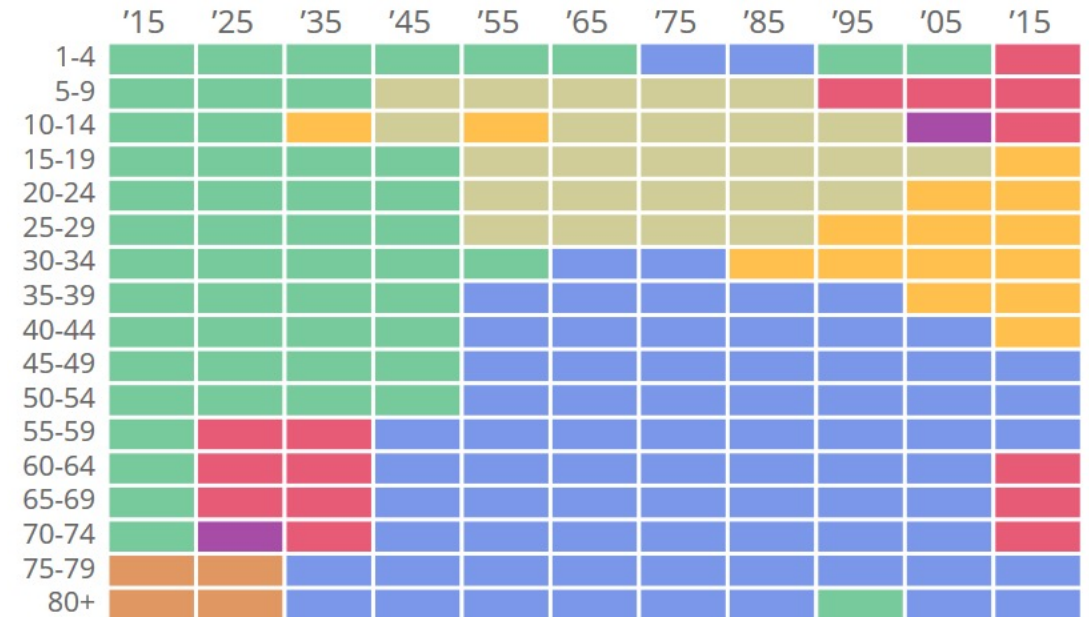
Infection, cancer, heart disease. (BBC)



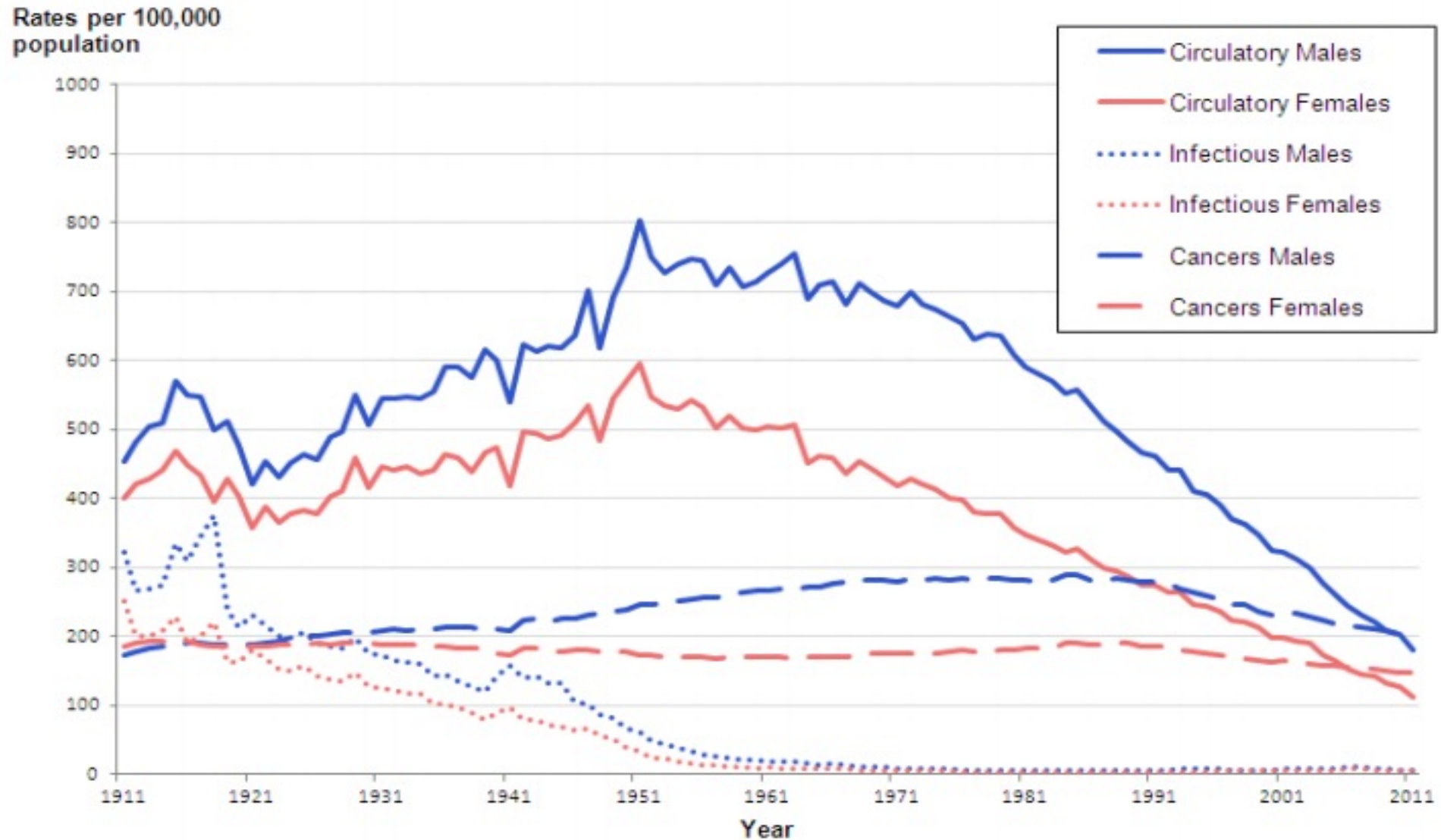
Female



Male



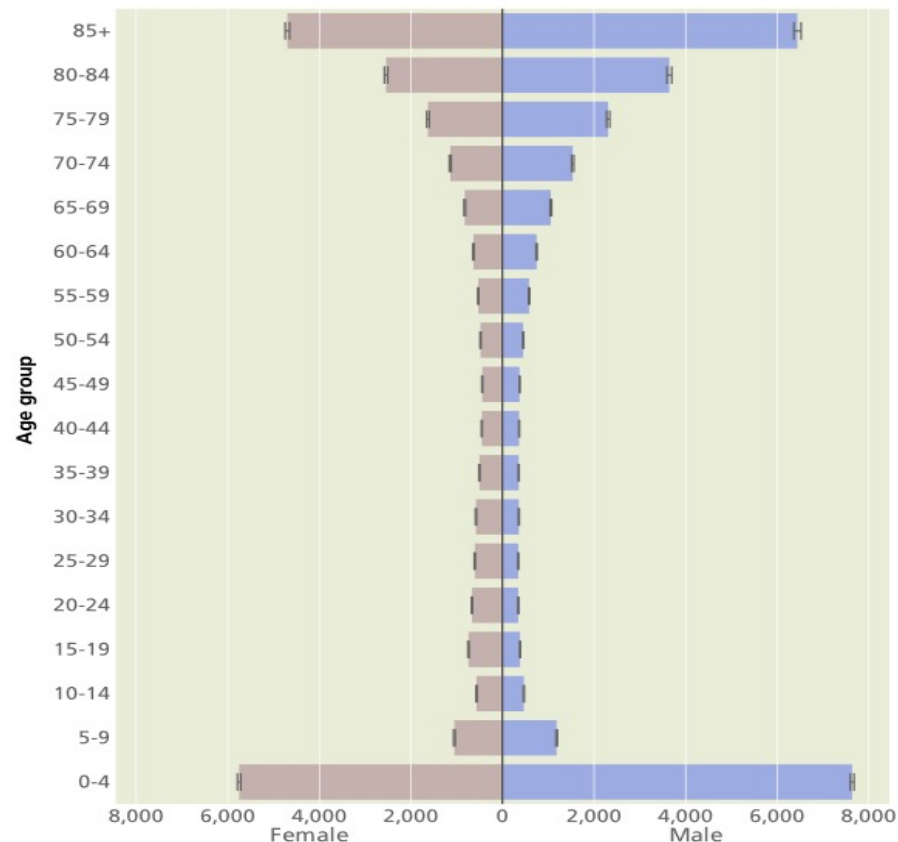
# Age-standardised mortality rates England and Wales. (ONS)



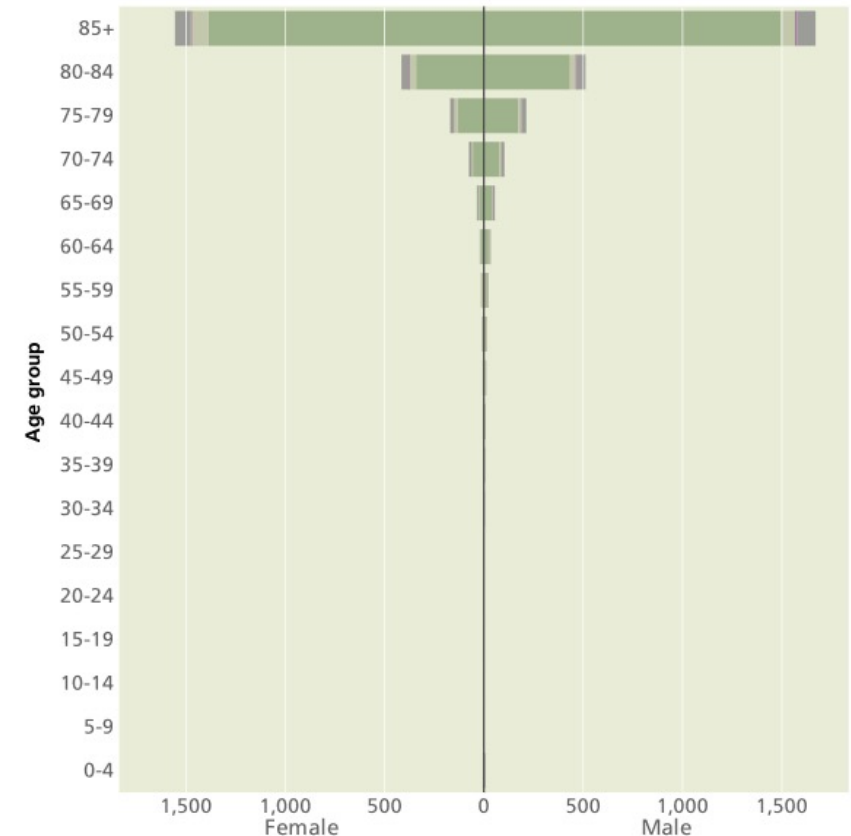
Infectious diseases retain their ability to kill. In the UK now mainly older people. Science has been repeatedly effective against infections.

*(England data, CMO Report)*

Hospital **admissions** for infections by age, /100,000- pre COVID.



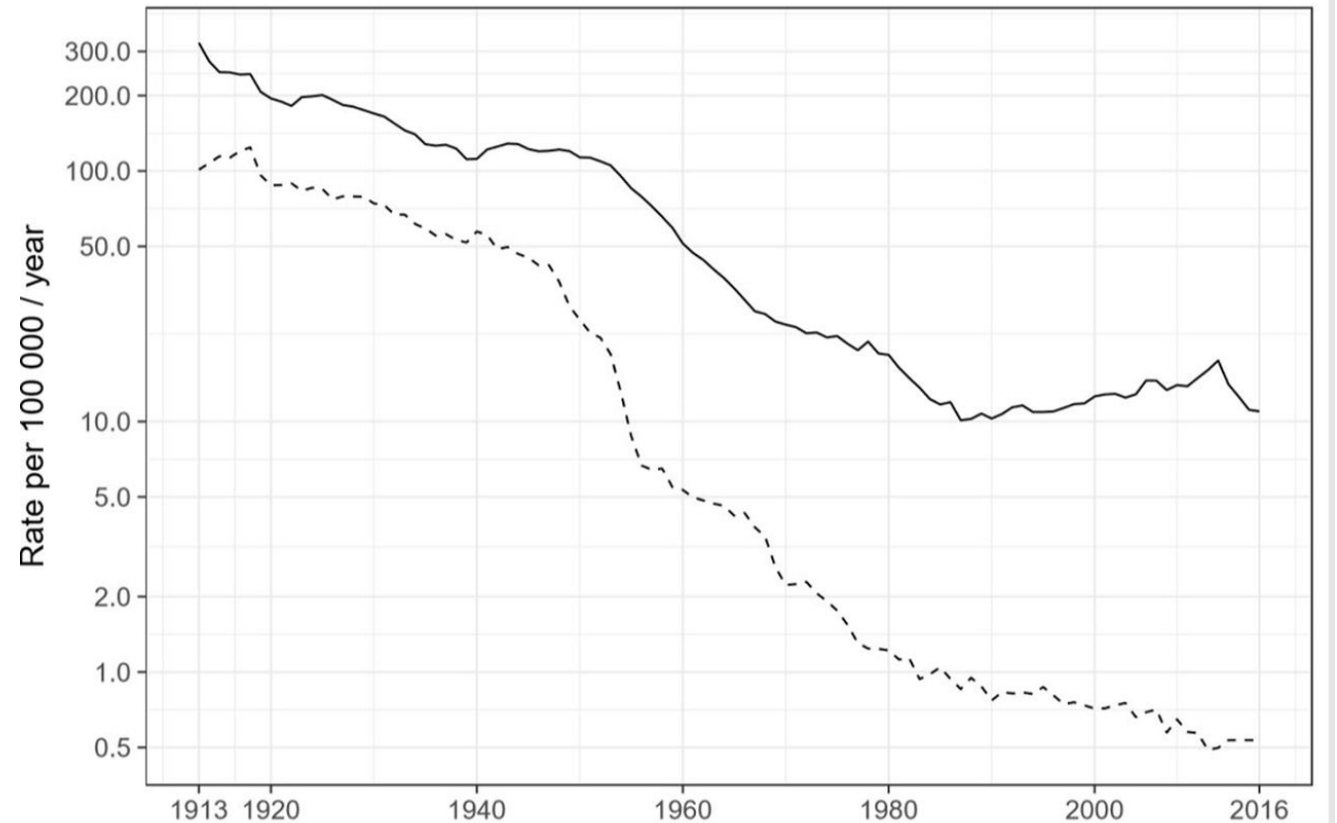
Average annual **mortality** from infections by age, /100,000- pre COVID.



# Viruses, bacteria, fungi, parasites.

Include:

- Sanitation.
- Better diet and housing.
- Antisepsis.
- Vaccination.
- Antibiotics.
- Antivirals.
- Social interventions.



