MRC | Epidemiology Unit

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Modelling scenarios for NHS Health Check using Microsimulation

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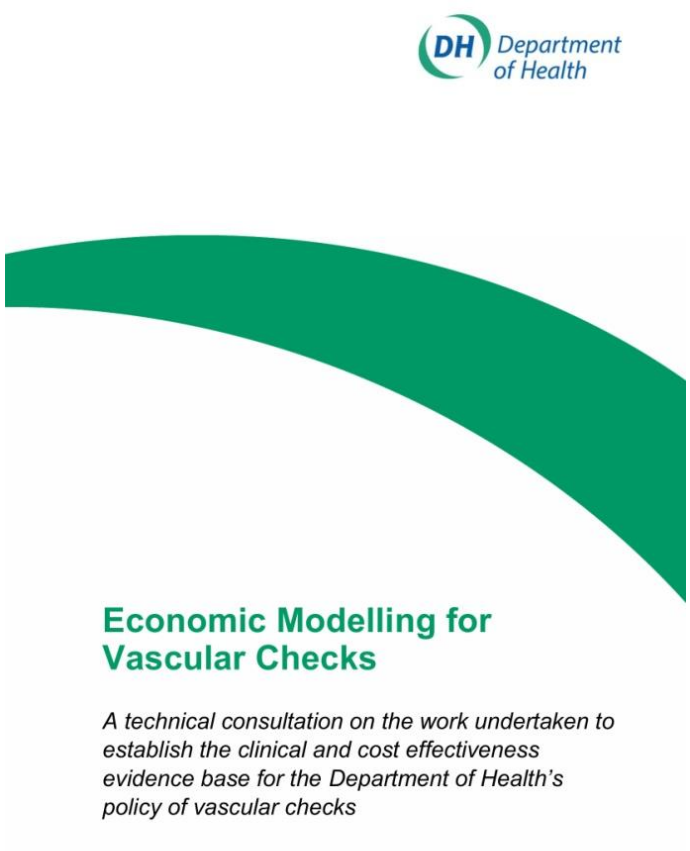
Introduction

- Overview and aim of this presentation:
  - Why modelling?
  - Advantages of microsimulation
  - Example: Cholesterol and Statins

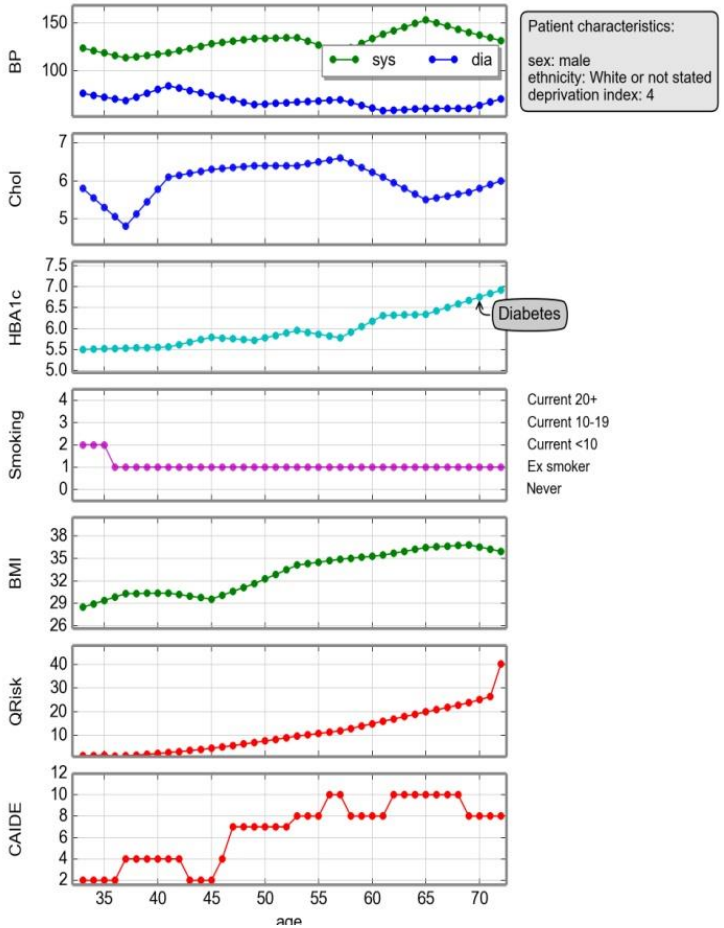
Why modelling?

