Understanding CVD drivers trends and policy options to improve CVD health.

Professor Martin O’Flaherty
Department of Public Health and Policy
University of Liverpool
moflaher@liverpool.ac.uk
@moflaher
In this talk

• The determinants of CVD mortality associated with both treatment and lifestyle (i.e. what proportion is due to treatment versus lifestyle/prevention)

• An overview of evidence in high-income countries on population-level policy strategies (including the IMPACT model)

• Reflecting on the consequent implications for policy action.
  • Lag times and speed
  • Impact on other diseases
  • Impact on health equity
20+ years of continuous decline in CVD mortality in EU countries

Graph shows standardized death rates due to all CVDs, people aged 25-74

Capewell & O’Flaherty *Eur Heart J* 2011
But in Eastern Europe, trends went up and then, abrupt decline

Graph shows standardized death rates due to all CVDs, people aged 25-74
The “Rapid Changes” evidence

- Recent flattening (and reversals) of CHD mortality rates in young adults
- Trials on hypertension and blood lipid treatment showing effects within months
- Healthy diet trials show results within months
- Sudden reversals in Central European countries (IMPACT Poland, Czech Republic Slovakia)
- Natural experiments:
  - Cuba special period 1990-2000
  - Norway & Dutch starvation winters in WWII
- Implementation of Smoking Bans

Capewell & O’Flaherty *Lancet* 2011
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The “Rapid Changes” evidence

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WHAT DRIVES THESE RAPID CHANGES?

Capewell & O’Flaherty *Lancet* 2011
Capewell & O’Flaherty *Eur Heart J* 2011
Understanding trend drivers
The IMPACT CHD Model

Deaths observed
The IMPACT CHD Model

Deaths observed

Deaths EXPECTED if rates stay the same
The IMPACT CHD Model

- Deaths observed
- Deaths EXPECTED
- Deaths postponed
The IMPACT CHD Model

A mathematical model that integrates evidence on

- Demographics
- Risk factor trends
- Treatment trends
- Validated

And takes into account how uncertain we are about the science.
The IMPACT CHD Model:

Risk factor at pop level:
- Blood pressure
- Diabetes
- Smoking
- Blood cholesterol
- Obesity
- Physical Activity

Treatments:
- Acute Coronary
- Hypertension Rx
- Secondary Prevention
- Statins
- Revascularization
- Heart Failure

Change attributed to RISK FACTORS changes in the population

Change attributed to MEDICAL CARE

unexplained
Countries formerly at high risk and decreasing CHD mortality trends, Risk factors explained ~70% of the fall in deaths

Countries with medium risk and decreasing CHD mortality trends:
Risk factors explain ~50-60% of fall in deaths

Countries with INCREASING CHD mortality trends, Risk factors explain ~70% of the rise in deaths

We know what drives heart attacks trends in most populations.
IMPACT: CHD mortality fall in Poland 1991-2005

Change attributed to RISK FACTORS changes in the population

Change attributed to MEDICAL CARE

unexplained

P. Bandoz et al BMJ 2012
IMPACT: CHD mortality fall Poland 1991-2005

26,200 fewer deaths in 2005 →

Risk Factors worse +7%
- Obesity (increase) +4.5%
- Diabetes (increase) +2.5%

Risk Factors better -66%
- Cholesterol (diet) -39%
- Smoking -11%
- Physical activity -10%
- Population BP fall 0% (Men↑Women↓)

Treatments -38%
- AMI treatments -5%
- Unstable angina -4%
- Secondary prevention -7%
- Heart failure -12%
- Angina: CABG surgery -2%
- Angina -1%
- Hypertension therapies -2%
- Statins (Primary prevention) -3%

Unexplained -10%
P. Bandoz et al BMJ 2012
IMPACT model: CHD mortality **RISE** in Beijing

1984 – 1999

Cholesterol 77%

Diabetes 19%
BMI 4%
Smoking 1%

370 FEWER DEATHS BY TREATMENTS
AMI treatments 41%
Hypertension treatment 24%
Secondary prevention 11%
Heart failure 10%
Aspirin for Angina 10%
Angina:CABG & PTCA 2%

In 1999: 1820 EXTRA DEATHS ATTRIBUTABLE TO RISK FACTOR CHANGES
Syria and Tunisia: **Increasing CHD mortality**

### Treatments

- Acute Myocardial Infarction (AMI)
- Unstable Angina
- Secondary Prev Post AMI
- Secondary Prev Post CABG/PCI
- Chronic Angina
- Hospital Heart Failure
- Community Heart Failure
- Hypertension Treatment
- Statins primary prevention

### Risk Factors

- Smoking
- SBP (mmHg)
- Cholesterol (mmol/l)
- BMI (kg/m²)
- Diabetes %
- Physical inactivity %

#### Trends

- The Model
- Drivers: High Risk
- Drivers: Low Risk
- Drivers: Cent Europe
- Drivers: Rising deaths
- Drivers: Over time

#### Conclusions
Key drivers of NCDs in UK  1990 – 2016

- 40%
- 19%
- 9%
- 2%

https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)32207-4/fulltext
Key drivers of NCDs in UK 1990 – 2016

![Diagram showing key drivers of NCDs in the UK with percentages: 40% for diet, 19% for smoking, 9% for alcohol, and 2% for other.]

