The impact of NHS Health Check programme on cardiovascular disease burden in Liverpool

A health economics microsimulation to quantify the policy options

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With many thanks to Phil McHale, Rachael Gosling, Sophie Kelly, and Richard Jones
In my talk today...

I will

• briefly report on the existing evidence regarding the local implementation of Health Checks
• use a modelling approach to estimate the potential effectiveness, cost-effectiveness and equity of current implementation
• explore possible areas for improvement
Current Health Checks implementation

- Annual coverage: **13.8%** (target 20%)

- Annual uptake: **32.3%** (target 66%)

- Risk profile: **74.1%** (low risk), **19.6%** (middle risk), **6.2%** (high risk)

- Prescription rate: 9.1% (low risk), 25.8% (middle risk), 41.7% (high risk)

- Referral to smoking cessation/weight management/exercise therapy services: <4%

- Invitation cost: £5.11 (per invited individual)

- Participation cost: £13.00 - £19.00 (per participant)

Source: Jones et al. Review of the NHS Health Check Programme in Liverpool; 2016
Study aims

• Is current local implementation of Health Checks effective / cost – effective / equitable?

• Is there any room for improvement?
METHODS
IMPACT \textsubscript{NCD-Liverpool}

- Based on the validated IMPACT\textsubscript{NCD} model (BMJ;2016)
- Calibrated to local demographics, risk factor exposures, and CVD epidemiology
- Using local data about Health Checks effectiveness and costs
- With the addition of a health economics module
Cost-utility analysis

• Incremental utility of each Health Checks scenario against a ‘no Health Check’ scenario
  – Measured in QALYs (age, CHD, stroke, diabetes)

• Incremental cost against a ‘no Health Check’ scenario
  – Measured in £ (implementation/CHD/stroke/diabetes/hypertension)

• Discount: 3.5% per year
Model validation

- QIMD 1 (least deprived)
- QIMD 2
- QIMD 3
- QIMD 4
- QIMD 5 (most deprived)

CHD deaths

Year

Observation

IMPACT_{NCD}
RESULTS (PRELIMINARY)
Current implementation (by 2030)
Current implementation (by 2030)

Incremental cumulative costs (£)

Incremental cumulative effects (QALYs)
Uptake to 66%, participation cost £15
Coverage to 20% per year
Prescription rate to 80% (mid-high risk)
Long-term healthier lifestyle

• 50% of middle and high-risk participants (QRISK > 10) increase their F&V consumption by 1 portion,
• their physical activity by 1 active day per week,
• and they decrease their BMI by 1%.
• Those with BMI >50 kg/m² have bariatric surgery and reduce their BMI to 30% kg/m²
• 10% of smokers will achieve long term smoking cessation.
Long-term healthier lifestyle
Combined improvement

![Graph showing combined improvement](image-url)
Put things in perspective
Reduce BMI 1% and SBP 0.8 mmHg
Results

EQUITY
Absolute equity

Incremental cumulative effects (QALYs)

QIMD 1
least deprived

QIMD 2

QIMD 3

QIMD 4

QIMD 5
most deprived

Current

Combined

Structural

Increasing deprivation
Relative equity

- QIMD 1 (least deprived)
- QIMD 2
- QIMD 3
- QIMD 4
- QIMD 5 (most deprived)

Proportional effects (QALYs)

Current, Combined, Structural

Increasing deprivation
Conclusions

• Current local implementation of Health Checks is likely not cost-effective and is likely to increase relative health inequalities

• Achieving maximum optimisation (combined scenario), Health Checks is likely to become cost-effective but may still increase relative health inequalities

• The addition of structural policies to current implementation it is likely to be cost saving and reduce inequalities
Thank you!
IMPACT NCD-Liverpool

Inputs
- Health Survey for England North West (exposures & their correlations)
- Population vital statistics from local authority
- Effect sizes from meta-analyses
- Scenario assumptions

Process
- Create a close to reality synthetic population of Liverpool
- Evolve the synthetic population over time, under a set of stochastic rules grounded on epidemiological principles and using local data

Outputs
- Utility from CHD/Stroke/Diabetes
- Costs (implementation/CHD/Stroke/Diabetes/HTN)
- Distributional nature of them (can explore impact on socioeconomic inequality)
Dynamic Synthetic Population (close-to-reality)

Policy

Statistics

Demographic Projections

Social Epidemiology

Exposure dynamics

Disease Epidemiology

High Quality Meta-analyses

Modelled Diseases (incidence/prevalence/mortality)

Policy Effectiveness

Policy Cost

Policy Equity

Extensive Validation
Define age, sex and socioeconomic status of synthetic individuals

Estimate behavioural risk factors

Estimate biological risk factors

Repeat until death or end of simulation
IMPACT\textsubscript{NCD} hierarchical engine

- Age, sex, socioeconomic status
- Modelled interventions
  - Salt
  - Fruit & Veg
  - Smoking
  - Passive smoking
  - Physical activity
  - Body mass index
  - Systolic blood pressure
  - Total cholesterol
  - Diabetes mellitus

- Coronary heart disease risk (incidence/prevalence)
- Stroke risk (incidence/prevalence)
- Relevant cancers risk (incidence/prevalence)

- Coronary heart disease mortality
- Stroke mortality
- Relevant cancers mortality
- All other causes mortality
Model validation 2

QIMD 1
least deprived

QIMD 2

QIMD 3

QIMD 4

QIMD 5
most deprived

Observed
IMPACT_{NCD}

Year

Stroke deaths

2011 2013 2015
2011 2013 2015
2011 2013 2015
2011 2013 2015
2011 2013 2015

0 40 80 120
Model validation 3

QIMD 1
least deprived

QIMD 2

QIMD 3

QIMD 4

QIMD 5
most deprived

Observed
IMPACT_{NCD}

All-cause deaths

Year
Uptake to 66%, coverage to 20%, participation cost £15. Concentrated to the most deprived quintile.