- Including knowledge available since 2008
- Focussing on eligibility
- Refined methodological approach

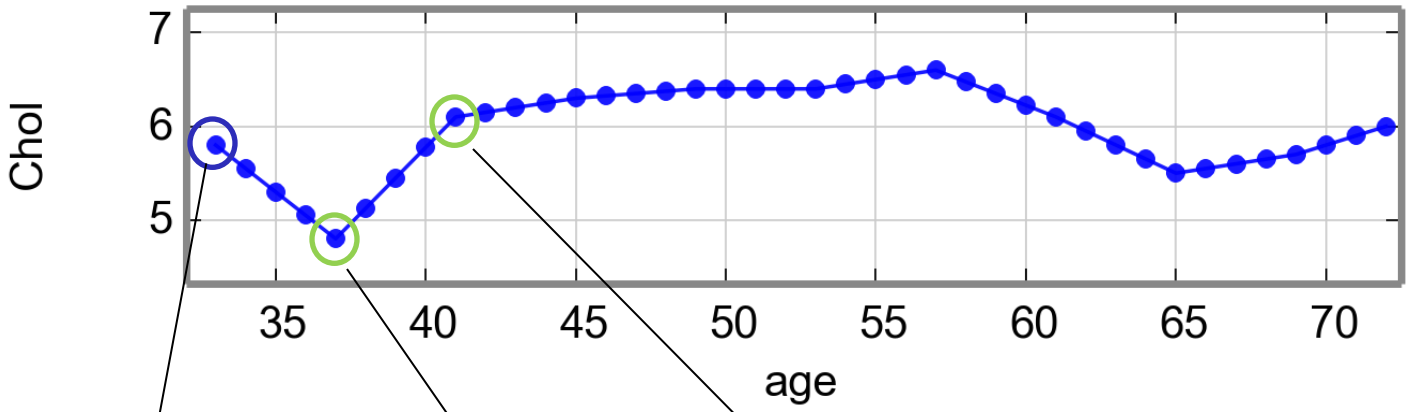


Modelling approach: Microsimulation

- Microsimulation:
  - An individual-level simulation over time
- Main advantages:
  - Population to individual level
  - Capturing individuals' variability



Example: Cholesterol trajectory

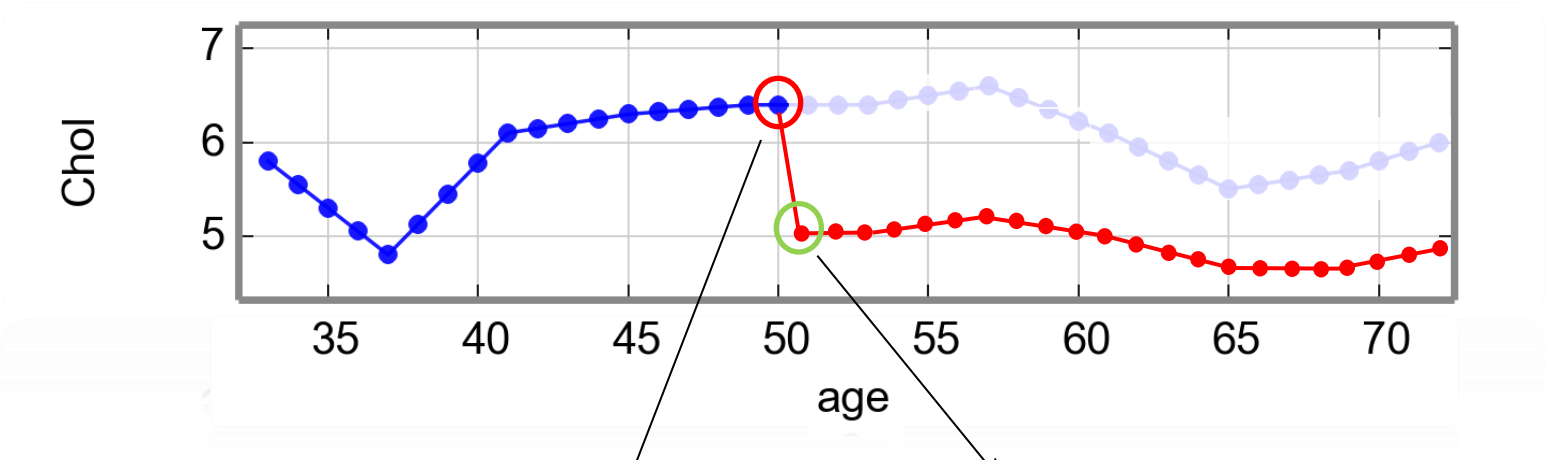


Rematch to new individual from ELSA

Individual from HSE:
Male, age 33,
Eth=1, qimd=4,
chol=5.8, BMI=28.5

Match to individual from longitudinal dataset (ELSA):
Based on age, cholesterol, BMI

