# The contribution of health care to population health

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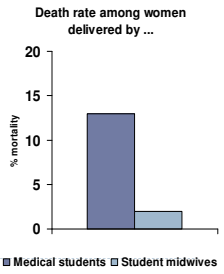
## In the beginning....
## Health care before the 19th century

- Hospitals
  - Places of sanctuary
  - Patients "patiently waiting for death"
- Surgeons
  - Part-time barbers
  - Judged by speed of completing amputations
- Physicians
  - Masters of "watchful waiting"
  - Judicious application of herbal remedies
- Nurses
  - Sisters of mercy

## Ignaz Semmelweis
## A tragedy in three acts

- Hungarian physician working in Vienna
- Noted that death rate among mothers delivered by medical students in Vienna much higher than by student midwives
- Medical students came straight from anatomy room
- He instituted hand washing with chlorinated water – death rate fell
- Kept quite for fear of upsetting chief obstetrician
- Subjected to vilification from colleagues
- Returned from Vienna to Budapest, where he repeated his success
- Went mad and died of an infected cut




## Joseph Lister
## Asepsis

- Early adherent to Pasteur's germ theory
- Appointed Professor of Surgery in Glasgow and given new hospital, but infection rate stayed at over 50%
- Introduced sterilisation with carbolic acid – infection rate dropped
- Initially ignored in London, as nothing important could come out of Scotland!
- Unlike Semmelweis, finally vindicated in his own life time

## Anaesthesia

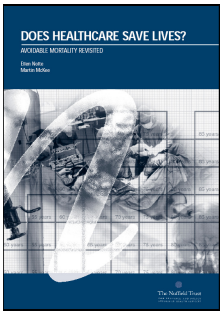
- Amputations on battlefield often undertaken under influence of rum!
- Introduction of chloroform safer, more effective, and socially acceptable

## ... but in the 20th century

- Antibiotics
- Vaccines
- Cancer chemotherapy
- Treatment for cardiovascular disease
  - Anti-hypertensives
  - Anti-angina drugs
  - Thrombolytics
- Treatment for mental illness
  - Chlorpromazine
  - Anti-depressants

## The concept of avoidable mortality

- Deaths preventable by timely and effective care
- Idea goes back to Florence Nightingale
- Concept developed in 1970s by Rutstein




## And in practice…

- Decide upper age limit
  - Everyone has to die from something
  - Problem of identifying a single cause of death from among multiple disease processes
  - Initially 65, now typically 75
  - Some initial exceptions
    - Diabetes (<50)
    - Leukaemia (<15)
- Decide what causes are amenable to medical care
  - Initially based on expert judgement of what treatments exist and were likely to be effective

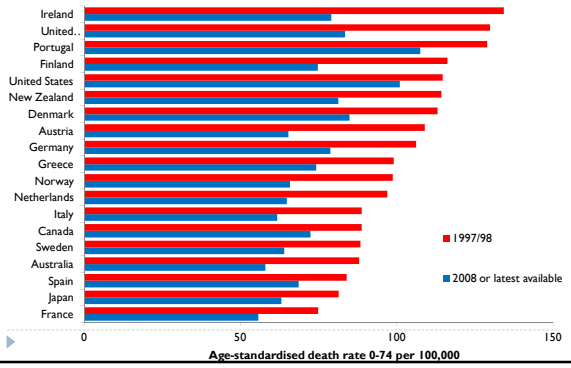
## What was included (examples)

- Infections
  - Tuberculosis
  - Measles
- Cancers
  - Non-melanoma skin
  - Breast
  - Colon & rectum
- Cardiovascular disease
  - Ischaemic heart disease
  - Stroke
- Respiratory disease
  - Pneumonia
  - Influenza
- Gastrointestinal disease
  - Peptic ulcer
  - Cholecystitis
- Renal disease
  - Nephritis & nephrosis
- Maternal deaths
- Certain perinatal deaths

