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Estimating lifetime benefits of optimizing secondary preventive treatment for atherosclerotic CVD

Miracolo A[1]; Politopoulou K[1]; Jayawardana S.A[2]; Gill J.L[1]; Apostolou E[1]; Carter A.W[2]; Kanavos, P.G[1]

1. Medical Technology Research Group, LSE Health, London School of Economics and Political Science, UK. 2. Department of Health Policy, London School of Economics and Political Science, UK

Background

- Cardiovascular disease (CVD) is responsible for **one third** of premature deaths in Europe – almost **4 million deaths** per year[1], and causes the majority of morbidity in the region[2]
- Recent estimates put financial burden at **€282 billion** in the EU alone[3]
- There is evidence of increasing mortality rates, likely due to **inadequate prevention** of atherosclerotic events[1] and **insufficient achievement of therapeutic goals** for hypertension and hyperlipidaemia[4]
- Those with pre-existing CVD are at high risk of recurrent events if not treated effectively
- Secondary prevention models can reduce cardiovascular mortality by **58%**[5] but there is evidence of **insufficient secondary prevention**
- We targeted a literature gap to **estimate survival benefits achievable** via enhanced management of atherosclerotic CVD (ASCVD) risk factors, providing an **estimation of anticipated benefits in population health** (country level).

Research Questions

1. What is the impact of improved secondary prevention in those with pre-existing cardiovascular disease?
2. How many life-years can be gained in 7 country populations by reducing risk factors including raised blood pressure levels, raised cholesterol levels, raised blood sugar & smoking?
3. Is European cardiovascular data sufficient to determine life years gained from improved risk factor control?
4. How can EU Member States improve secondary CVD prevention for their populations to improve cardiovascular health (CVH), save lives and reduce costs?

Methodology

Modelling Approach

- Adopted and modified analytical framework[6] and the **SMART-REACH** model[7] to estimate survival benefits in 3 subpopulations:
  1. **Those with ASCVD risk factors not receiving preventative treatment**
  2. **Those with ASCVD risk factors receiving preventative treatment**
  3. **Those without ASCVD risk factors**
- The total survival for a country was estimated as the sum of survival for these three subpopulations
- Multivariable regression gave baseline (risk free) event-free survival at 1-year. Replicated to give coefficients for all risk-factors
- Modelled the impact of increasing treatment coverage (incorporating adherence) from **43% to 70%** (NB for smoking, this equates to 70% of those with ASCVD who smoke quitting)
- Countries of interest include **Denmark, France, Germany, Italy, Poland, Spain** and the **UK**

Data Sources

- Prevalence data for CVD risk factors (hypertension, hyperlipidaemia, diabetes and smoking) collected for ASCVD populations in the 7 countries
- Sourced from large scale, observational studies in ASCVD populations - use standardized protocols, are geographically diverse & include comprehensive patient histories & clinical examination[8-14]

SMART-REACH Model Limitations

- Risk factor representation in the model:
  - Diabetes as binary factor - assess incremental survival achieved going from 'having diabetes' to 'not having diabetes'
  - Cholesterol incorporated as 'Total Cholesterol' (not LDL)
  - Systolic BP of 140mmHG considered target
  - Obesity not included in validated, published model
- This might deviate from clinical reality and prevailing national guidelines but is fundamental to the model used here

SMART-REACH clinically validated over several years & shows excellent predictive performance

Data Limitations

- Large individual-level datasets were not available, constraining model inputs
- Data gaps meant that:
  - Average prevalence values used for Italy
  - Locations of CVD, history of atrial fibrillation and congestive heart failure treated as dummy variables
  - Creatinine baseline value of 93 µmol/L was utilised

Data sets widely accepted as rigorous & representative of ASCVD population characteristics

Results

Table 1: Life years gained improving treatment coverage from 43% to 70% (per year)

	Hyperlipidaemia	Hypertension	Diabetes	Tobacco Use
Denmark	174	20	593	425
France	1901	215	8551	3917
Germany	2955	339	14845	7194
Italy	2036	353	12334	6421
Poland	1158	133	5257	2821
Spain	713	162	6155	2363
UK	717	226	8333	4048

Key Output

- Improving management of hyperlipidemia, hypertension and diabetes could save over **67,000 life years** (per year) across 7 countries
- Improving smoking cessation could save an additional **27,000 life years** (per year) across 7 countries

What are the Implications?

- Investing in prevention, early detection and screening are crucial to reducing the risk of CVD
- Enormous benefit related to better pharmaceutical management of hypertension, hyperlipidemia and diabetes
- Large payback likely in terms of cost savings across EU, both:
  - Direct
  - Indirect
- Important to diagnose and treat people with CVD as early as possible to prevent complications
- We focused on 6 EU countries + UK - scaling up cross-EU likely to have even bigger positive impact
- Improved data would allow more accurate predictions of benefit of enhanced CVD management

How can we Improve Secondary CVD Prevention across the EU?

1. **Fund targeted joint diabetes and heart health checks in primary care**
2. **Develop a European CVH Plan**
3. **Encourage Member States to develop, implement and fund national CVH plans**
4. **Ensure equitable access to treatment across EU**
5. **Enhance EU-wide data collection**

Conclusions

This unique approach develops estimates that can feed into strategies for research and policy for secondary prevention of CVD in Europe given the thousands of annual life years that could be accrued and the impact on quality-adjusted life expectancy, productivity and other dimensions of value.

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