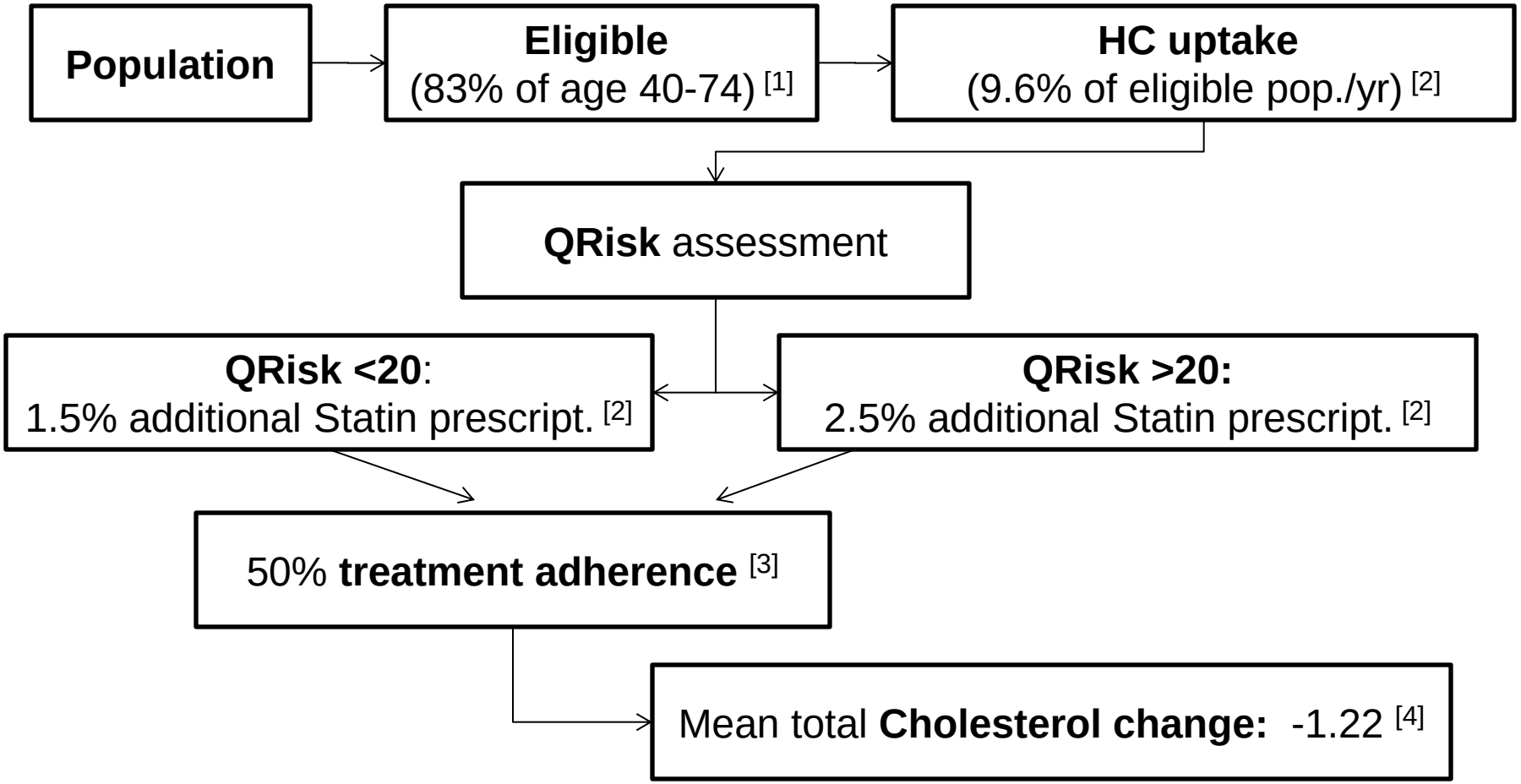
Example: Cholesterol trajectory



Rematch to new individual from ELSA

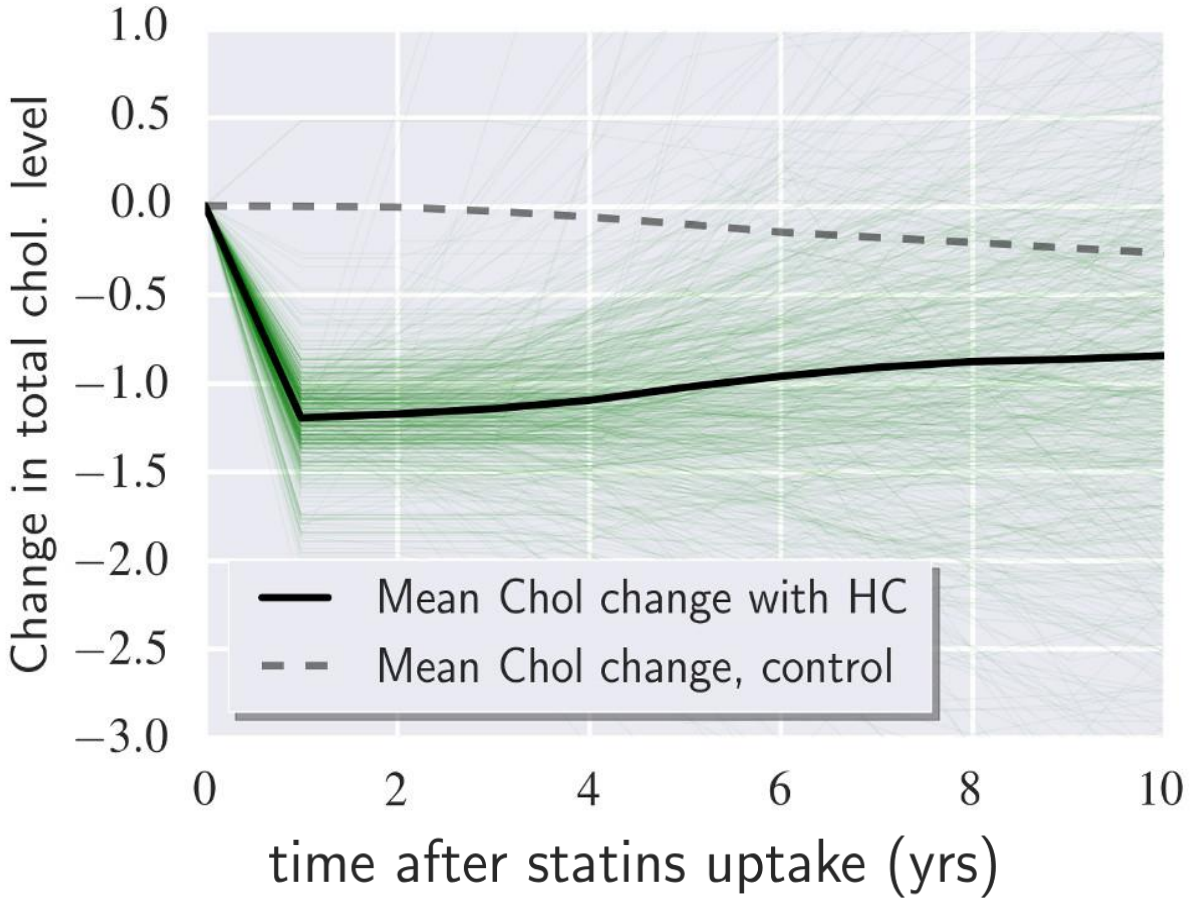
Health Check, Statin prescription

Model pathway: Cholesterol and Statins

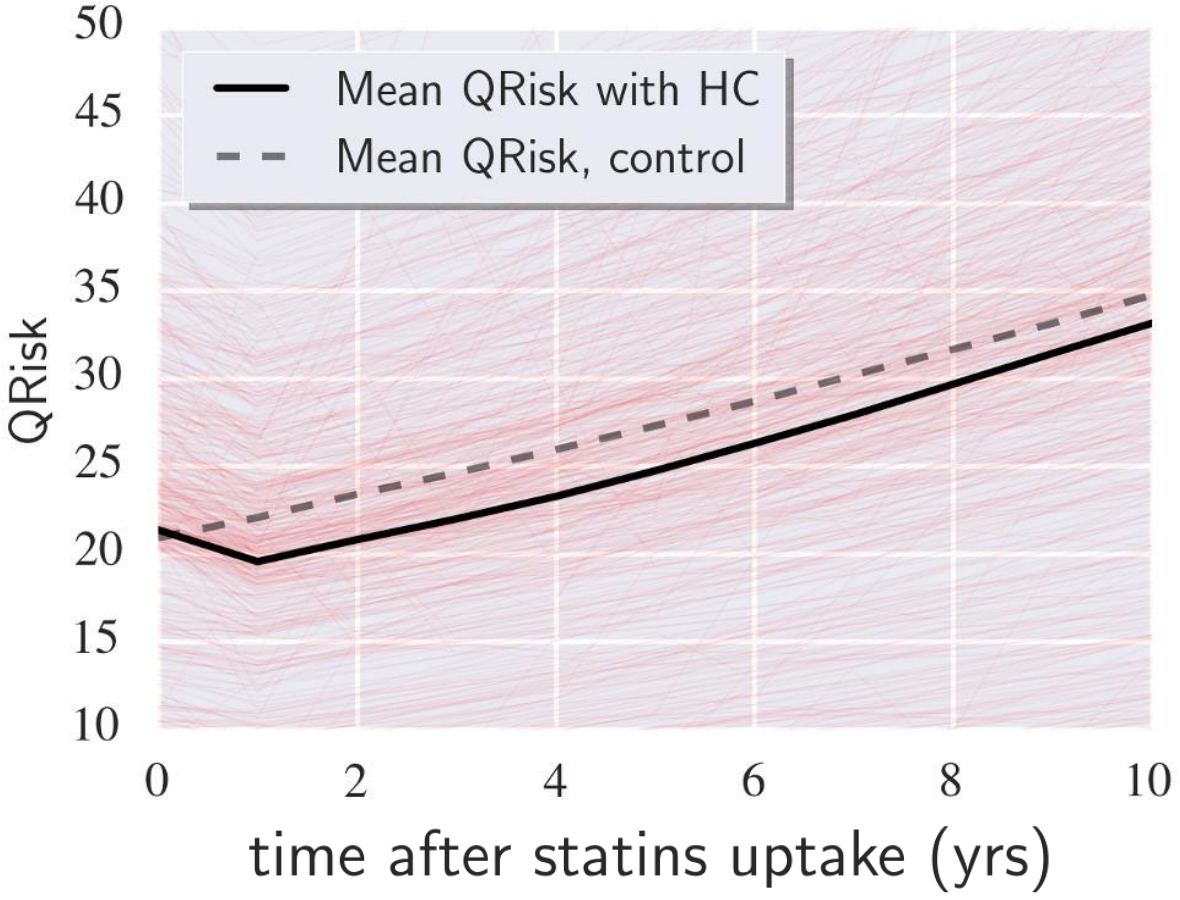


