Findings from the latest Health Survey for England (HSE) reports

London, UK

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CVD risk trends in South Africa and England

Findings from the ExPoSE project

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UCL

UKRI Economic and Social Research Council

1. Project overview
2. Methods
   - Data sources & analysis
   - Risk scores
   - Statistics
3. Comparing CVD risk trends in England & South Africa (1998-2017)
   - Trends in CVD risk and major bio-behavioural risk factors
   - Socioeconomic patterns
   - Variance explained and adjusted CVD trends
   - Treatment effects

1. Project Overview

ExPoSE

Explaining **Po**pulation trends in cardiovascular risk: A comparative analysis of health transitions in **S**outh Africa and **E**ngland

Collaborating institutions:

Funded by:

Research questions

1. What are the population trends in CVD risk in South Africa since its first national health survey in 1998?
2. To what extent are these trends explained by demographic, behavioural, social, environmental, health-related and/or other factors?
3. How do these results compare to those in a high-income country with a different infectious disease profile such as England over the same time period?

2. Methods

Harmonise & preprocess data

Examine population trends in CVD risk

Identify potential explanatory variables

Explain trends over time

Data sources

England:

- 17 nationally-representative cross-sectional surveys from the Health Surveys for England (HSE), 1998-2017
- Harmonised by Dr Shaun Scholes, UCL HSSRG

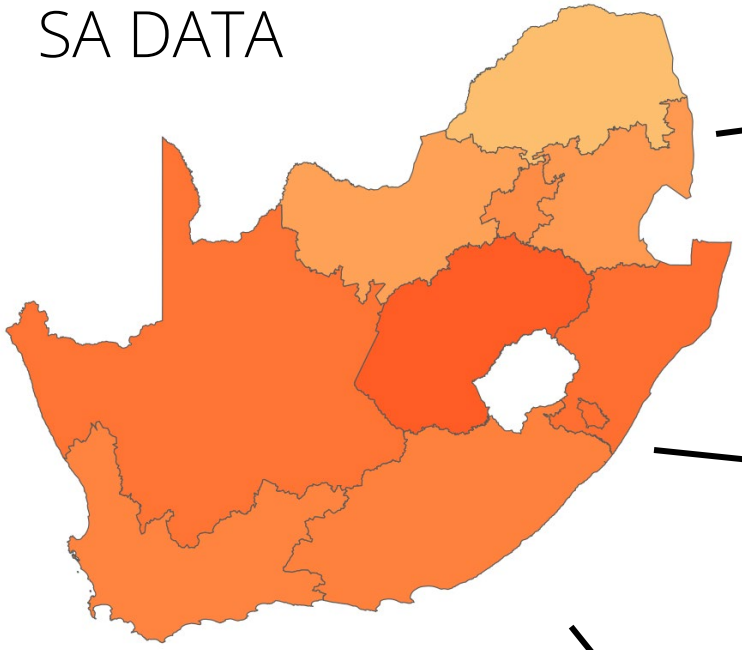
South Africa:

- 11 Nationally-representative cross-sectional surveys from South Africa 1998 through 2017
  - DHS 1998, DHS 2003, SAGE 2007-8, NIDS 2008, NIDS 2010-11, SANHANES 2012, NIDS 2012, NIDS 2014-15, SAGE 2014-15, DHS 2016, NIDS 2017

Implausible values cutoffs applied to measurements

Variable	Cutoffs to identify implausible values
Height	Height<120 cm or height > 220 cm
Weight	Females: Weight<25 Kg or weight > 250 Kg; Males: Weight <35 Kg; Weight > 250 Kg
Body mass index (BMI)	BMI < 10 kg/m^2 or BMI>131 kg/m^2
Waist circumference	Waist < 30 cm or waist > 220 cm
Hip circumference	Hip circumference < 40 cm or hip circumference > 230
Systolic blood pressure (SBP)	SBP < 60 mmHg or SBP > 270 mmHg SBP readings were set to missing if less than 15 mmHg greater than the corresponding DBP reading.
Diastolic blood pressure (DBP)	DBP < 30 mmHg; DBP > 150 mmHg. DBP readings were set to missing if they were less than 15 mmHg lower than the corresponding SBP reading.
Resting heart rate (RHR)	RHR < 20 bpm; RHR > 250 bpm
Total cholesterol	<1.75 mmol/L or >20 mmol/L or total cholesterol < HDL cholesterol
HDL cholesterol	<0.40 mmol/L or >5.00 mmol/L or total cholesterol < HDL cholesterol
HbA1c	HbA1c< 2.5% or > 25%