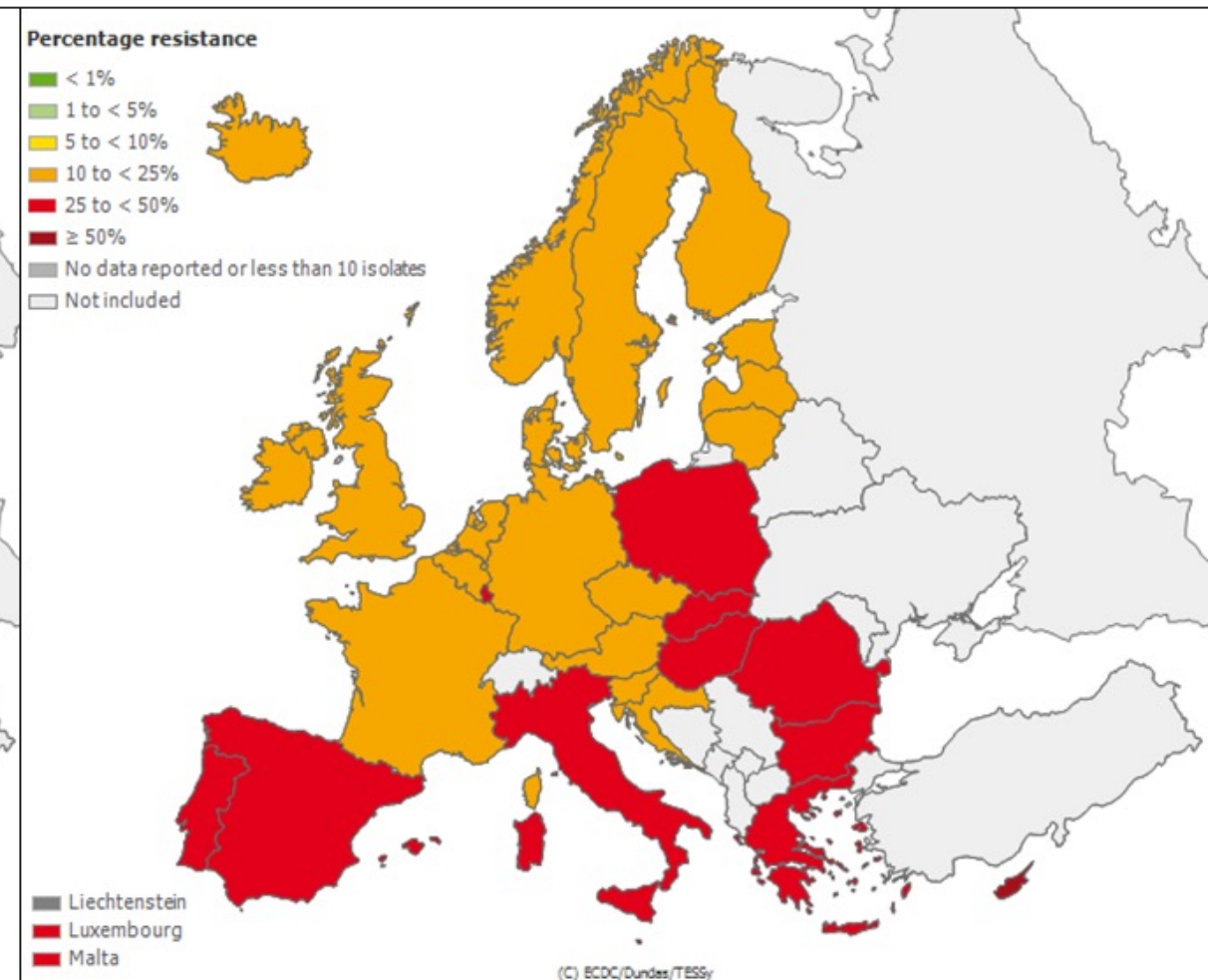
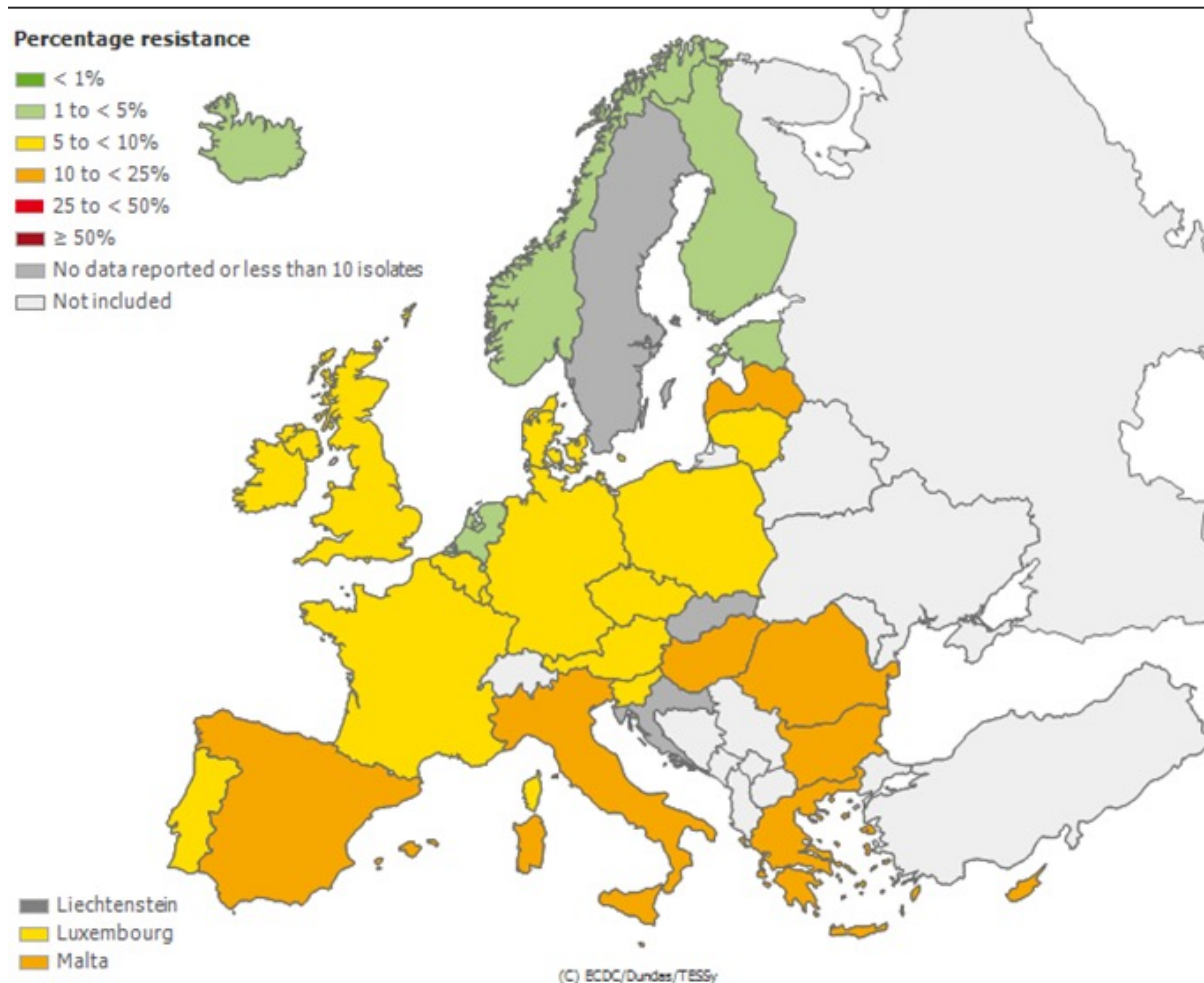
Tuberculosis since 1913. Solid- cases. Dashed- mortality. Glaziou et al 2018.



# Antimicrobial resistance increasing over time.

## Example: change of E. coli resistant to cephalosporins over 4 years.

(ECDC 2009-2013)

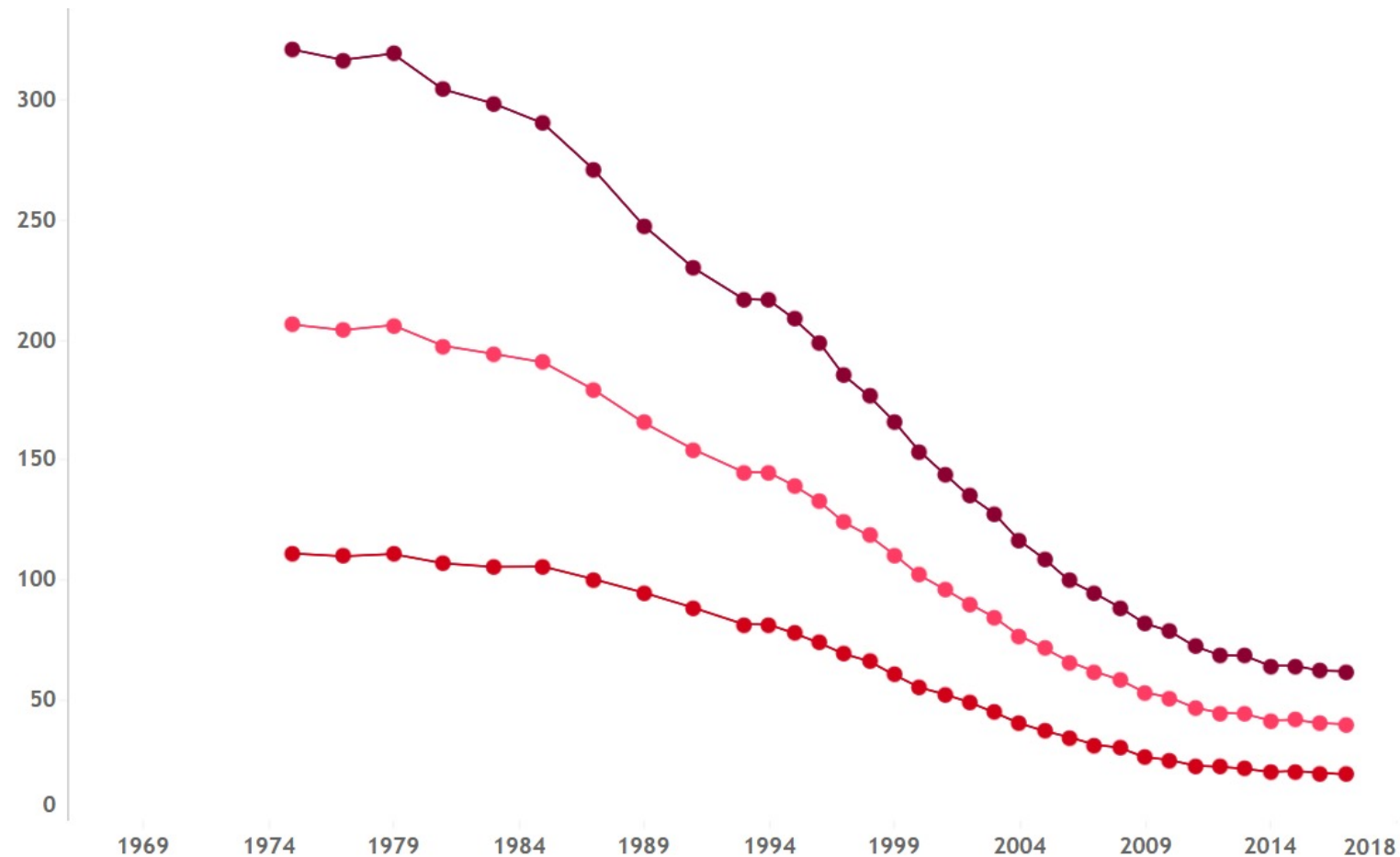


# Age-standardised coronary heart disease mortality rates, UK 1975-2018. **Male, female, overall**. Around 73% reduction. (BHF 2021)



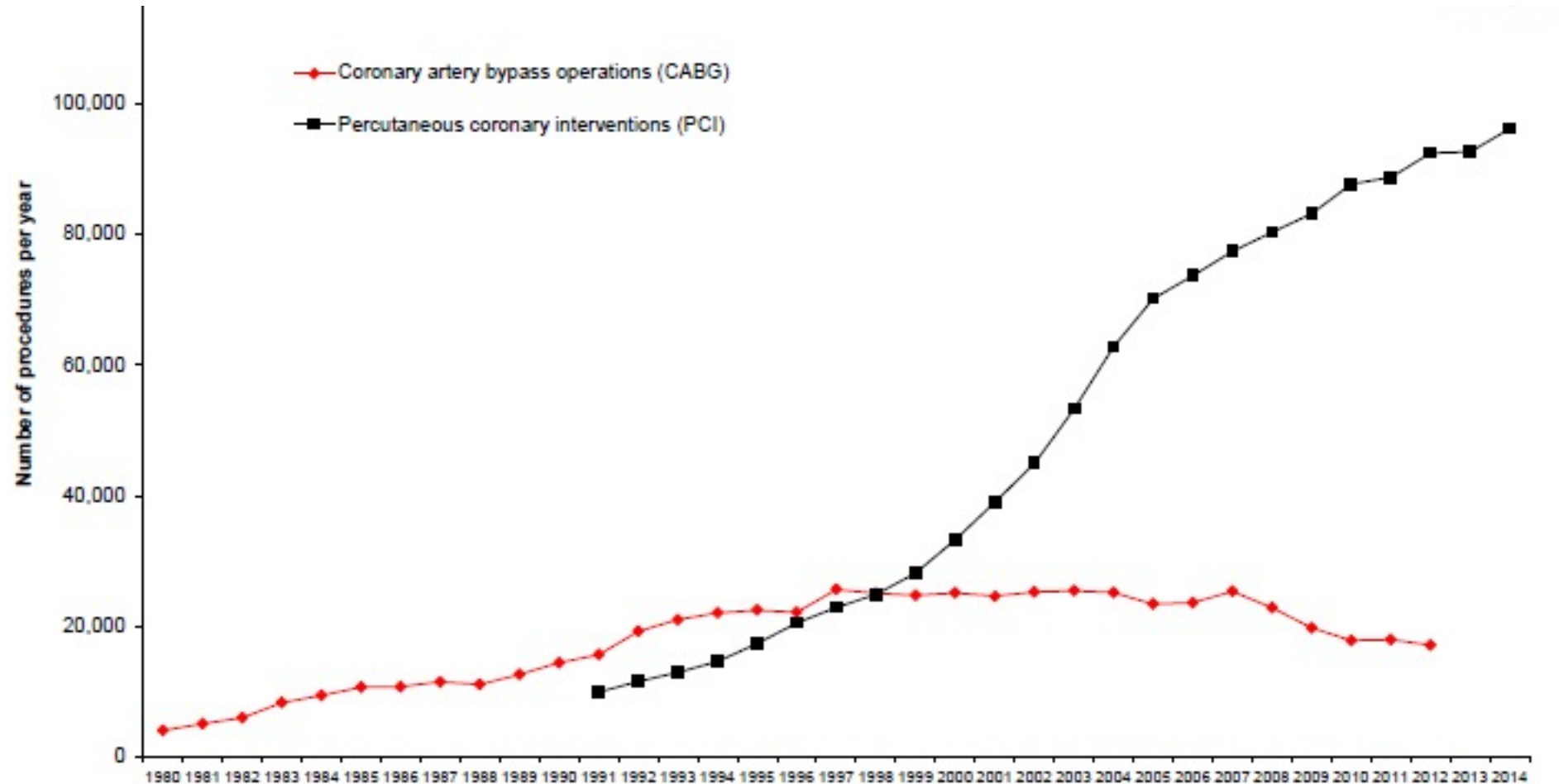
Under 75 year old age-standardised coronary heart disease mortality, UK 1975-2018: 206 to 36/100k. Male, female, overall.

(BHF 2021)



# Coronary artery bypass operations v angioplasty, UK since 1980.

(BHF 2021)





# Age-standardised mortality from stroke, 1969-2018, UK.

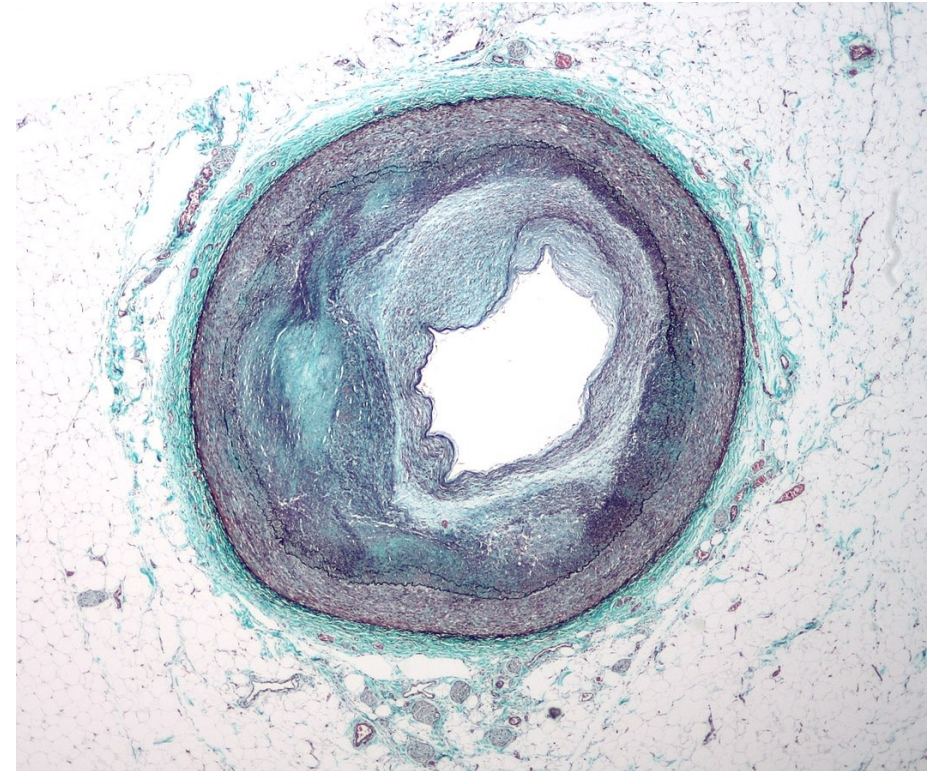
(BHF 2021)



The remarkable improvements in cardiovascular disease are made up of multiple modest advances stacked on top of one another.