## Challenges

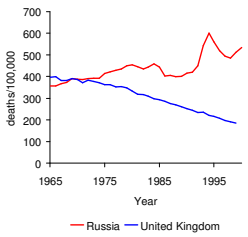
- Need for regular revisions
  - Emergence of new treatments
  - Reduction to negligible levels of some causes of death
- Interpretation
  - Small numbers in small populations

## So how are we doing?



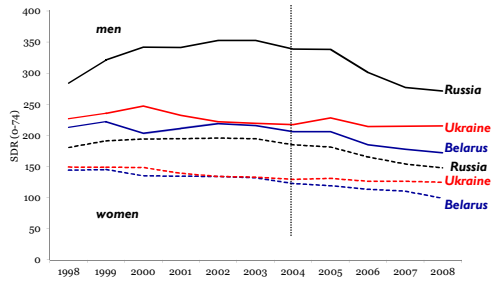

## Avoidable mortality in practice: What happened where medical care failed to modernise?

- Death rate from avoidable mortality in UK and Russia similar in 1965, when little could be done
- Gap began to widen in 1970s, and has continued to do so since

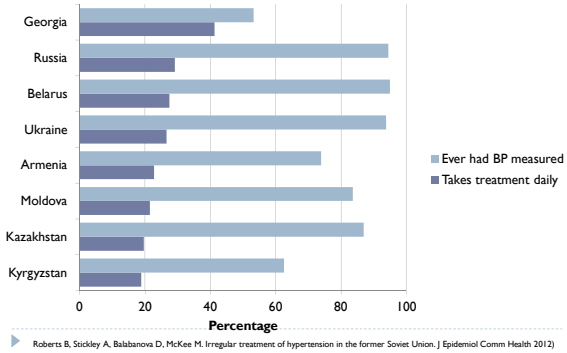



Source: Andreev, Nolte, Shkolnikov,Varavikova & McKee, 2003

## Avoidable mortality: Belarus, Russian Federation & Ukraine, 1998-2008

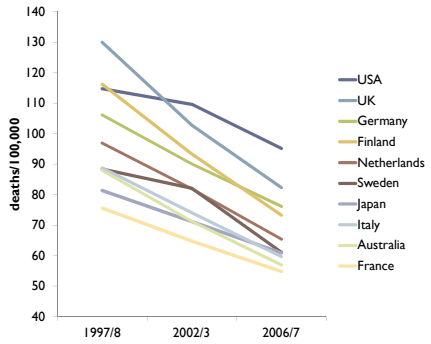



## Management of hypertension in the former Soviet Union

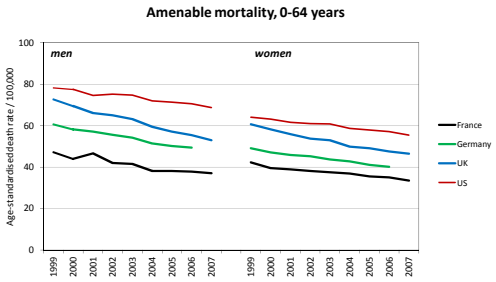



Roberts B, Stickley A, Balabanova D, McKee M. Irregular treatment of hypertension in the former Soviet Union. J Epidemiol Comm Health 2012)