- **Diet**: 40%
- **Smoking**: 19%
- **Alcohol**: 9%
- **Other**: 2%

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**Dementia**

Can we reduce the risk?

1. **Look after your heart**
2. **Be physically active**
3. **Follow a healthy diet**
4. **Challenge your brain**
5. **Enjoy social activity**

To find out more visit: www.alz.co.uk/WAM @AlzDnt #WAM2014

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**Cancer Prevention**

4 in 10 cancers can be prevented

- **Lifestyle**
  - Keep a healthy weight
  - Be smoke free

- **Other**
  - Limit alcohol intake
  - Protect your skin from the sun
  - Avoid tobacco and other drugs
  - Avoid risky sexual practices
  - Prevent infections

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Let's beat cancer sooner cancerresearchuk.org/health
THREE “HOW TO” QUESTIONS

• Reduce CVD Burden
• Reduce the equity gap
• Reduce stress in health care systems
Possible Futures?

Tackling unhealthy food and smoking with fiscal & regulatory policies
Annual probability of the modelled scenarios to be cost-effective (value for money)

Current implementation & Policies on sugar, salt and tobacco

Optimal implementation level

Probability of being cost-effective

Year
Annual probability of the modelled scenarios to be cost-effective (value for money)

Current implementation & Policies on sugar, salt and tobacco

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Probability of being cost-effective

Year

2011 2015 2020 2025 2030 2035 2040

0% 20% 40% 60% 80% 100%
Annual probability of the modelled scenarios to be cost-effective (value for money)

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Optimal implementation level

Current implementation level
Annual probability of the modelled scenarios to be cost-effective (value for money)

- Current implementation & Policies on sugar, salt and tobacco
- Optimal implementation level
- Current implementation level

![Probability of being cost-effective over time](image)
Can we reduce inequalities?

Current implementation & Policies on sugar, salt and tobacco

Optimal implementation level
Modelling future burden of dementia and disability in the CVD slowdown era

Total cumulative costs and value of informal care and QALYs, adults aged 35-100, England & Wales, over ten years, 2020-29

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Healthcare (£billions)</th>
<th>Social care (£billions)</th>
<th>Value of informal care (£billions)</th>
<th>Total costs (£billions)</th>
<th>Value of QALYs (£billions)</th>
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<tbody>
<tr>
<td>Scenario 1 – Long term CVD decline</td>
<td>959.5 (798.7 to 1,148.2)</td>
<td>104.5 (86.8 to 125.2)</td>
<td>614.8 (511.6 to 735.1)</td>
<td>1,678.8 (1,397.5 to 2,008.4)</td>
<td>16,752.5 (16,649.1 to 16,850.7)</td>
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<tr>
<td>Scenario 2 – Slowdown in CVD improvements</td>
<td>998.1 (832.1 to 1,182.0)</td>
<td>108.2 (90.0 to 128.2)</td>
<td>624.2 (520.4 to 738.9)</td>
<td>1,730.5 (1,442.7 to 2,048.5)</td>
<td>16,661.7 (16,545.3 to 16,747.2)</td>
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<tr>
<td>Difference (scenario 2-1)</td>
<td>36.3 (25.2 to 53.3)</td>
<td>3.5 (1.7 to 5.9)</td>
<td>7.8 (1.9 to 16.8)</td>
<td>47.6 (29.6 to 75.3)</td>
<td>-103.5 (-76.3 to 232.7)</td>
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Collins et al (Abstract in JECH 2019, full manuscript in submission)
Population level policies to prevent heart diseases

- RAPID
- LARGE HEALTH GAINS
- LARGE ECONOMIC GAINS
- EQUITABLE

- Affects the environment we live

- And the heavy lifting is done OUTSIDE THE Health Care System
  - Transfer resources to deal with ageing and multimorbidity
Key insights

• Trends are not set in stone:
  • Can change rapidly in both directions

• We understand the drivers
  • What is the best combination of strategies to reduce the burden, as there is no “magic bullet”

• Three main goals
  • Reduce CVD Burden
  • Reduce the equity gap
  • Reduce stress in health care systems
Thank you.
Japan: Diabetes, Obesity and Cholesterol offsetting gains.

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<th>Coronary heart disease deaths prevented or postponed (DPPs) due to changes in total treatment, and changes in prevalence and levels of risk factors between 1980 and 2012 in Japan.</th>
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<td><strong>DPPs</strong></td>
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<td>(95% uncertainty interval)</td>
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<td>---------------------------------------------------------------</td>
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<td><strong>Total treatments and risk factors prevalence</strong></td>
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<td>Explained by changes in total treatments</td>
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<td>Explained by changes in risk factor prevalence and risk factor levels</td>
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<td>Systolic blood pressure (decreased by 8.87 mm Hg in the period)</td>
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<td>Total cholesterol (increased by 0.28 mmol/L in the period)</td>
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<td>Body mass index (increased by 0.68 kg/m² in the period)</td>
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<td>Smoking (decreased by 14.0% in the period)</td>
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<td>Physical inactivity (decreased by 18.5% in the period)</td>
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<td>Diabetes (increased by 1.6% in the period)</td>
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<td>Unexplained by the present IMPACT model</td>
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1984 1999

*Critchley, Capewell et al. Circulation 2004 110: 1236-1244*
Syria and Tunisia: Increasing CHD mortality
Palestine & Turkey: **Declining CHD mortality**

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Conclusions