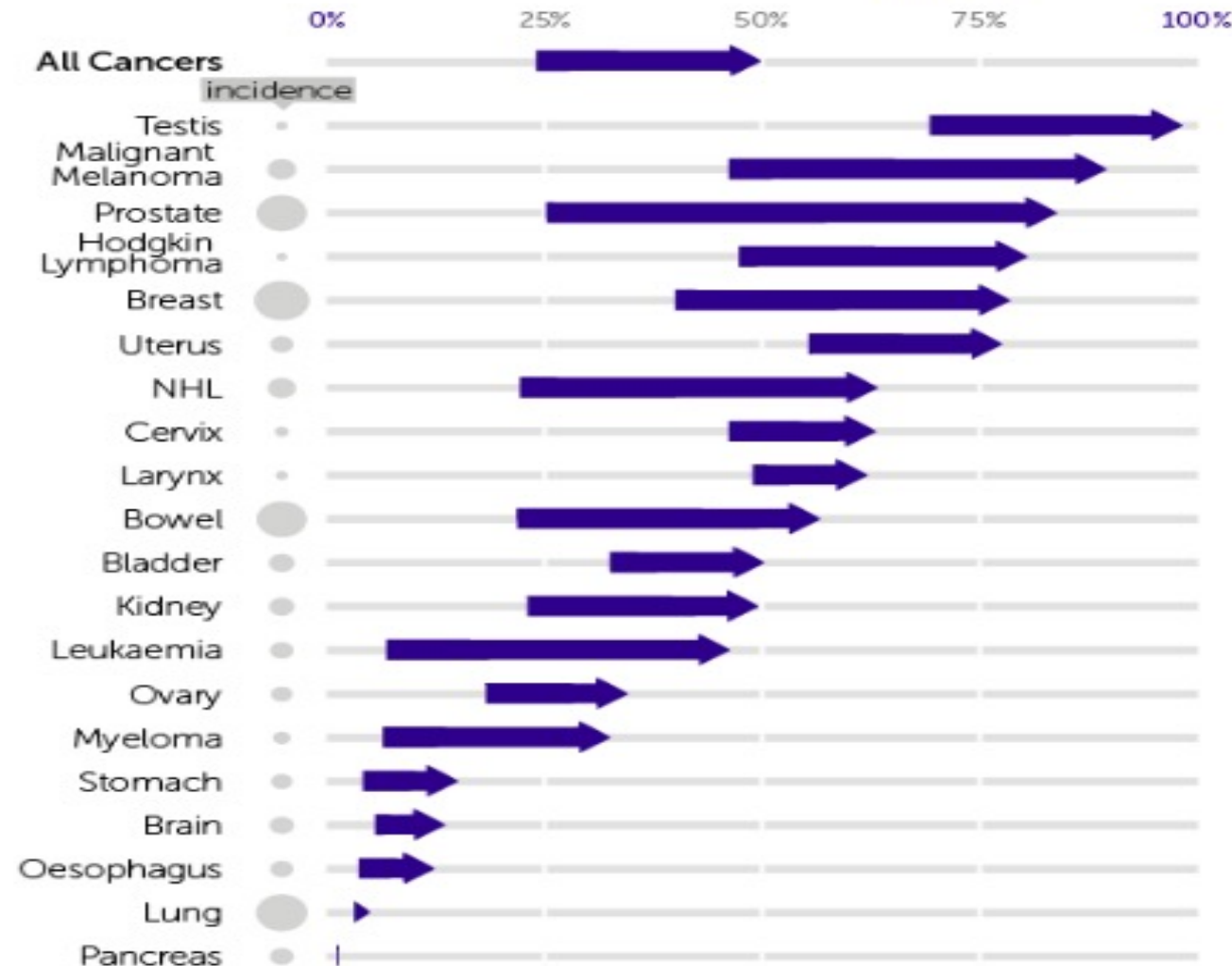
Include:

- Smoking reduction.
- Aspirin and anti-platelet agents.
- Statins for cholesterol.
- Hypertension reduction.
- Drugs for heart failure such as ACE inhibitors.
- Thrombolysis (clot-busting) drugs after some heart attacks and strokes.
- Angioplasty and surgery.

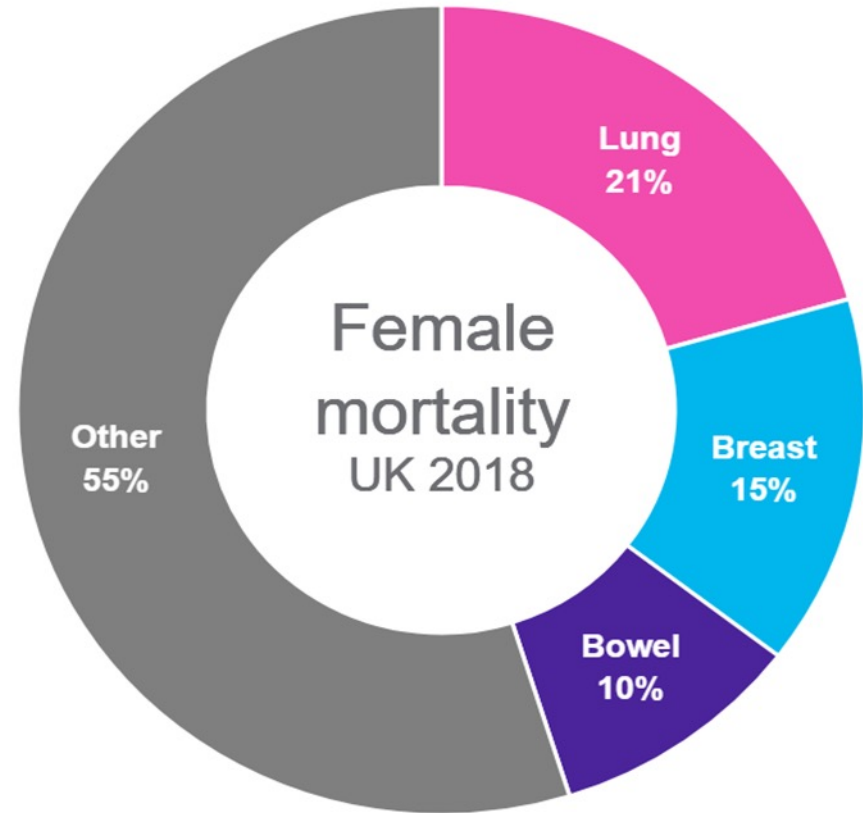
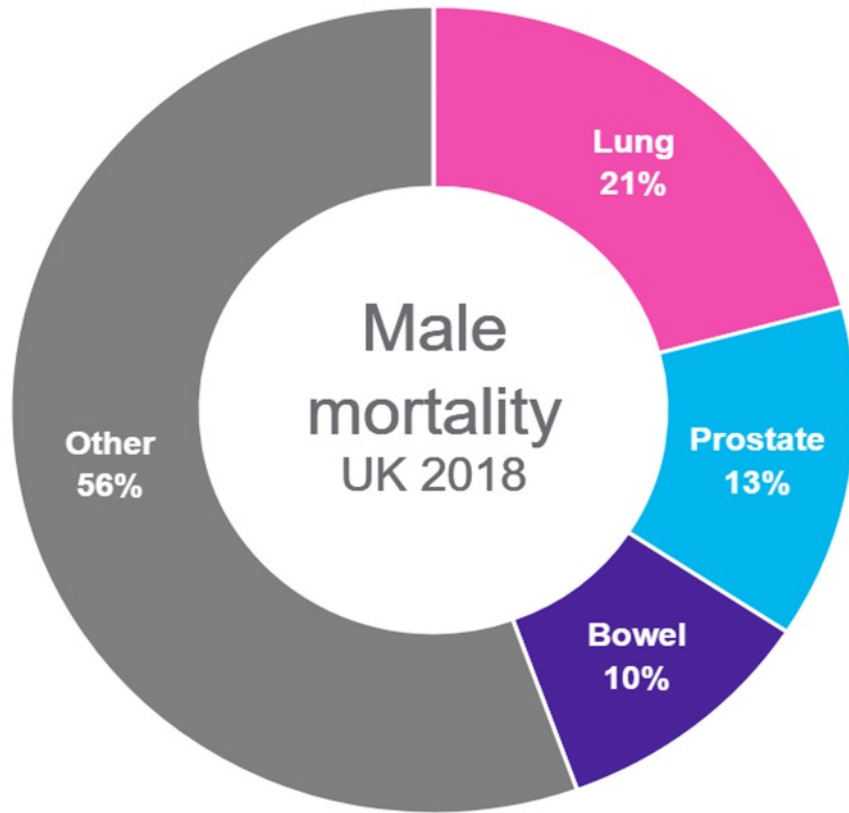


Atherosclerosis in a coronary artery. *Nephron*.

Changes in 10 year cancer survival 1971 to 2011.  
Most people will live 10 years or more from diagnosis. (CRUK)

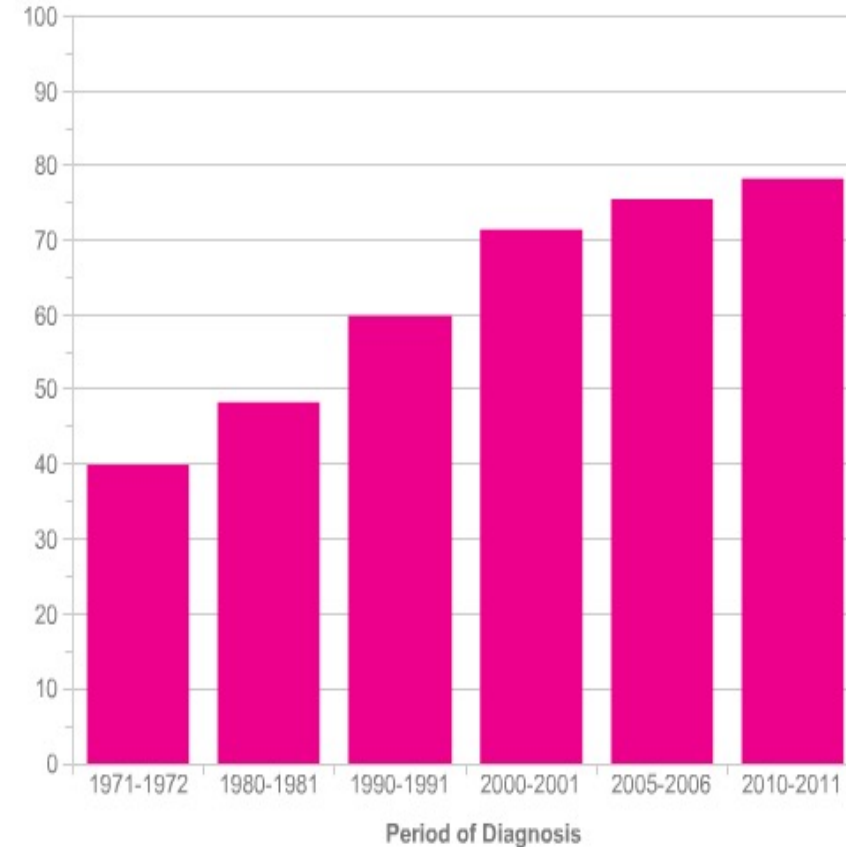
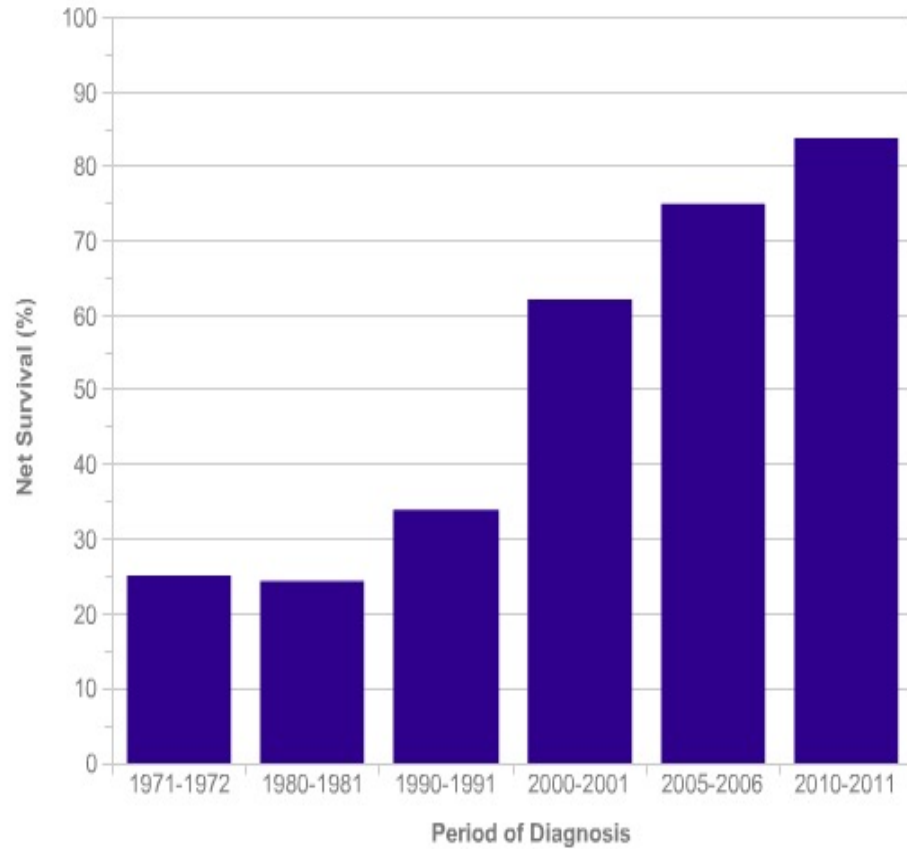


Lung, breast, prostate and bowel the most common causes of cancer mortality. (CRUK/ONS 2021)