Sources: [1] DH website (2014/15), [2] Robson et al. (2014), [3] Lemstra et al. (2012), [4] Cholesterol treatment trialists (2015)

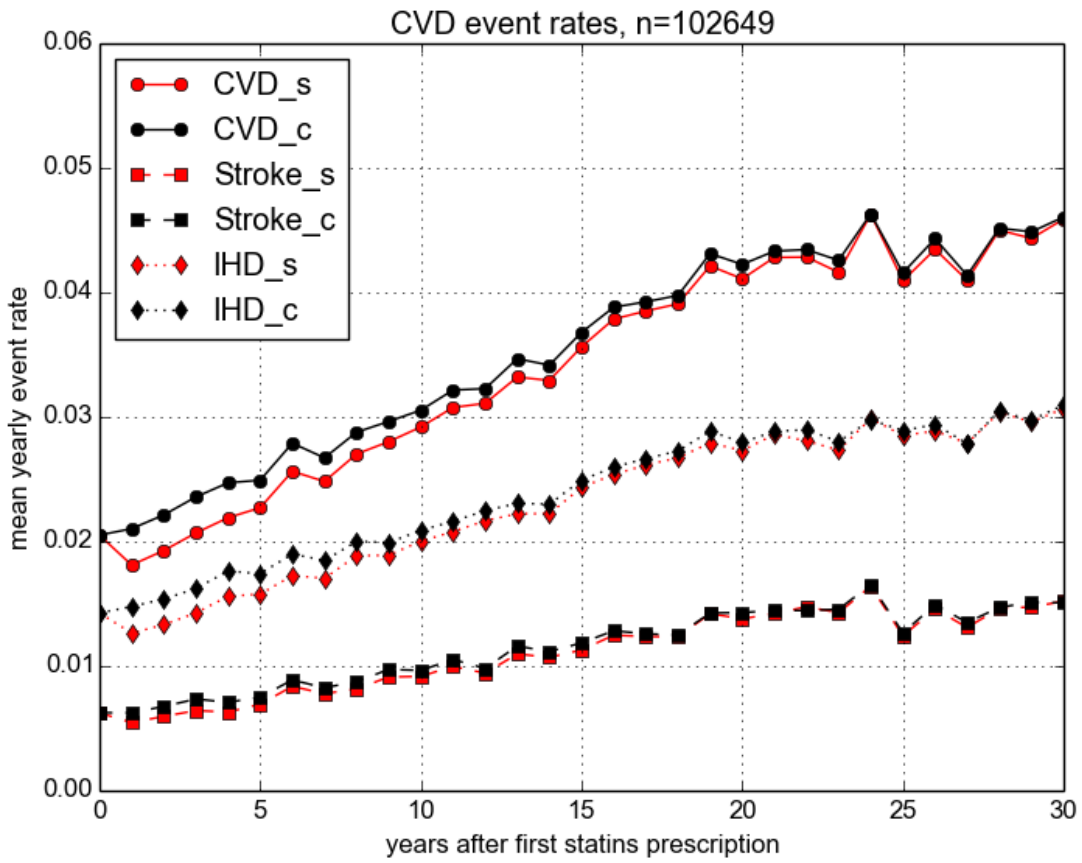
Comparing HC vs. no HC for statin takers



Comparing HC vs. no HC for statin takers



Comparing HC vs. no HC for statin takers



Summary

- We built a microsimulation model around part of Health Check programme
- Comparison between simulations with vs. without Health Check possible
- Model focus on simulating what-if scenarios around eligibility and uptake of Health Check