SA DATA

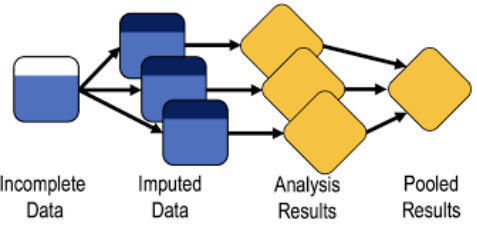


Calibration of sampling weights to consistent demographic series

Harmonise geographic subdivision

IPUMS DHS

Statistics South Africa
Preferred supplier of quality statistics



Multiple Imputation

Calculation of a wealth index comparable across surveys/time

Main outcome

10-year risk of fatal and non-fatal cardiovascular disease (myocardial infarction and stroke)

Model

Cox hazard model fitted on a pooled cohort from 85 prospective studies (10+ years follow-up, CVD free participants at baseline, followed until the first myocardial infarction, fatal coronary heart disease, or stroke event)

Predictors

pressure, history of diabetes, and total cholesterol.

Non-laboratory model

age, smoking status, systolic blood pressure, body mass index.

Calibration using age-specific and sex-specific incidences and risk factor values available from 21 global regions.

Calibration using age-specific and sex-specific incidences and risk factor values available for individual countries

Age and sex-specific trends in CVD risk and risk factors between 1998 and 2017

Adjusted CVD risk trends

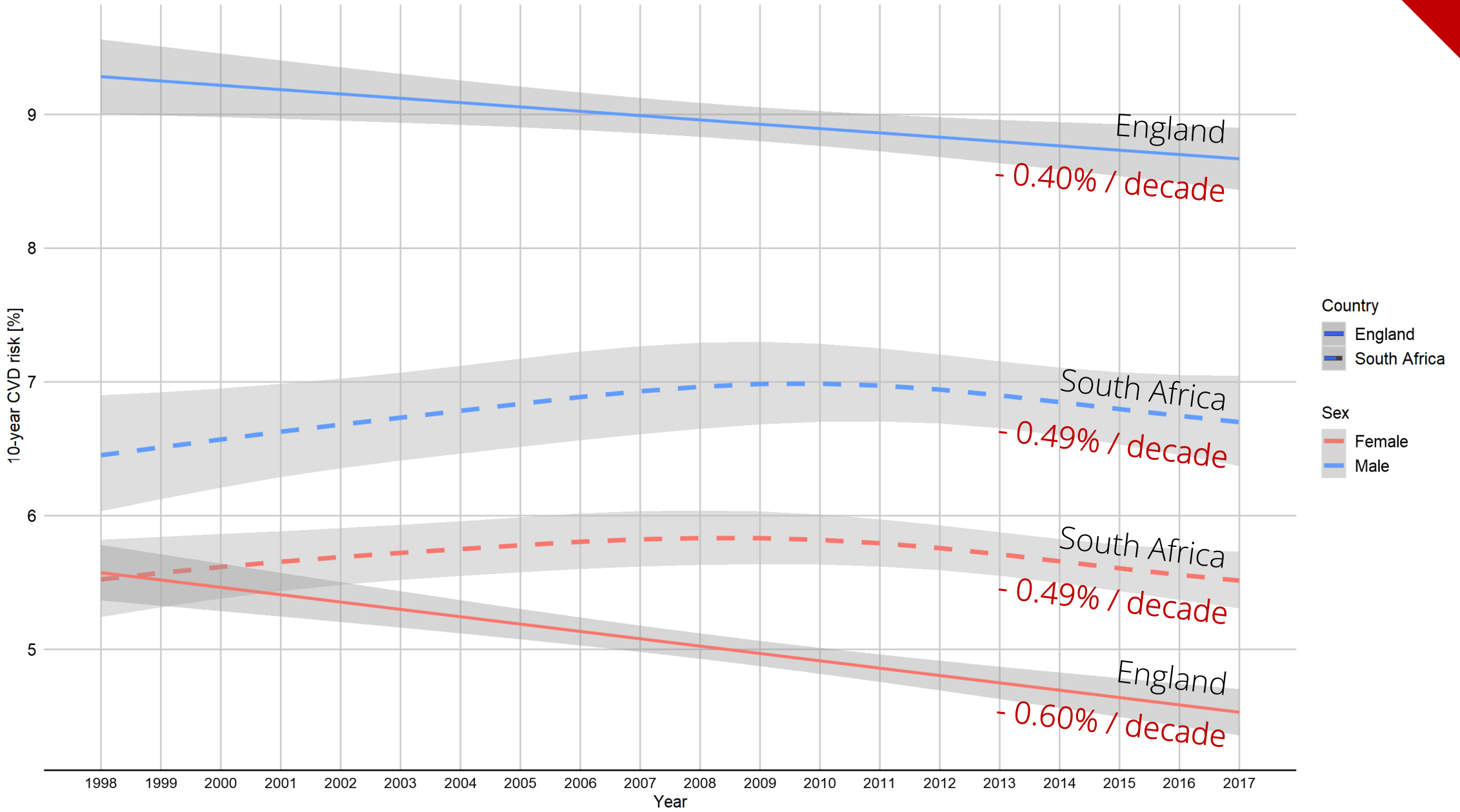
Observed and counterfactual BP & cholesterol population distributions over time