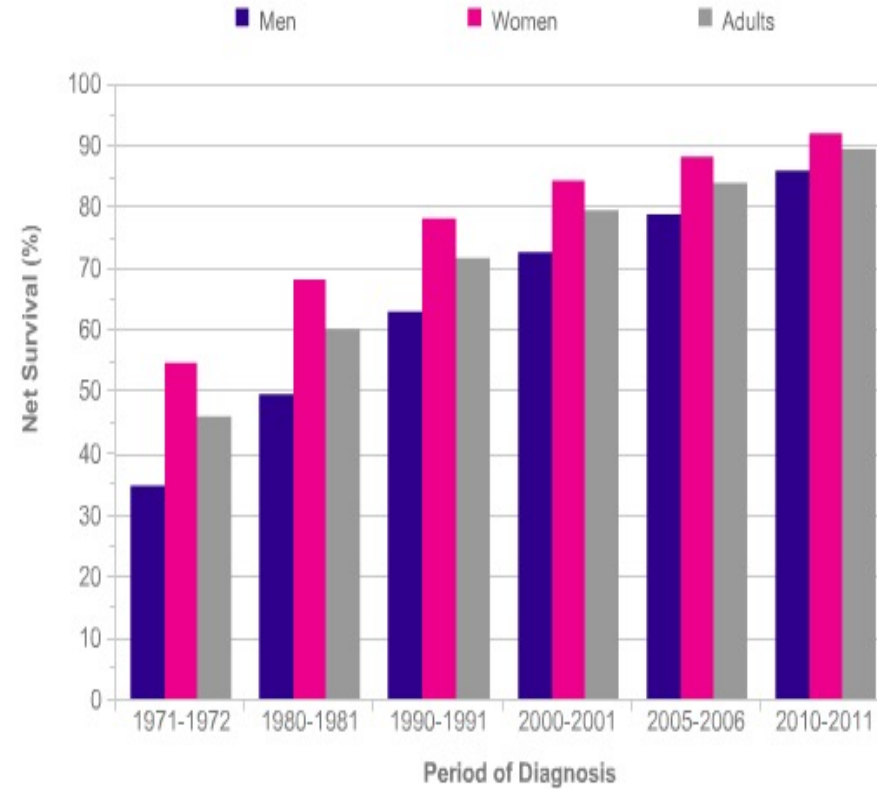
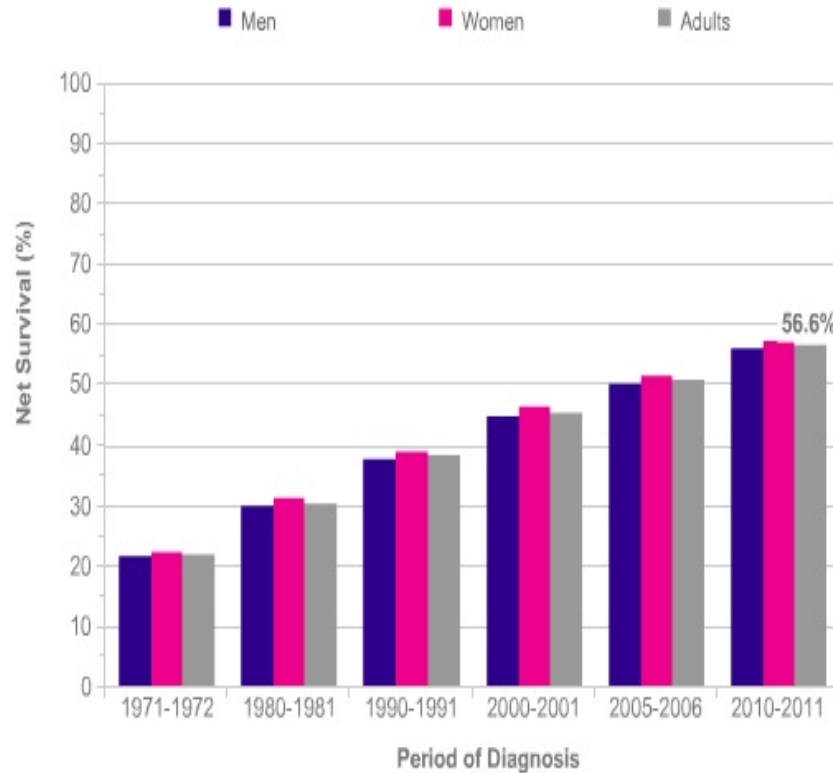




# 10 year cancer survival: prostate (L) breast (R) 1971 to 2011. (CRUK)

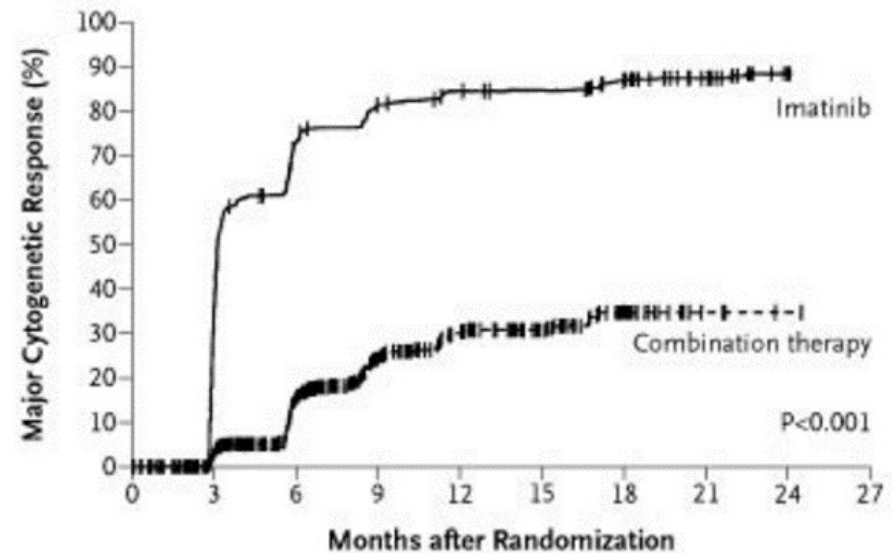


10 year survival: bowel cancer (L, 57%), melanoma (R, 90%). (CRUK)



The steady improvements in cancer prevention and treatment are continuing for most cancers.

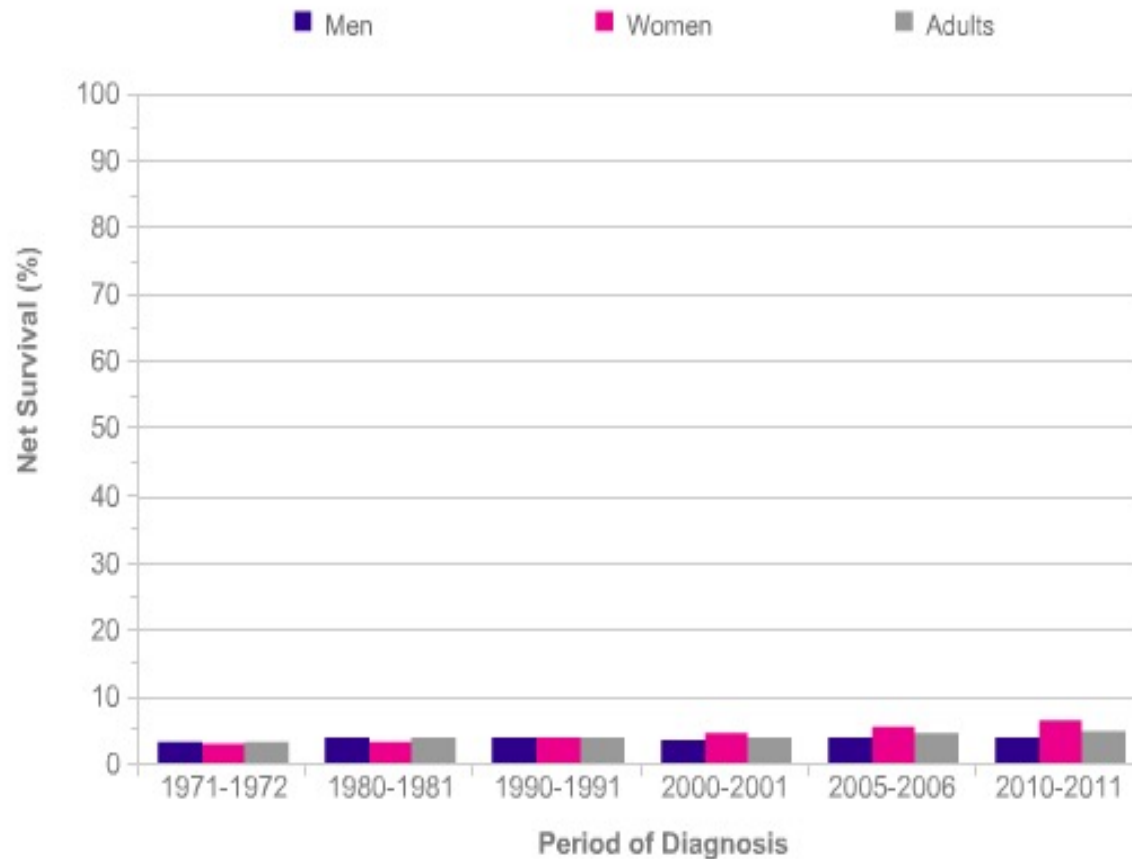
- Earlier diagnosis is key for most solid tumours.
- Surgery, chemotherapy, radiotherapy improving steadily.
- Targeted treatments, immunotherapy transforming some cancers.
- Prevention remains (much) better than cure.



Imatinib for chronic myeloid leukaemia. O'Brien et al NEJM.

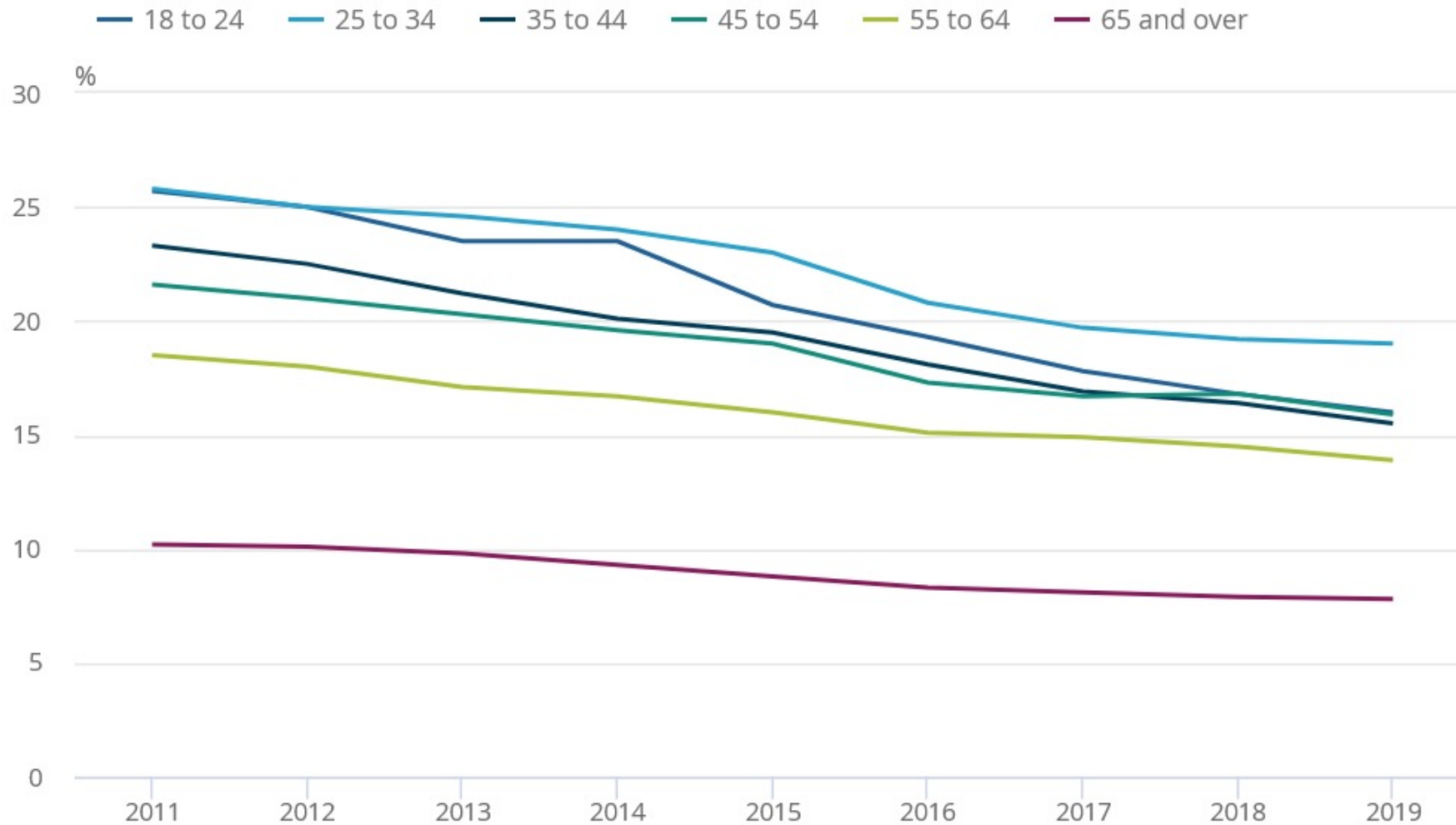
Lung cancer (R, 5%) 10 year survival. The UK's No1 killer from cancer, over 1:5. This cancer is almost entirely caused for profit.

(CRUK)



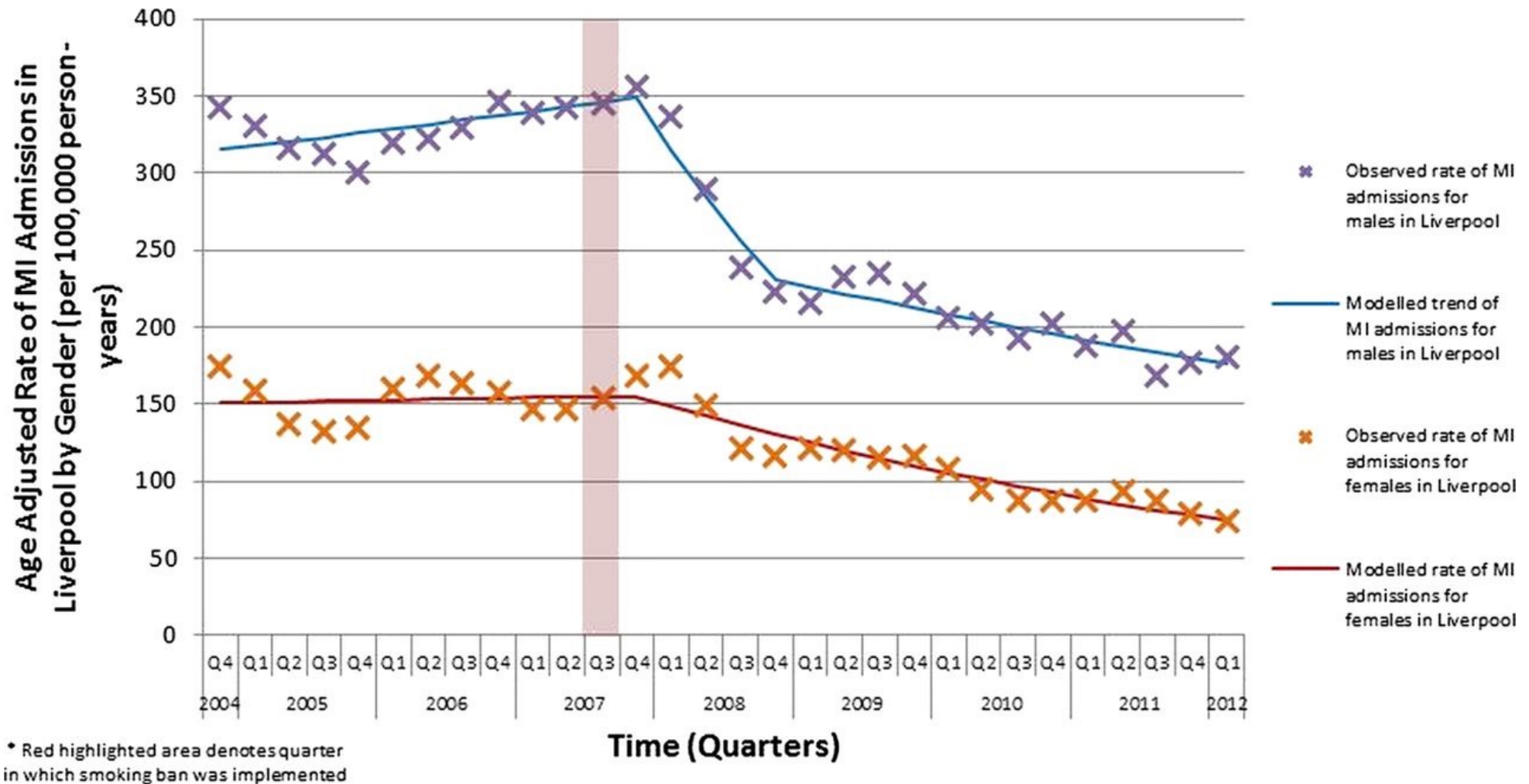
Vincent Van Gogh.