Thanks

- **James Woodcock**, MRC Epidemiology Unit
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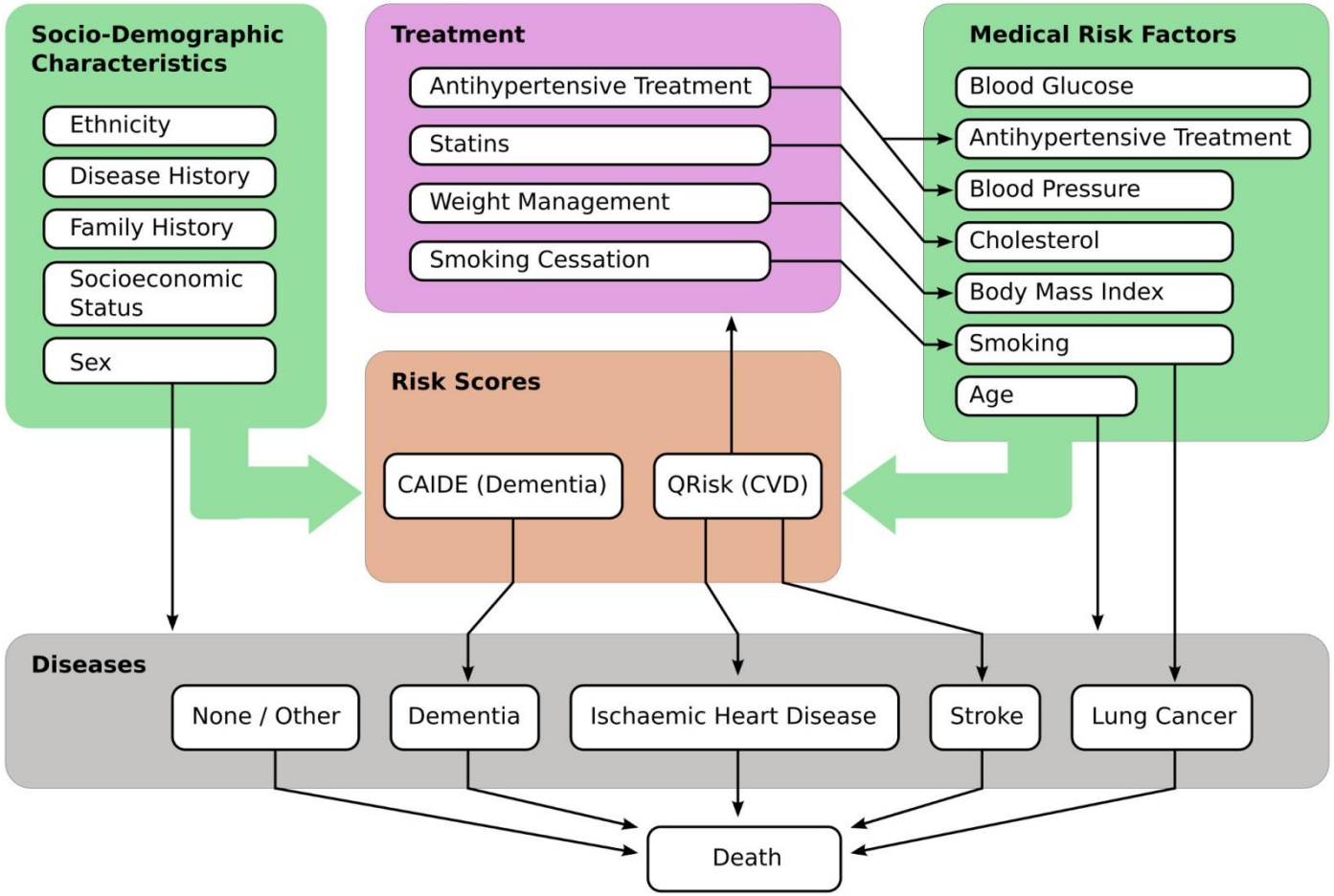
Model characteristics

- This model is **based on cross-sectional and longitudinal datasets** which are combined for the simulation over time (individual risk factor trajectories)
- Model assumes that **longitudinal data capture current treatment**
- Model focus on **CVD, Dementia and Lung cancer**
- Risk factors: **BP, BMI, Cholesterol, Smoking, HbA1c**