## … Or where it failed to reform

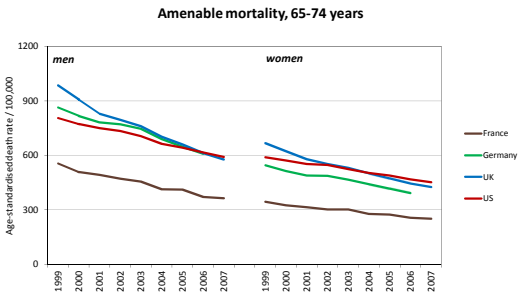



## Amenable mortality by age



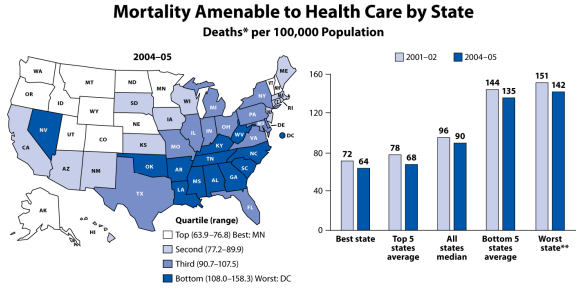

Nolte & McKee, Health Affairs, 2012

## Amenable mortality (age 65-74)



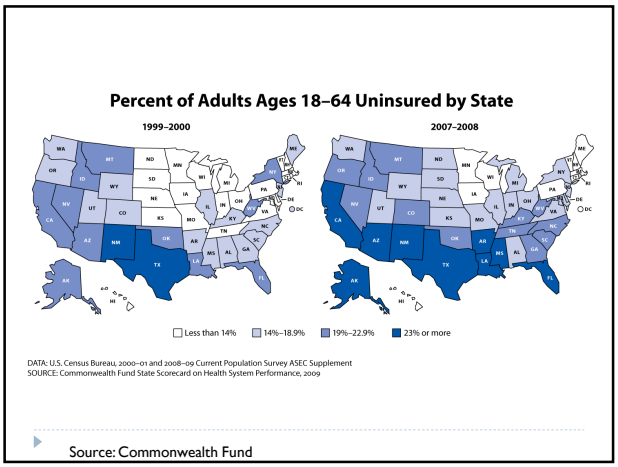

Nolte & McKee, Health Affairs, 2012

## Mortality Amenable to Health Care by State

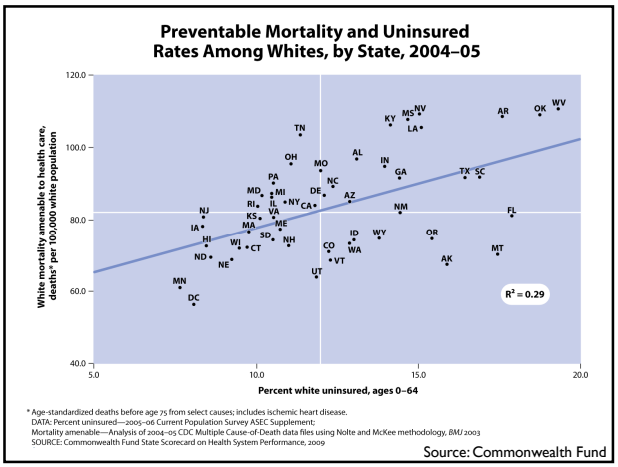



* Age-standardized deaths before age 75 from select causes; includes ischemic heart disease.
** Excludes District of Columbia.
DATA: Analysis of 2001–02 and 2004–05 CDC Multiple Cause-of-Death data files using Nolte and McKee methodology, *BMJ* 2003
SOURCE: Commonwealth Fund State Scorecard on Health System Performance, 2009