Over 90,000 deaths and 500,000 hospital admissions every year in the UK from smoking. Smoking rates declining (slowly). *(ONS)*



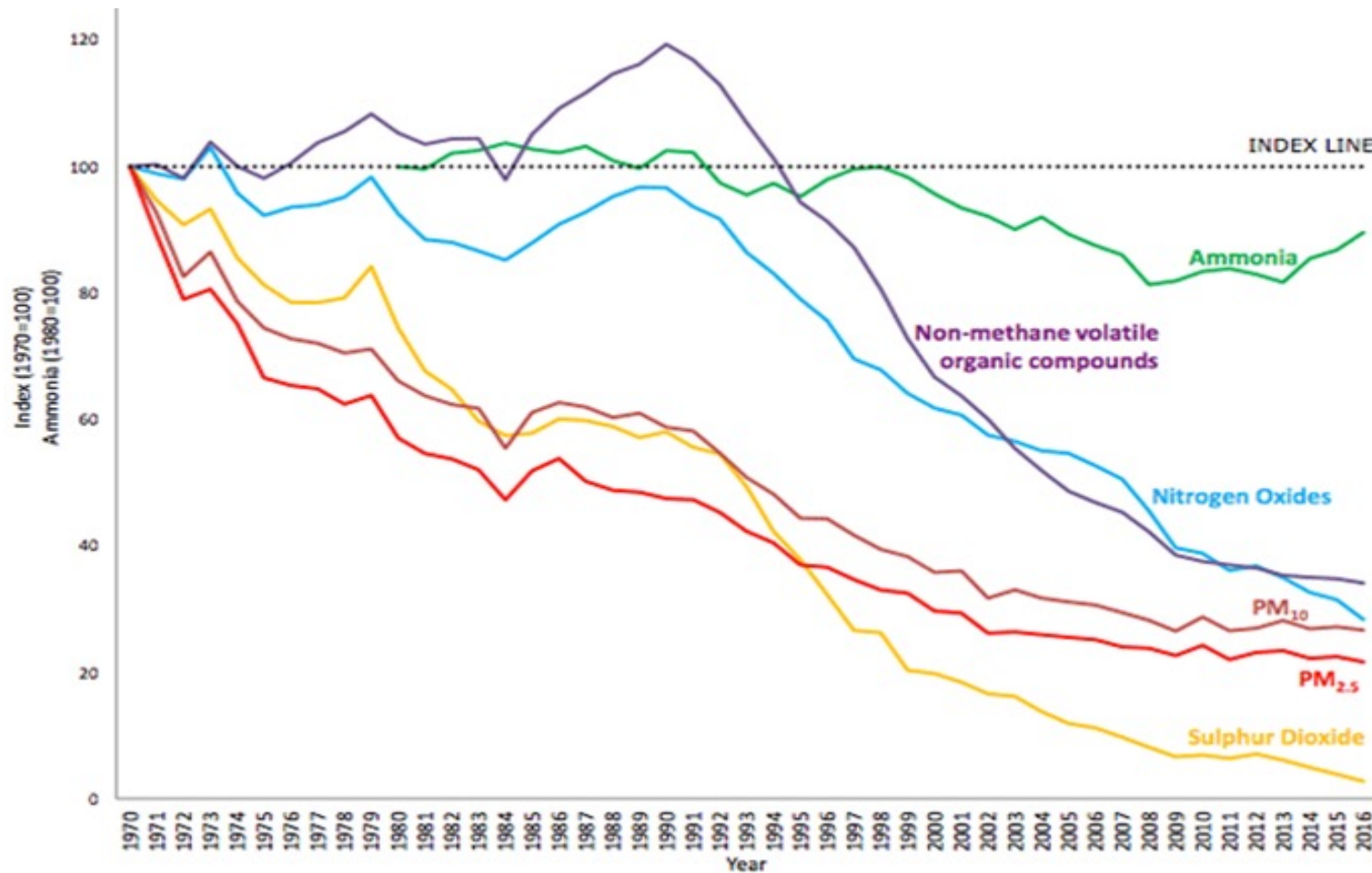


# The smoking ban in public places- change in heart attacks over time (Liverpool)- men and women. *Liu et al BMJ Open*

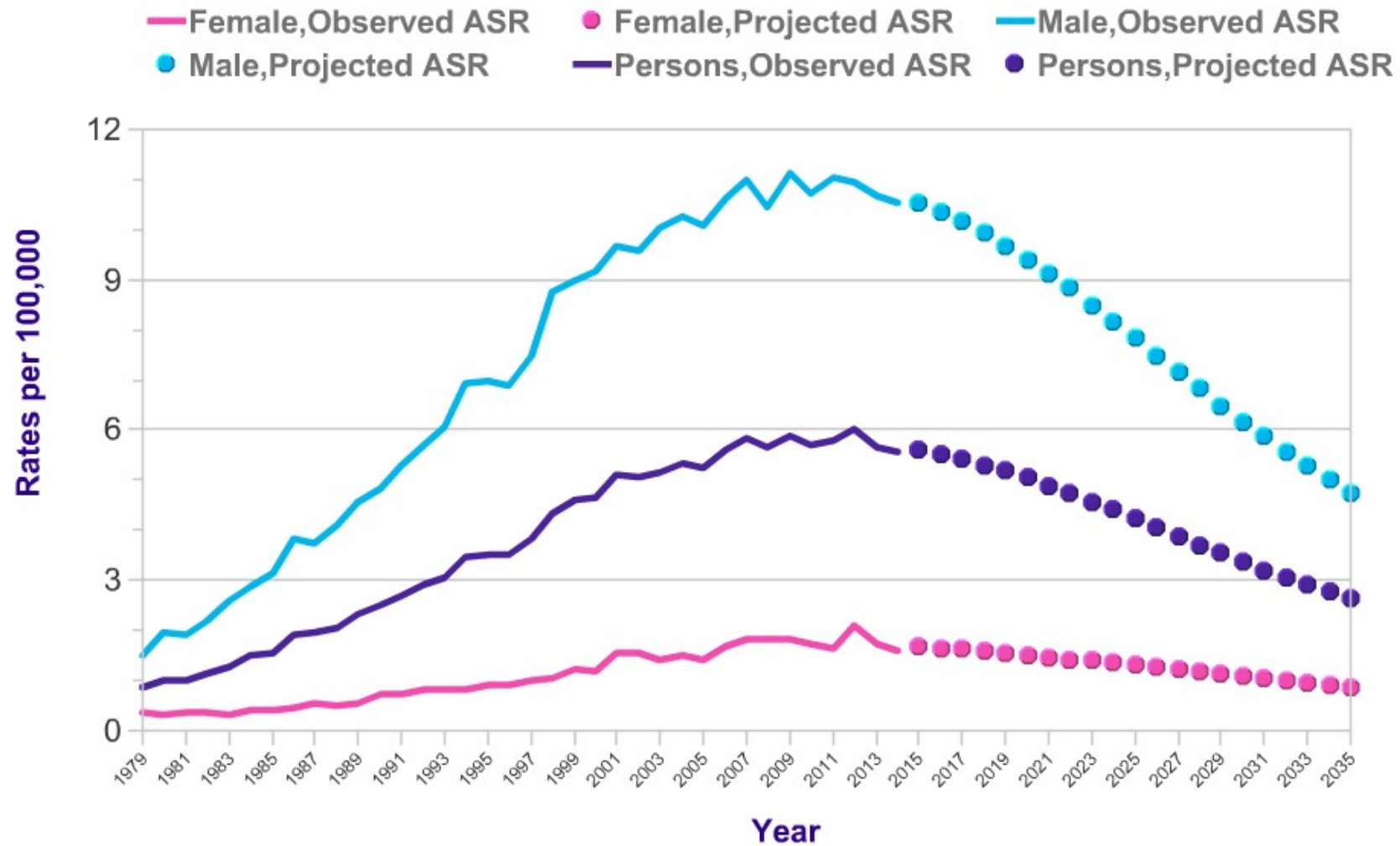


Many major air pollutants are decreasing- but particulate matter in urban areas remains too high. We have the capacity to change this.

*(DEFRA Emissions of air pollutants in the UK, 1970 to 2016. ONS.)*

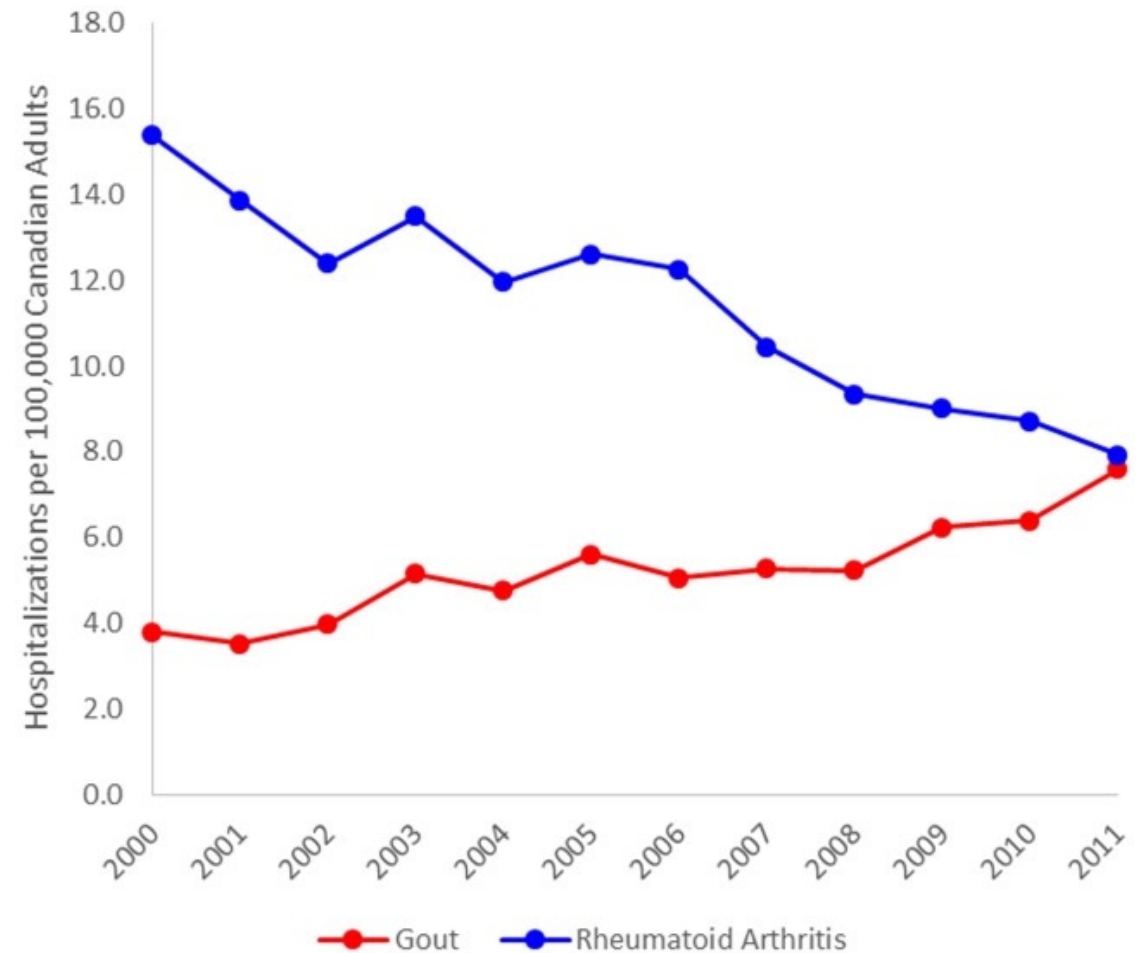


# Occupational diseases much rarer than they were. Observed and projected mesothelioma incidence, UK. (CRUK)



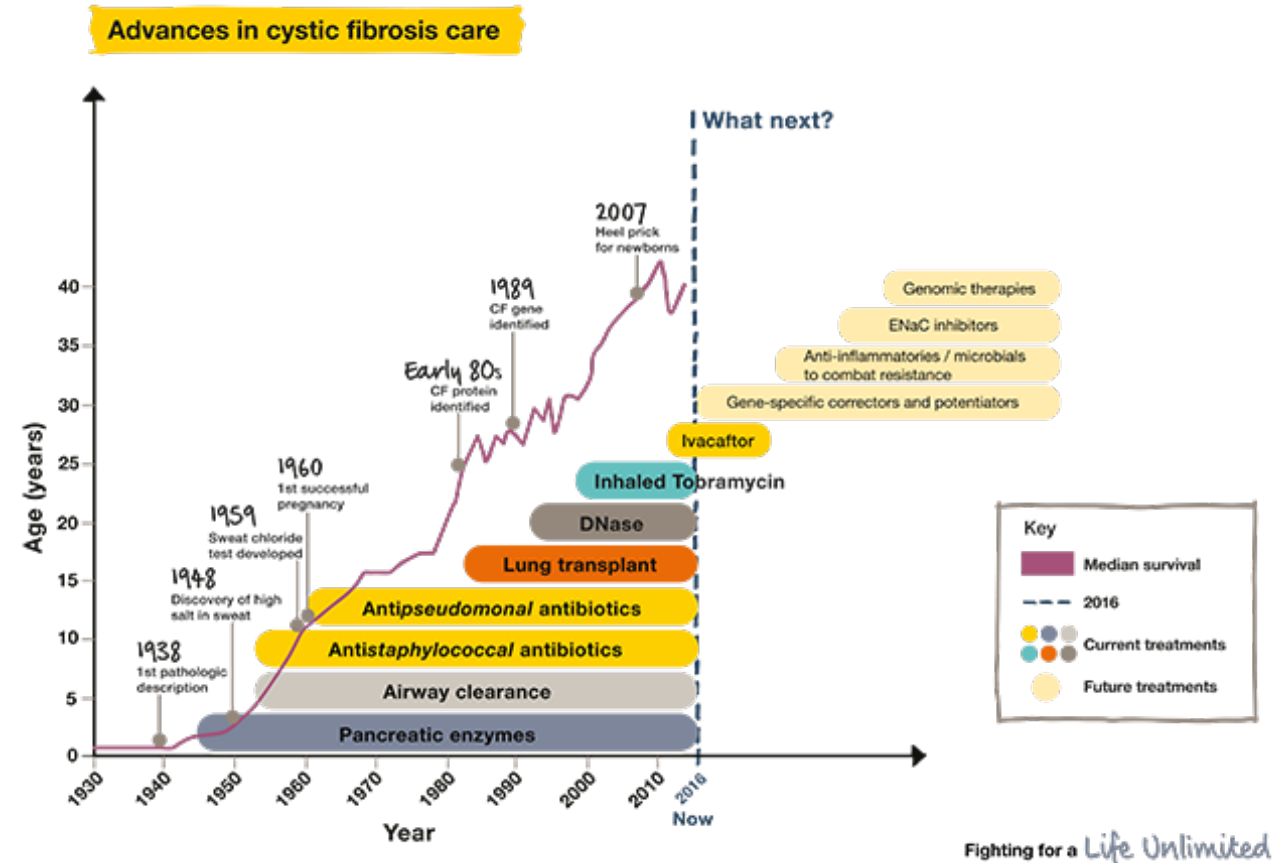
# Many common diseases that cause debilitating non-fatal outcomes also improving.

- Diseases which are driven by immune dysfunction.
- New, effective immune-modulating drugs.
- Less need for hospitalisation.
- Include:
  - Rheumatoid arthritis (R)
  - Inflammatory bowel disease.
  - Some multiple sclerosis.



# Many rarer genetic diseases.

- There are a lot of rare diseases. Their collective impact is significant.
- Good progress in several conditions caused by a single genetic mutation.
- Genetic diagnosis improving.