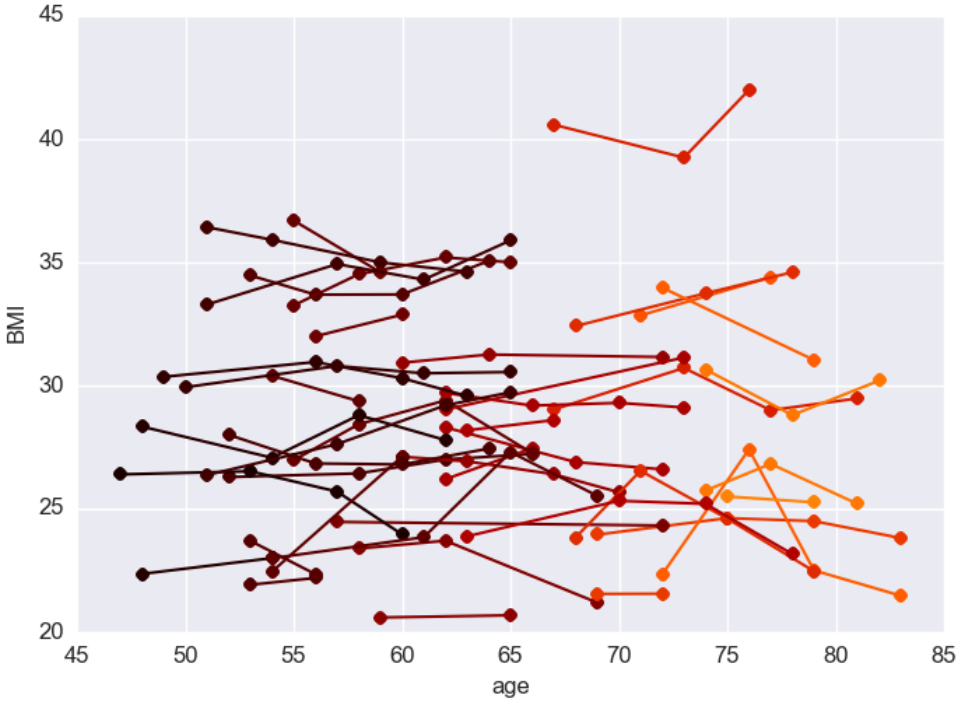
Diseases

- **CVD**: probability of event from **Qrisk:**.
  - 10-year risk annualised using incidence data, based upon age and sex
- **Dementia**: probability of eventfrom:
  - **Age <60: CAIDE risk score**
  - **Age >60**: following life table trend
- **Lung Cancer**: probability of event from life table ata, based on age/sex, data from cancer registry
- **Case fatality / mortality** data: ONS death statistics

Diseases and Treatment overview



Modelling risk factor trajectories



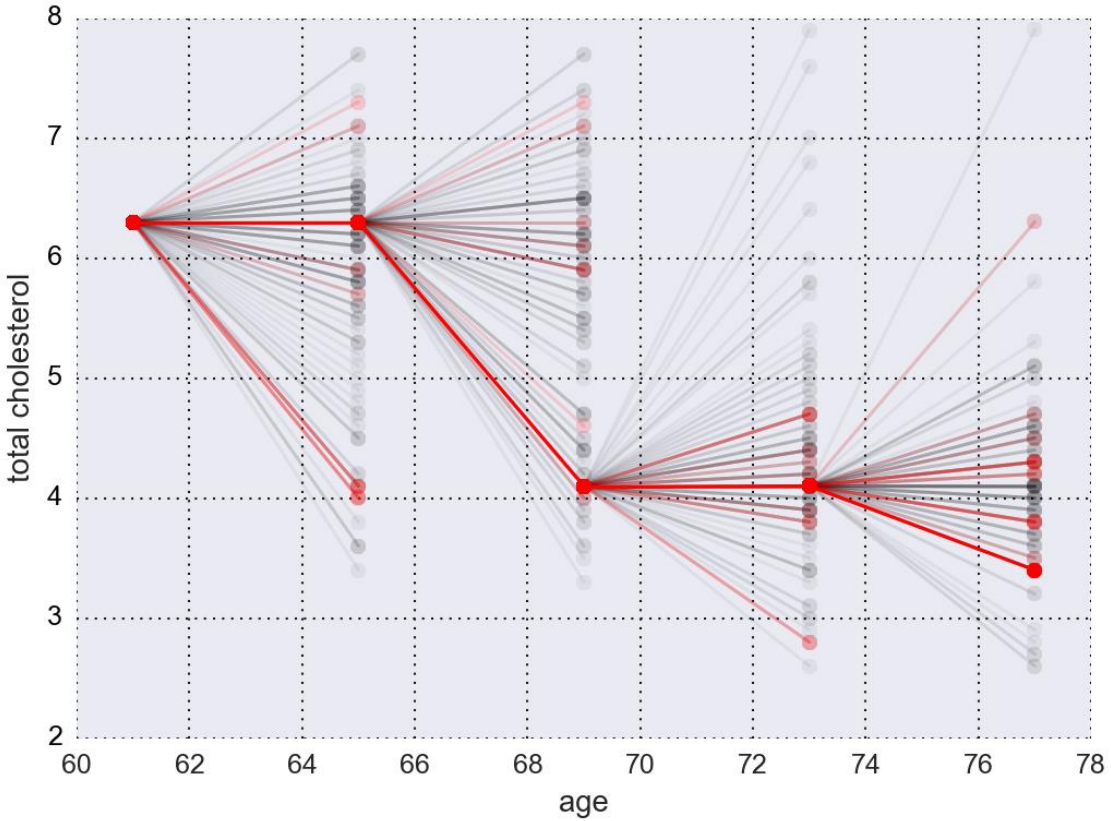
Some data from ELSA:

BMI measurements and follow-ups for a random subset of individuals

- Objective: Finding individuals in ELSA with corresponding characteristics, applying their change in risk factor over next 4 years