Source: Commonwealth Fund

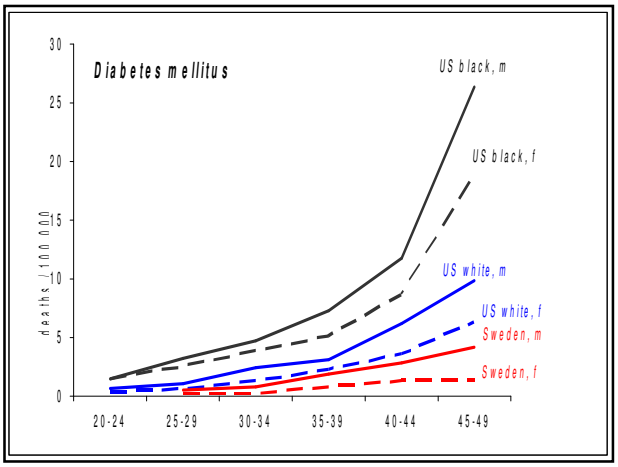


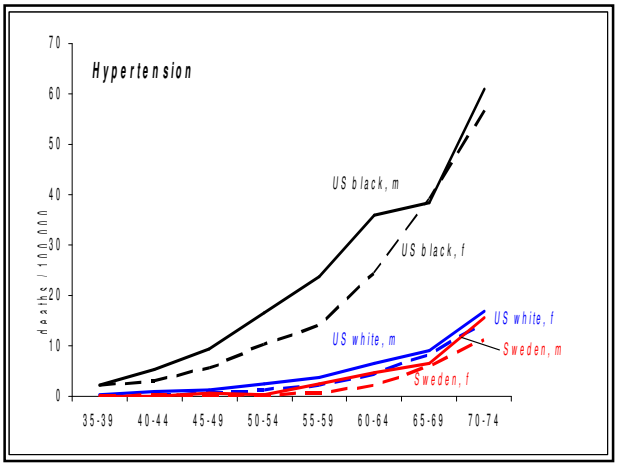

Source: Commonwealth Fund




Source: Commonwealth Fund

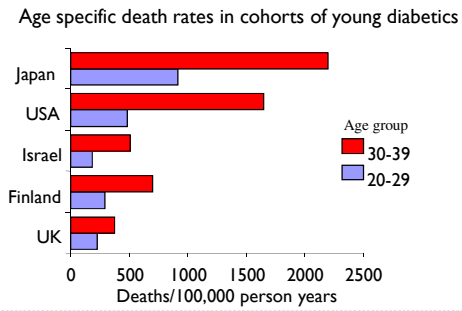
Let's look by cause



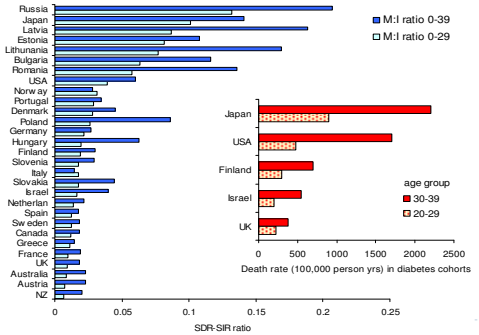

Diabetes: a lens through which to observe the system

## Diabetes: looking in more detail



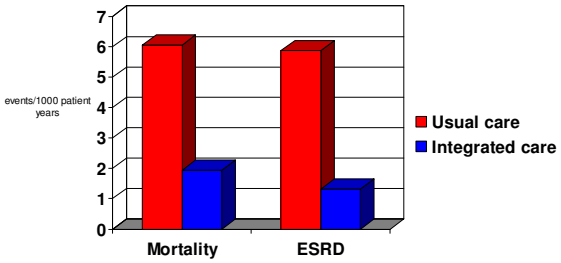

Derived from DERI, 1995 & Laing et al., 1999

## Beyond the few cohort studies: Intelligent use of data




Nolte, Bain, McKee. Diabetes Care 2006

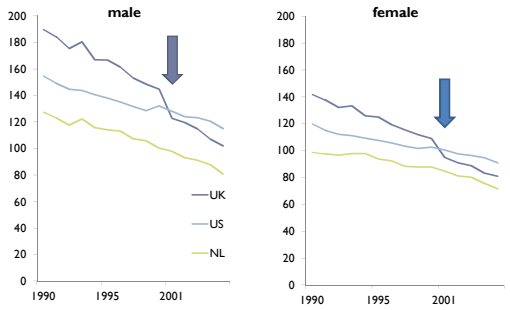
## Outcomes of diabetes by care model: Japan




Uchigata et al, 2004

## All very interesting .... but how do we use it in practice?

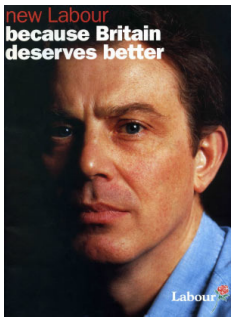
## The first question: Is it real? Deaths amenable to medical care in the UK




Includes 50% of IHD

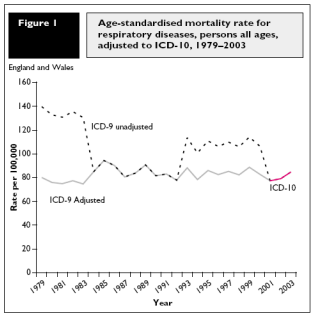
## The reason?