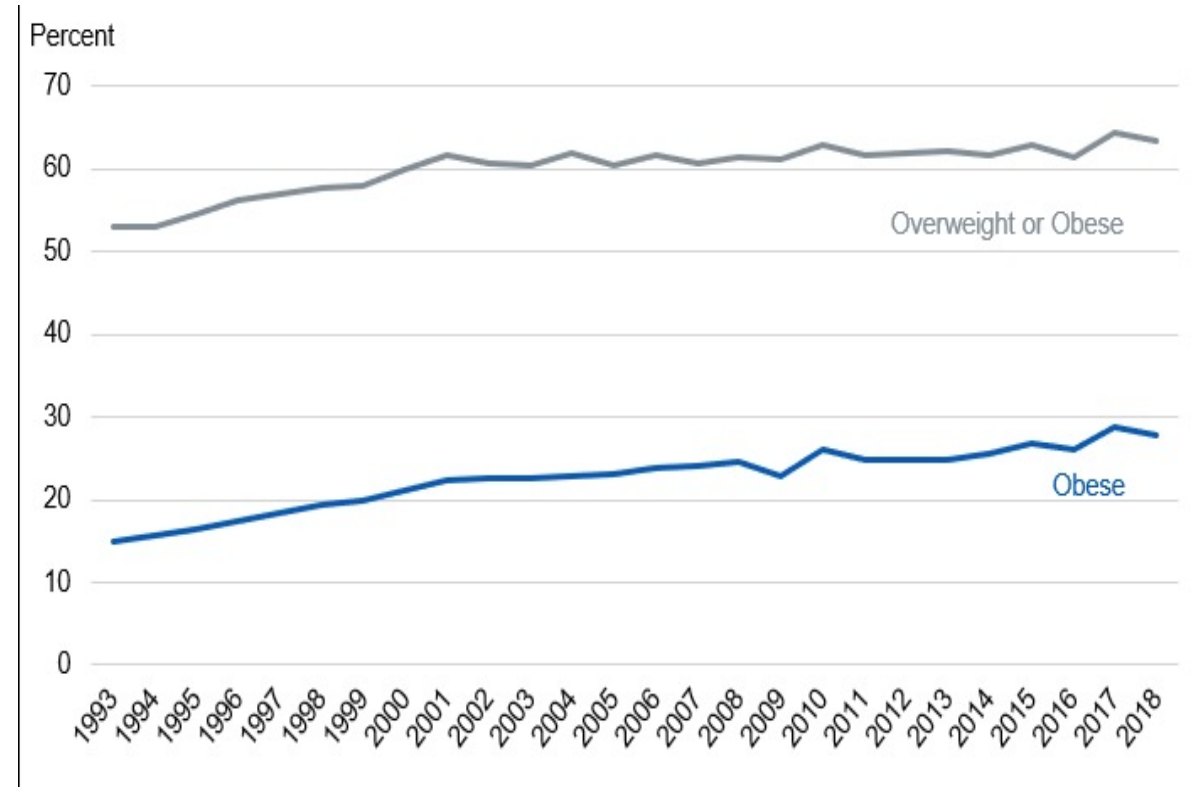


Steady improvement in cystic fibrosis. Cystic Fibrosis Trust.



## Obesity in the UK. Over 2 decades from 15%-26%.

- Mechanical.
- Type 2 diabetes.
- Coronary heart disease.
- Stroke.
- Postmenopausal breast cancer.
- Endometrial (uterine) cancer.
- Renal (kidney) cancer.
- Oesophageal cancer.
- Liver disease.
- Infections.

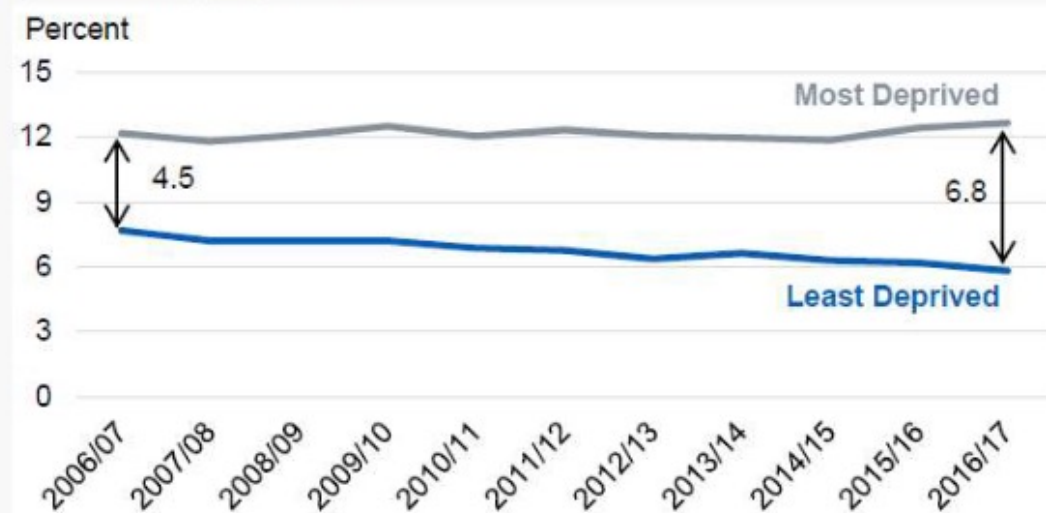


Percentage obese (BMI>30) by year.  
*Health Survey for England / NHS Digital.*

# The difference in childhood obesity between the most and least deprived is growing.

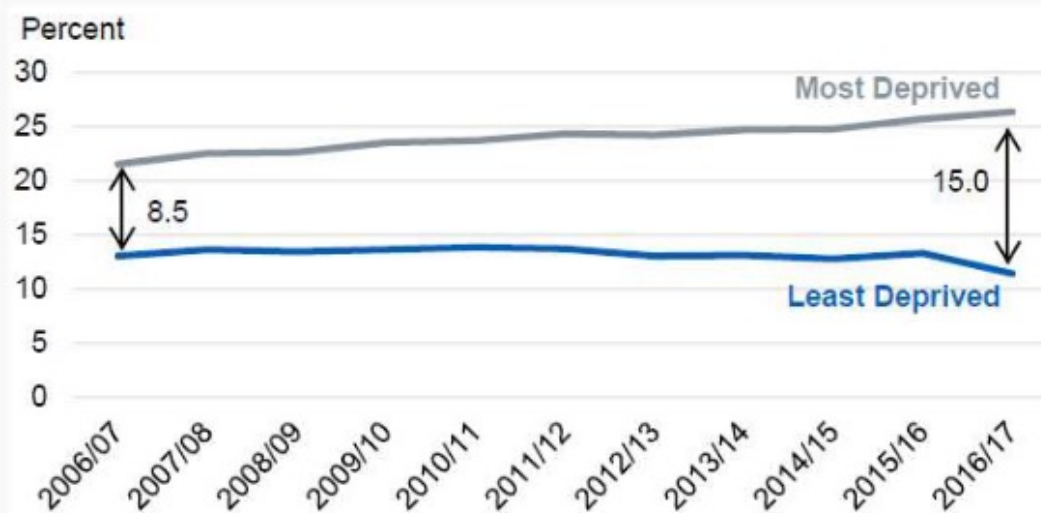
## Reception year

Between 2007/08 and 2016/17, the difference between obesity prevalence in the most and least deprived areas has increased from 4.5 to 6.8 percentage points.



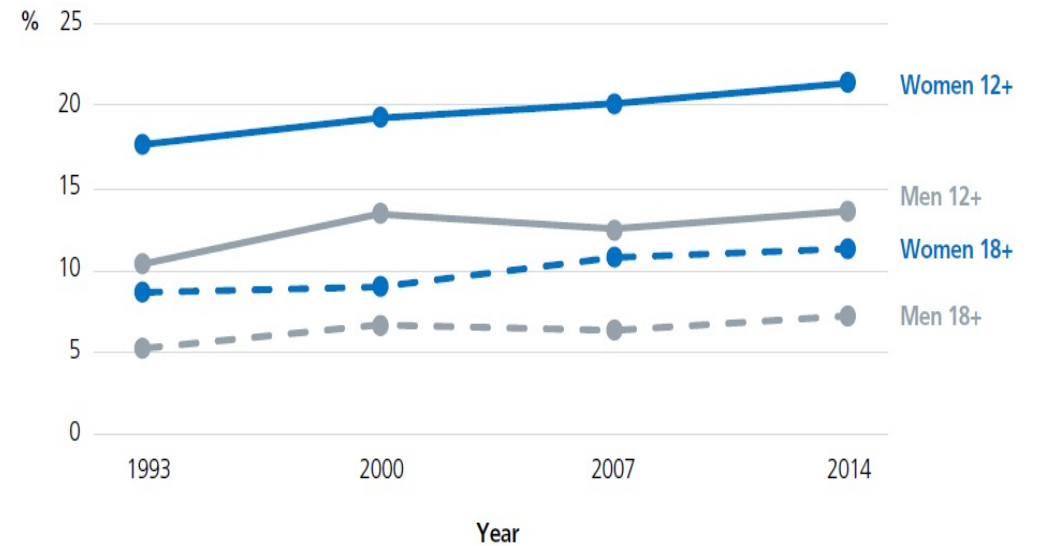
## Year 6

Between 2007/08 and 2016/17, the difference between the most and least deprived areas has increased from 8.5 to 15.0 percentage points.



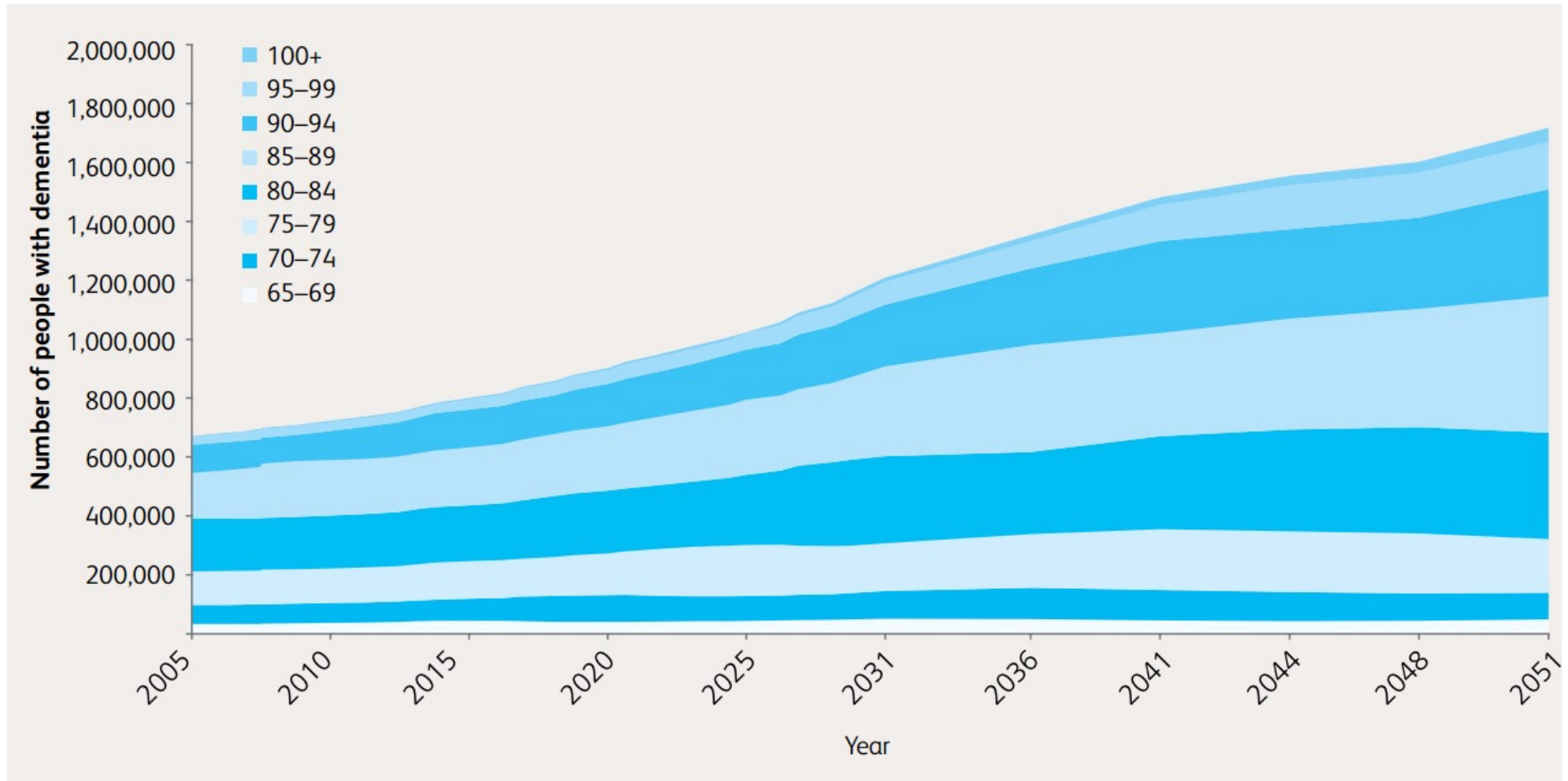
Areas medical science is *relatively* less successful will increase as a proportion of healthcare need.

- They will inevitable increase as a *proportion* of morbidity.
- Examples in every field.
- Some whole fields moving very slowly relative to need.
- Examples in pre-retirement adults include mental health, musculoskeletal disease.

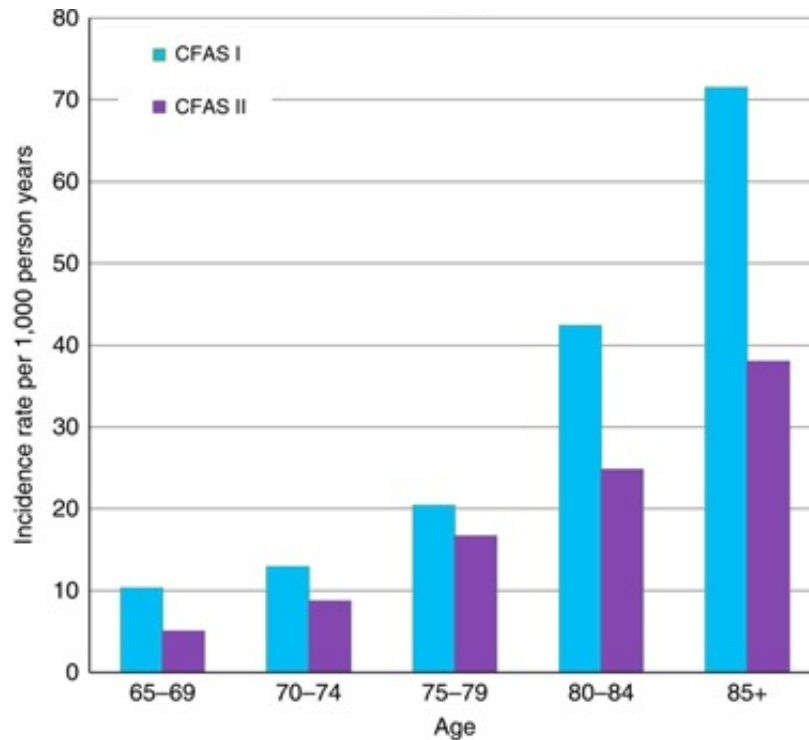


Common mental disorders (CIS-R score  $\geq 12$ ). NHS Digital 2016.