Modelling risk factor trajectories

Sampling process example: Cholesterol trajectory

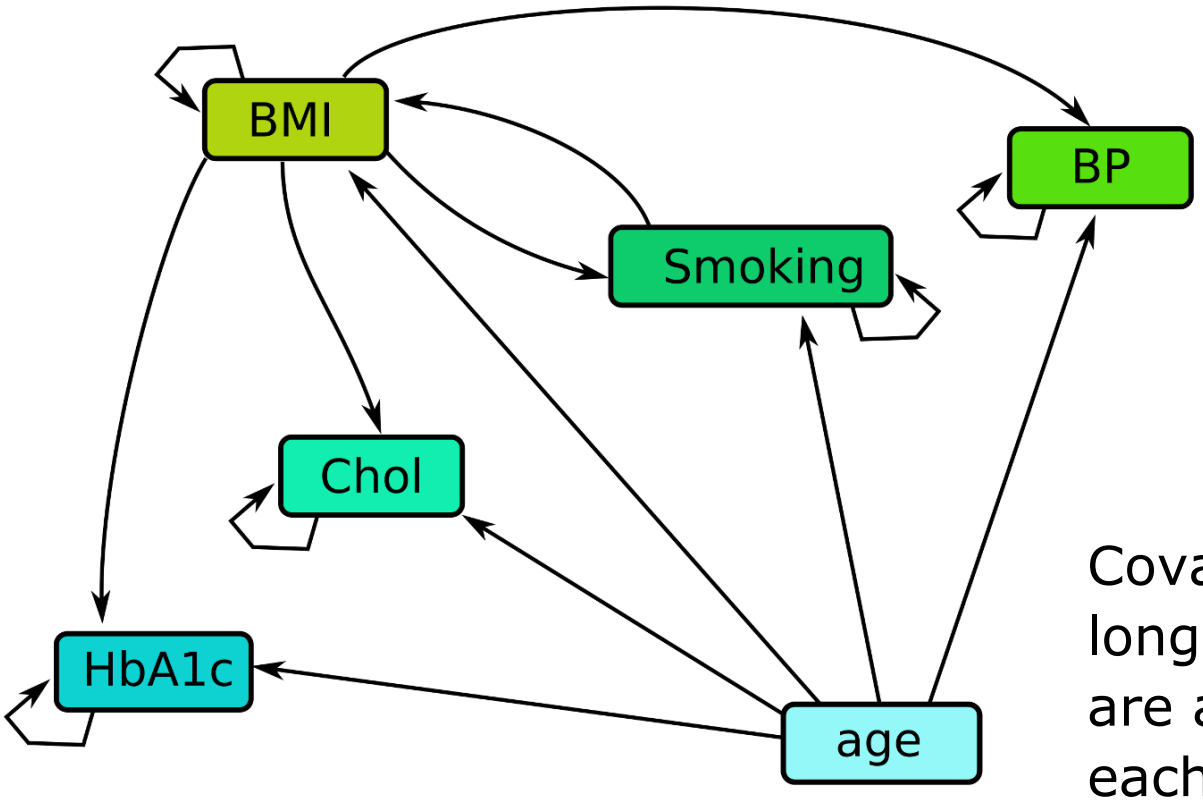


Grey: potential delta chol, based upon sex/chol categories

Red (faint): restricted pool of delta chol

Red (thick): sampled delta chols from restricted pool

Core model – Modelling trajectories



Covariates in longitudinal data that are assumed to predict each CVD risk factor

Health check Uptake - Data

- 20% of eligible population is offered a HC each year.
- We assume that 9.6% of total eligible population receive a HC each year
- 48% of eligible population receives HC each year.
- Based on 2014/15 DH figures of 19.7% of eligible population offered HC in 2014/15, and 48.8% of these taking up.
- Uptake among non-eligible individuals based upon chronic condition estimated at 5% per year.

Treatment – Data on who gets treated

- Smoking: 6.8% of smokers are referred to smoking cessation
- Obesity: 38.7% of people with BMI >= 30 are referred to diet and exercise
- Statins:
  - Qrisk < 20, 2.05% additional prescription
  - Qrisk > 20: 14.2% additional prescriptions
- Anti-HT:
  - Qrisk < 20: 1.5% additional prescriptions
  - Qrisk > 20: 2.5% additional prescriptions

Treatment – Data on effect

- Smoking cessations: 14.6% of those referred have quit after 1 year
- Weight management:
  - average change -2.0 BMI in completers -0.7 in non-completers,
  - Adherence 58% (completers)
- Statins:
  - Mean change of -1.22 in total cholesterol
  - Adherence 50%
- Anti-HT:
  - Age-dependent changes of SBP and DBP, between -3.1 and -9.0 for SBP
  - Adherence 55%

Treatment – Example: Smoking Cessation

- Trajectories from ELSA suggested higher quit rates and lower relapse rates after quitting than observed in studies.
- For smoking, assuming people are ex-smokers if there are two consecutive records of not smoking.
- Probabilistically, we reduce the quit rate from 6.5% in ELSA to 5%
- Probabilistically, we increase the relapse rate to 37% over 10 years.