"Things can only get better"



## Unfortunately not….

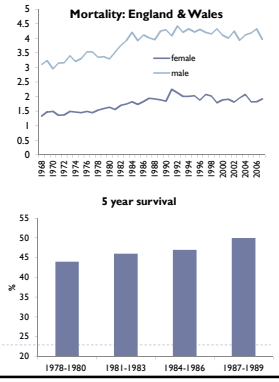
- Change in application of rule 3 for coding underlying causes introduced unilaterally in UK
- Reversed with introduction of ICD-10



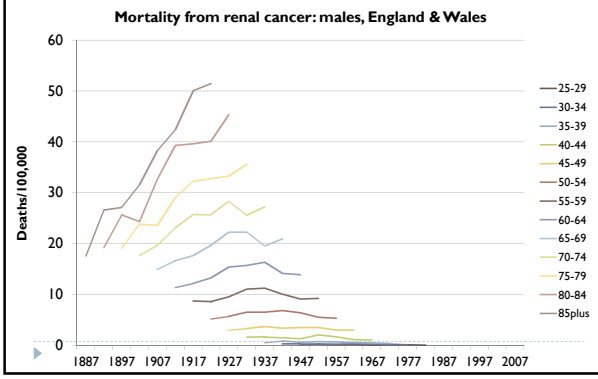

Brock et al, 2006

## Renal cancer: a case study in complexity

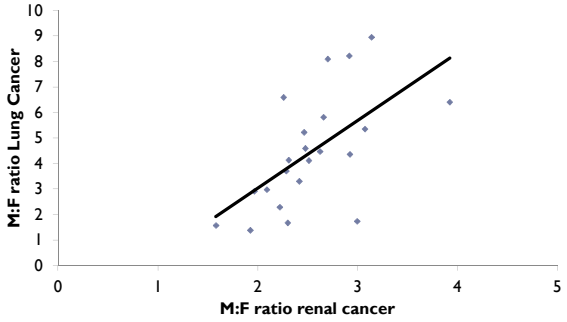
- Mortality is increasing or stable in many countries
- Yet cancer registry data indicate improved survival




## Is the incidence changing?




## Tracking the consequences of the smoking epidemic



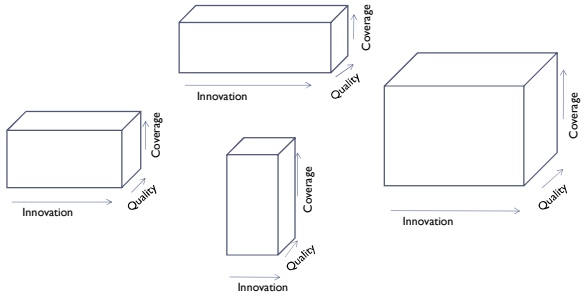

## Additional complications

- Increased use of abdominal imaging (CT, MRI) for gastrointestinal problems is picking up many more early stage renal cancers
- … creating lead time bias and artificially enhancing survival

## The AMIEHS project

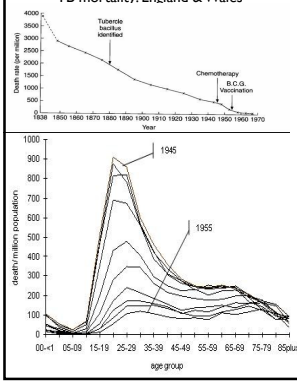
- Screening to identify all causes of death showing ≥30% decline in mortality from 1079-2000 in England and Wales (ICD-9 usage)
- Elimination of all where deaths now ≤ 100 per year
- Inclusion and exclusion where specific factors apply (AIDS, known coding issues)
- Systematic review to seek evidence of:
  - Changes in population level mortality directly attributable to specific medical care
  - RCT evidence of substantial reduction in mortality associated with specific interventions
- Systematic review to ascertain timing of interventions in European countries
- Identification of association between changes in mortality trends and introduction of innovations