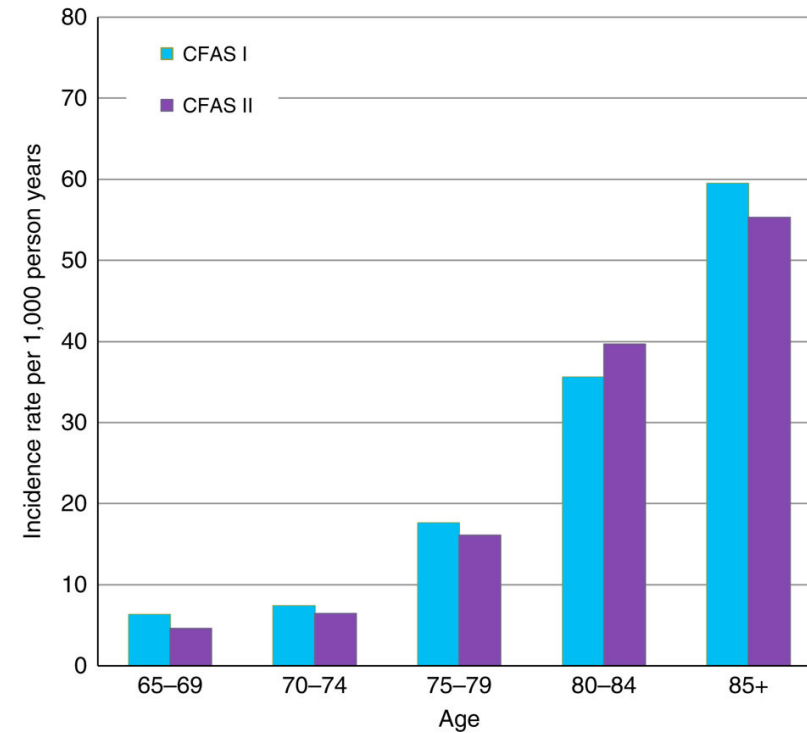
# Trends in dementia. *(Prince et al 2015)*



# Dementia- 20% reduction over 20 years not equal between men and women. *(Matthews et al Nature Com 2016)*



Male



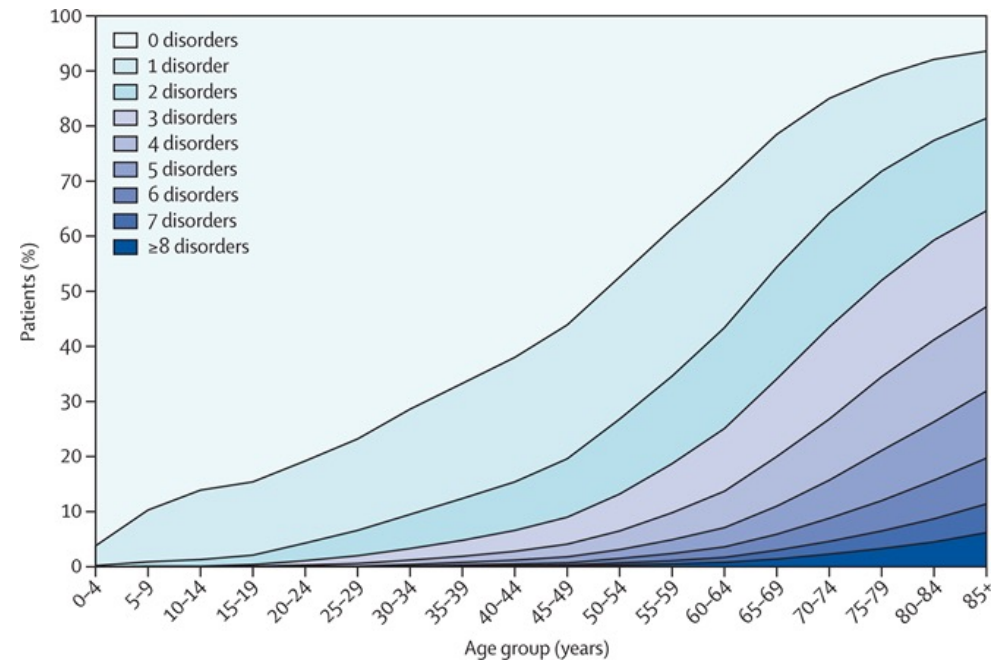
Female



# Multiple chronic conditions (also known as multimorbidity) increasing relative to single diseases.

This is a major problem because delivery of care and medical science are optimised for single diseases.

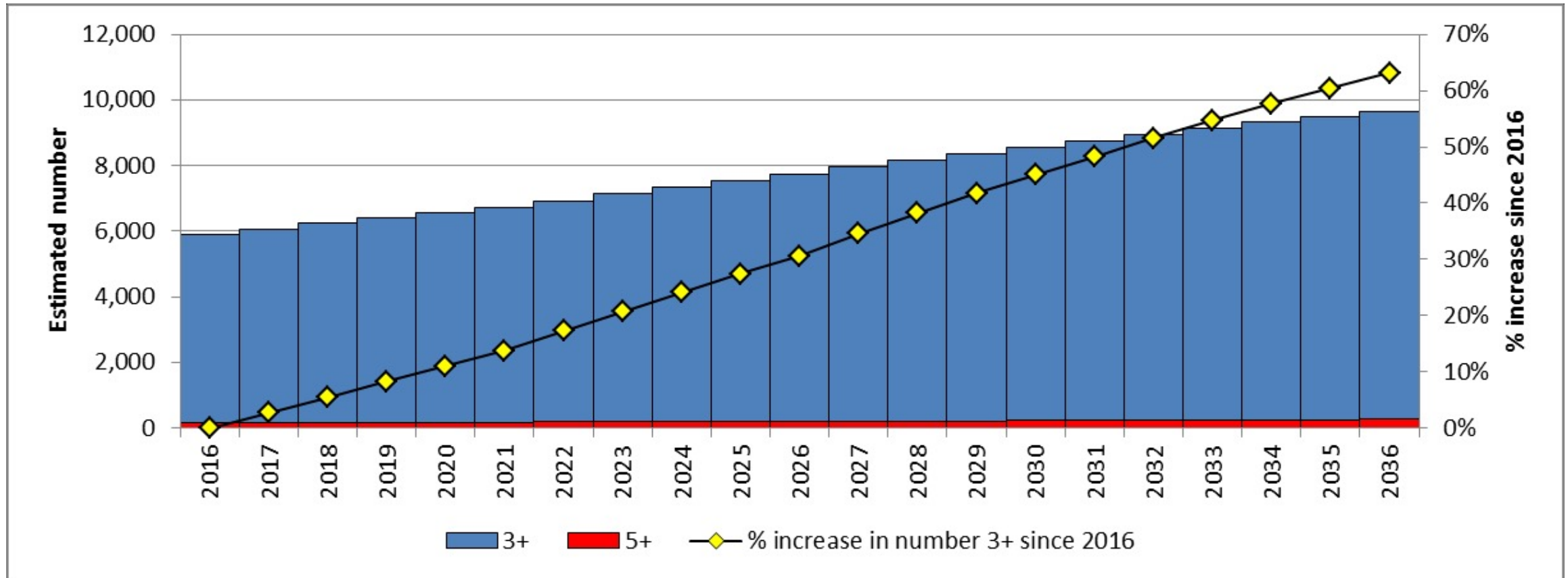
- Clinics
- Medical training
- National guidelines
- Laboratory research
- Clinical research.



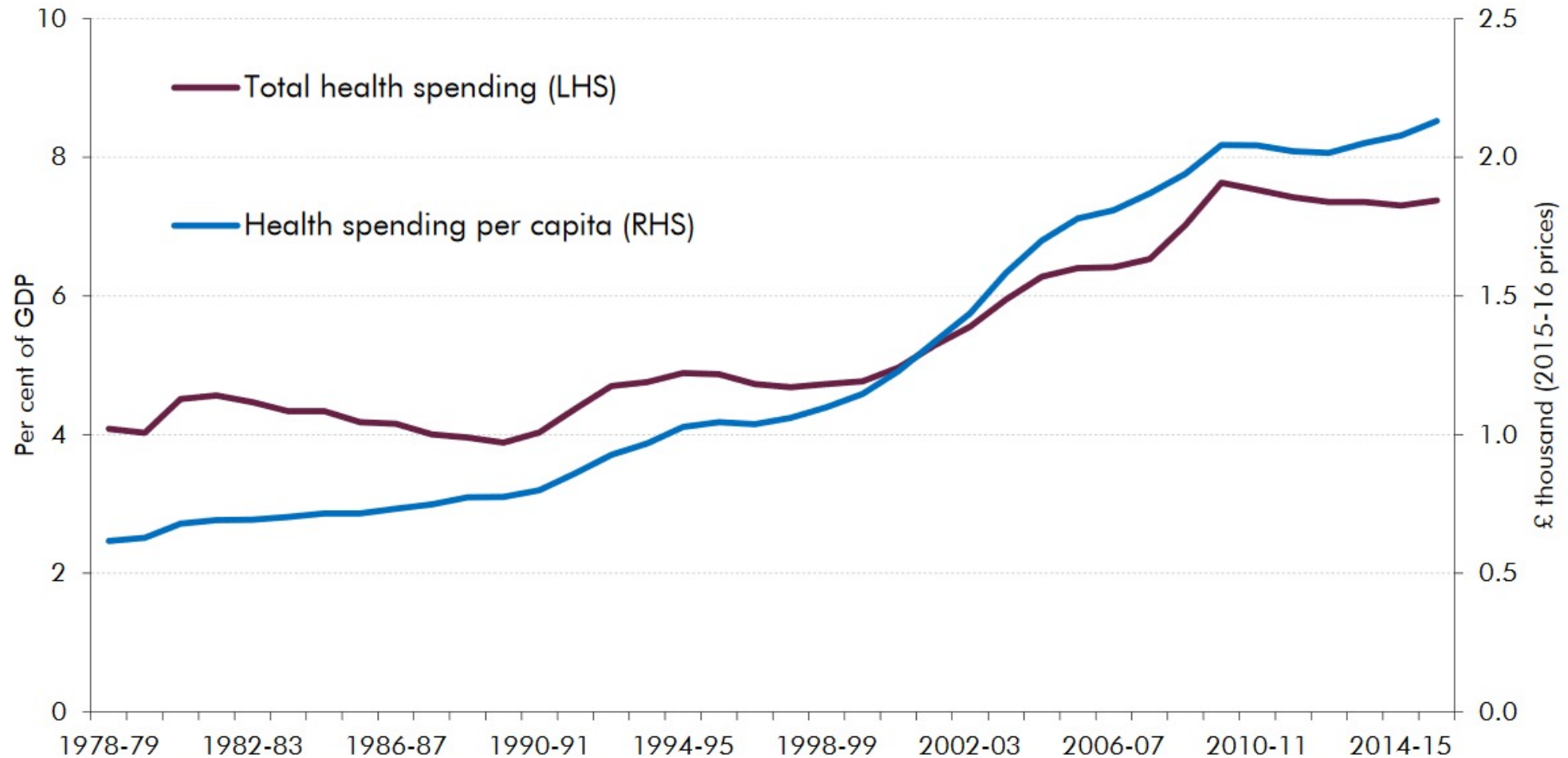
*Barnett et al 2012*

# Projected number of Somerset residents with 3 or 5 more major chronic conditions (multimorbidity) over time to 2036.

*Joint Strategic Needs Assessment (JSNA), Somerset.*

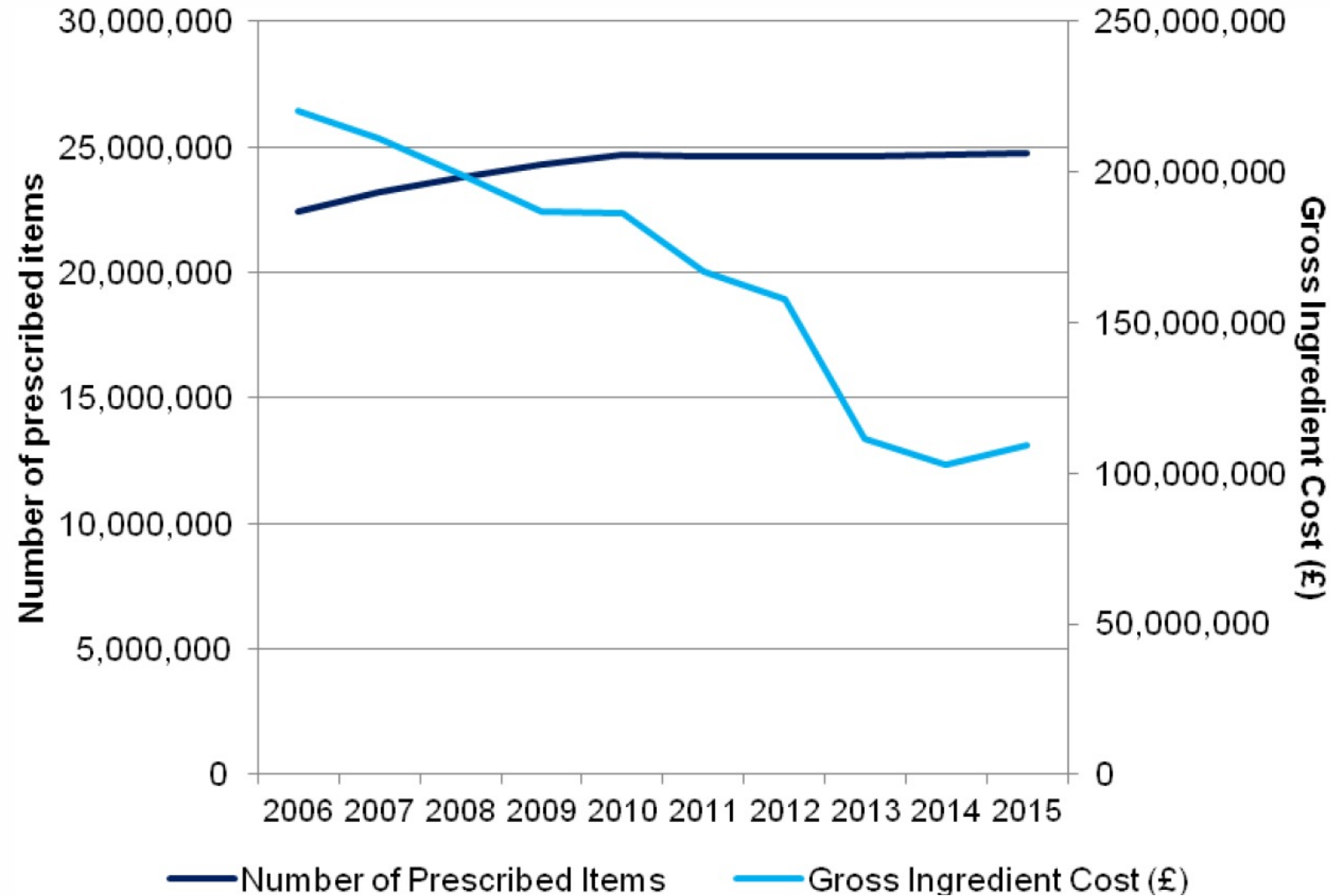


# Total and per capita health spending UK. (OBR 2016)

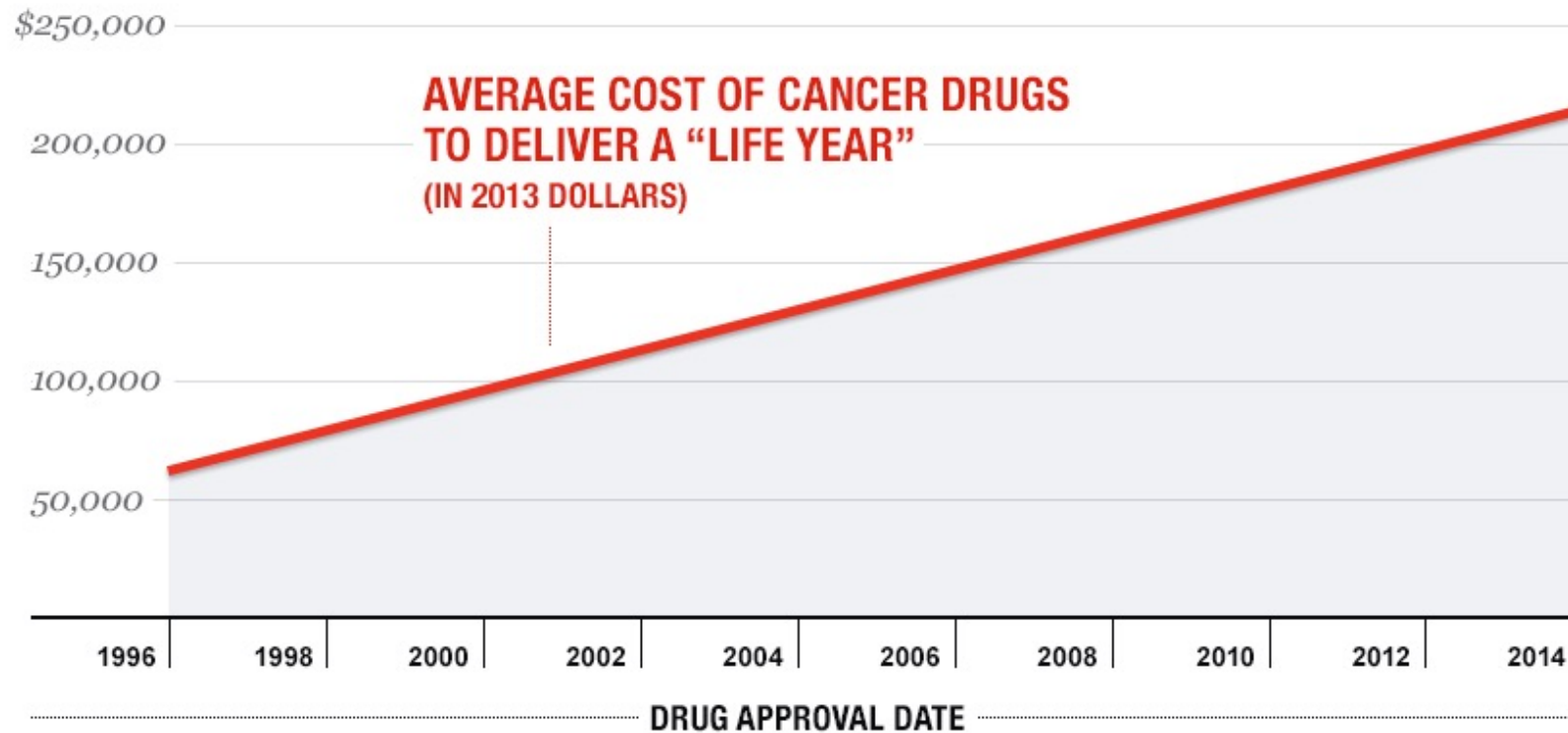


# Costs for cardiovascular drugs.

*Volume and cost of cardiovascular prescribing, 2006-2015. Scotland.*



# New cancer drugs- US cost.



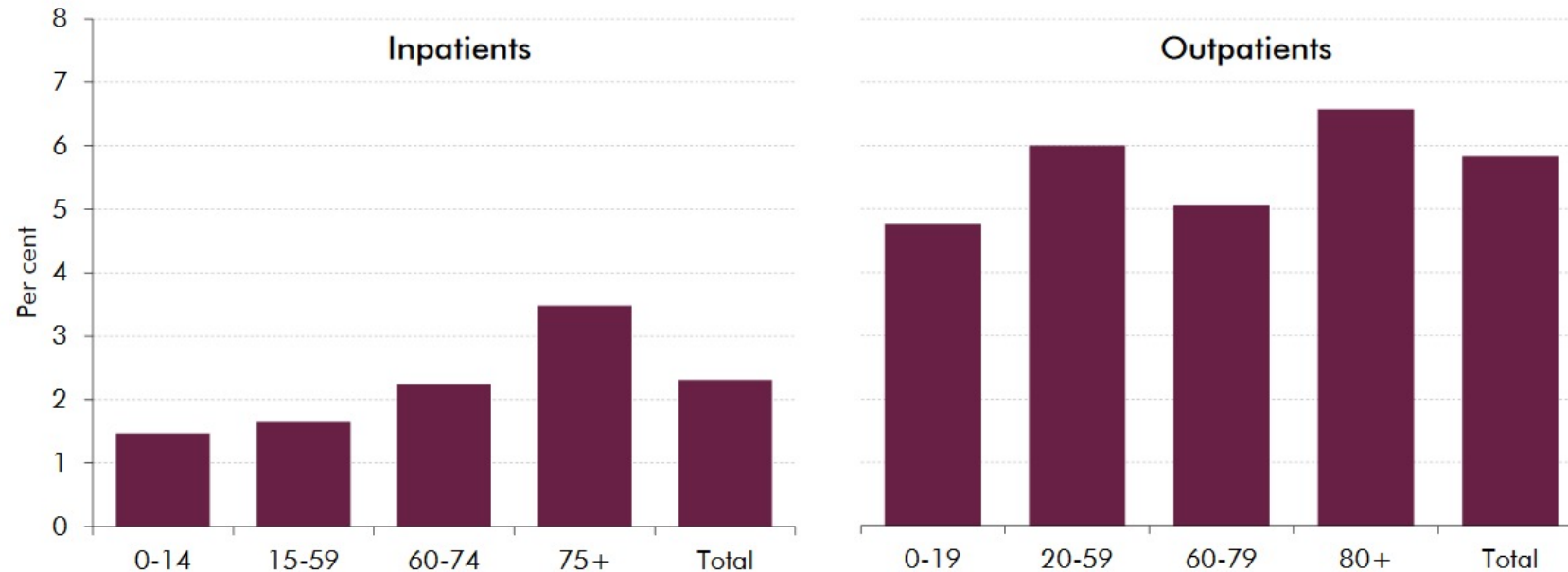
SOURCE: DAVID H. HOWARD, PETER B. BACH, ERNST R. BERNDT, AND RENA M. CONTI, "PRICING IN THE MARKET FOR ANTICANCER DRUGS,"  
JOURNAL OF ECONOMIC PERSPECTIVES, 2015

*Howard et al. J. Econ. Persp. 2015, adapted by Fortune. US data.*



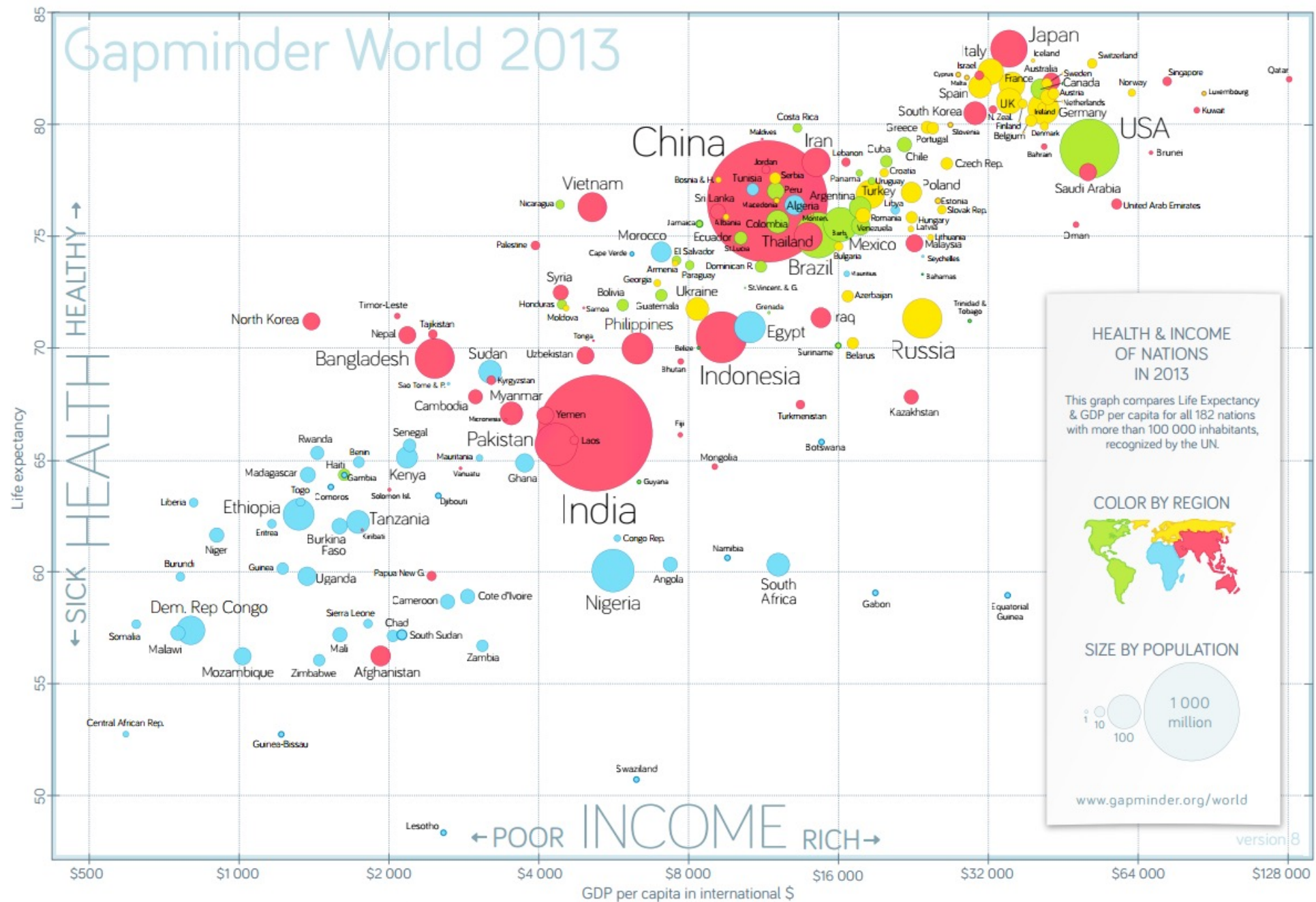
# Increase in demand for services not all an age effect.

## Average annual increase in utilisation by age. *(OBR)*

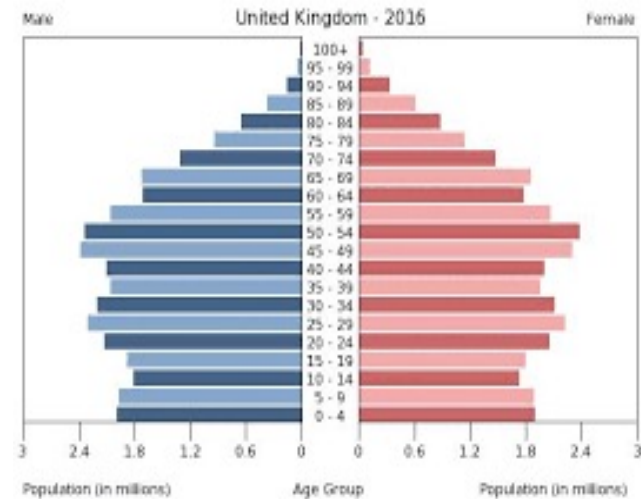
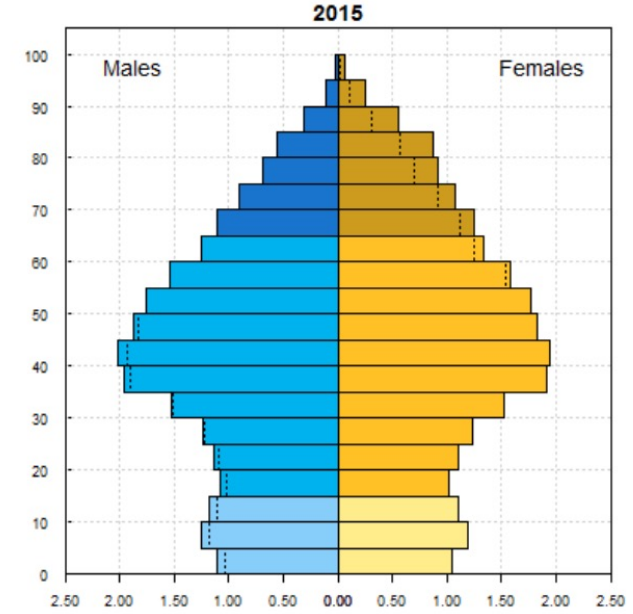
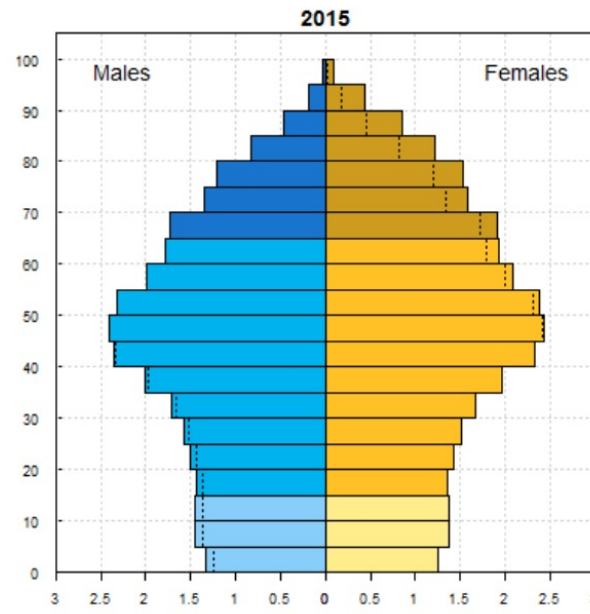
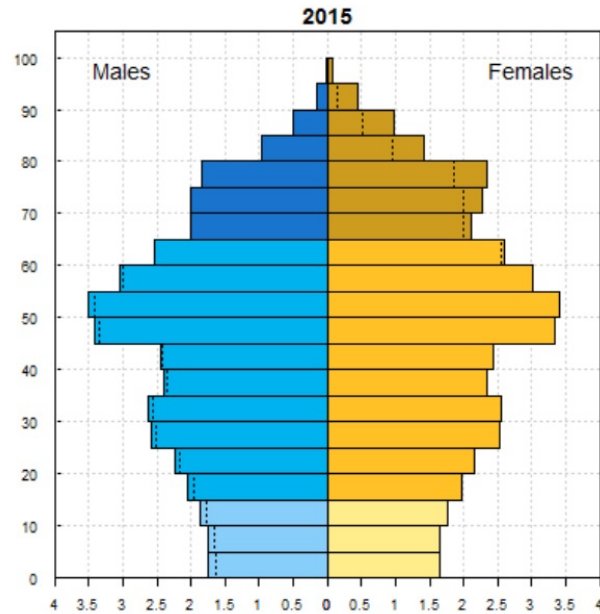


Note: Average annual growth between 2000-01 and 2013-14 for inpatients and between 2003-04 and 2013-14 for outpatients.  
Source: HES, ONS

# Gapminder World 2013



# Germany (L), Italy, Spain (R) demographic pyramids. UK bottom. ONS/UN.



# The march of medical science continues.

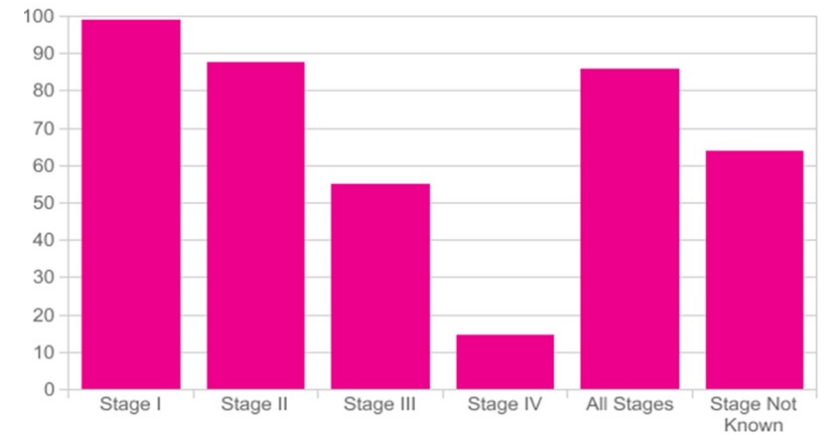
Some predictable areas (many not predictable).

- New non-chemotherapy drugs for cancer.
- Better immunotherapy for inflammatory diseases.
- mRNA vaccines.
- Steady move to less invasive procedures rather than major surgery.
- Day case rather than hospital stay.
- Better early diagnosis.



## Earlier diagnosis matters.

- Survival is often highly determined by how early disease is caught.
- Treatment is often much less invasive, or unpleasant (or costly).
- Better radiological imaging.
- Various 'oscopies visualise inside the body.
- AI (artificial intelligence / machine learning).
- Liquid biopsies to identify blood markers.
- Screening by genotype and other risk factors.
- Behaviours as well as technology.



Breast cancer 5 year survival by Stage. (CRUK)



The human aspect of medicine, nursing and allied professions would be recognisable to our predecessors centuries back.



*The Doctor (section)*. Sir Luke Fildes 1891.



IWM



In many areas of medicine the remarkable march of progress continues. But we need to address the areas that are lagging.

- Getting better- some examples out of many (with caveats).
- Cardiovascular diseases- heart disease and stroke.
- Much cancer treatment.
- Many inflammatory diseases.
- Infectious diseases (but risk of antimicrobial resistance).
- Many rarer diseases of childhood.
- Less invasive treatment.
- Challenges we must address- some examples.
- Disease associated with obesity.
- Some aspects of mental health.
- Dementia.
- Multi-morbidity.
- Costs of healthcare.
- Widening disparities.
- The continuing huge burden of disease caused by smoking.
- Social care.

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