## Different ways of creating better health

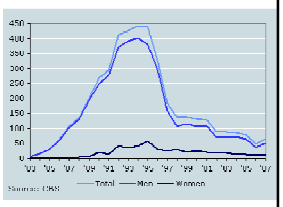



## Innovation: Magic bullets are very rare

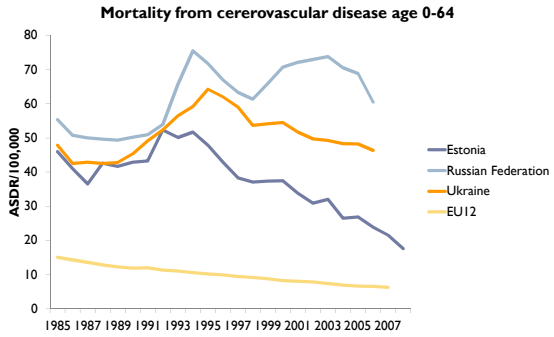
TB mortality: England & Wales




AIDS mortality: Netherlands




## Taking advantage of natural experiments



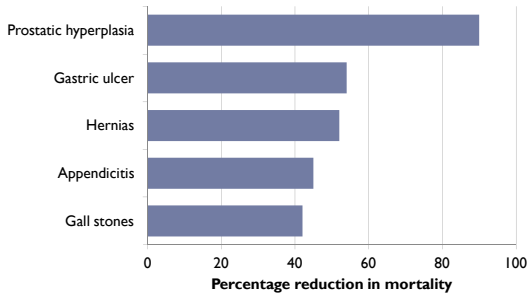

Source:WHO HFA

## Assessing the impact of innovation

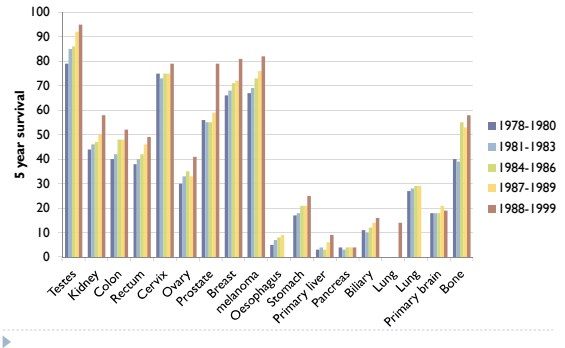
- Progressive gains in effectiveness of treatments
- Progressive improvements in safety and reduction of side effects
- Progressive experience by health professionals with use of new pharmaceutical/ technology
- Expansion of indications

- RCTs compare innovation with best existing treatment
- RCTs undertaken on highly selected subjects .... by highly selected practitioners .... In highly selected centres
- Few RCTs have mortality as an outcome
- Variable lags between innovation and reduction in mortality

## Quality: surgical outcomes in England and Wales 1979-2000

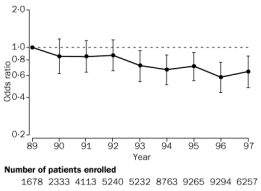



## Quality: Cancer survival in successive waves of Eurocare



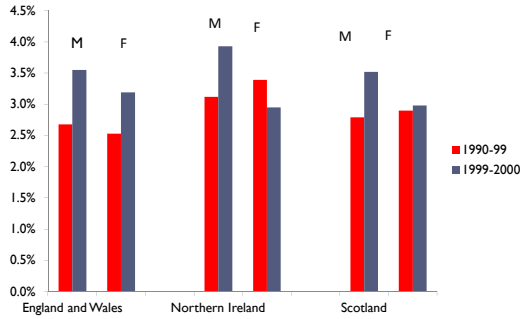
## Quality: Improvements in trauma care in the UK

**Potential reasons**
- More patients seen by senior doctor
- More staff with advanced life support training
- Improved co-ordination of services
- Introduction of audit system

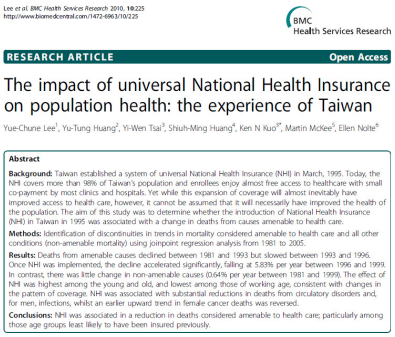



Source: Lecky et al., Lancet 2000

## The rate of change of amenable mortality in the UK




## Coverage: "Once NHI was implemented, the decline [in avoidable mortality] accelerated significantly, falling at 5.83% per year between 1996 and 1999"



Lee et al. BMC Health Services Research 2010, 10:225
http://www.biomedcentral.com/1472-6963/10/225

BMC Health Services Research

RESEARCH ARTICLE Open Access

The impact of universal National Health Insurance on population health: the experience of Taiwan

Yue-Chune Lee[1], Yu-Tung Huang[2], Yi-Wen Tsai[3], Shiuh-Ming Huang[4], Ken N Kuo[5*], Martin McKee[3], Ellen Nolte[6]

**Abstract**

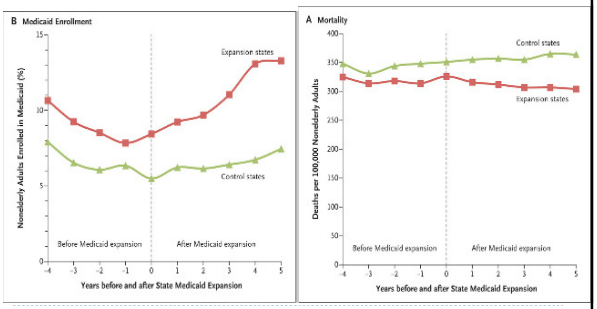
**Background:** Taiwan established a system of universal National Health Insurance (NHI) in March, 1995. Today, the NHI covers more than 98% of Taiwan's population and enrollees enjoy almost free access to healthcare with small co-payment by most clinics and hospitals. Yet while this expansion of coverage will almost inevitably have improved access to health care, however, it cannot be assumed that it will necessarily have improved the health of the population. The aim of this study was to determine whether the introduction of National Health Insurance (NHI) in Taiwan in 1995 was associated with a change in deaths from causes amenable to health care.

**Methods:** Identification of discontinuities in trends in mortality considered amenable to health care and all other conditions (non-amenable mortality) using joinpoint regression analysis from 1981 to 2005.

**Results:** Deaths from amenable causes declined between 1981 and 1993 but slowed between 1993 and 1996. Once NHI was implemented, the decline accelerated significantly, falling at 5.83% per year between 1996 and 1999. In contrast, there was little change in non-amenable causes (0.64% per year between 1981 and 1999). The effect of NHI was highest among the young and old, and lowest among those of working age, consistent with changes in the pattern of coverage. NHI was associated with substantial reductions in deaths from circulatory disorders and, for men, infections, whilst an earlier upward trend in female cancer deaths was reversed.

**Conclusions:** NHI was associated in a reduction in deaths considered amenable to health care, particularly among those age groups least likely to have been insured previously.

## Expansion of Medicaid coverage in Arizona, New York and Maine, 2002/3




Source: Sommers et al, NEJM 2012

## Looking ahead

- Need to reassess what causes are included:
  - Many of the original ones cause no or negligible deaths (at least in high income countries)
  - New treatments are rendering additional causes of death avoidable
  - But this obviously complicates historical analyses
- Can we find better ways of handling multiple death codes?
- What is the appropriate age threshold (if there should be one at all)?
- Can we measure the impact of health care on disability?

## In conclusion

- Avoidable mortality is a useful concept
- It is an indicator of what is happening
- But it is only a start
  - Data artefact
  - Innovation
  - Coverage
  - Quality