Variance Decomposition

Adjustment for seasonality

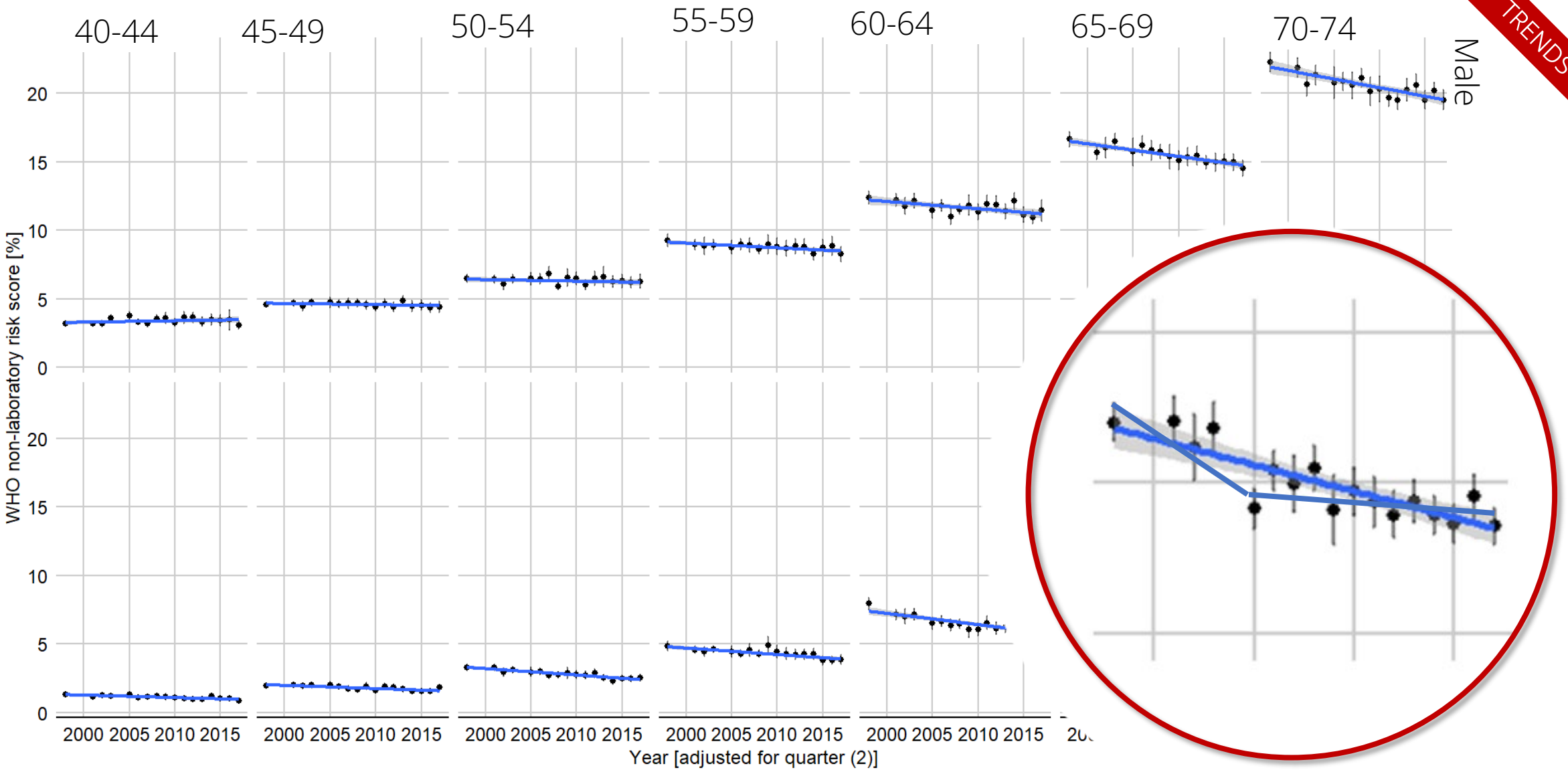
Adjustment of standard errors for survey design

3. CVD risk score trends & comparisons



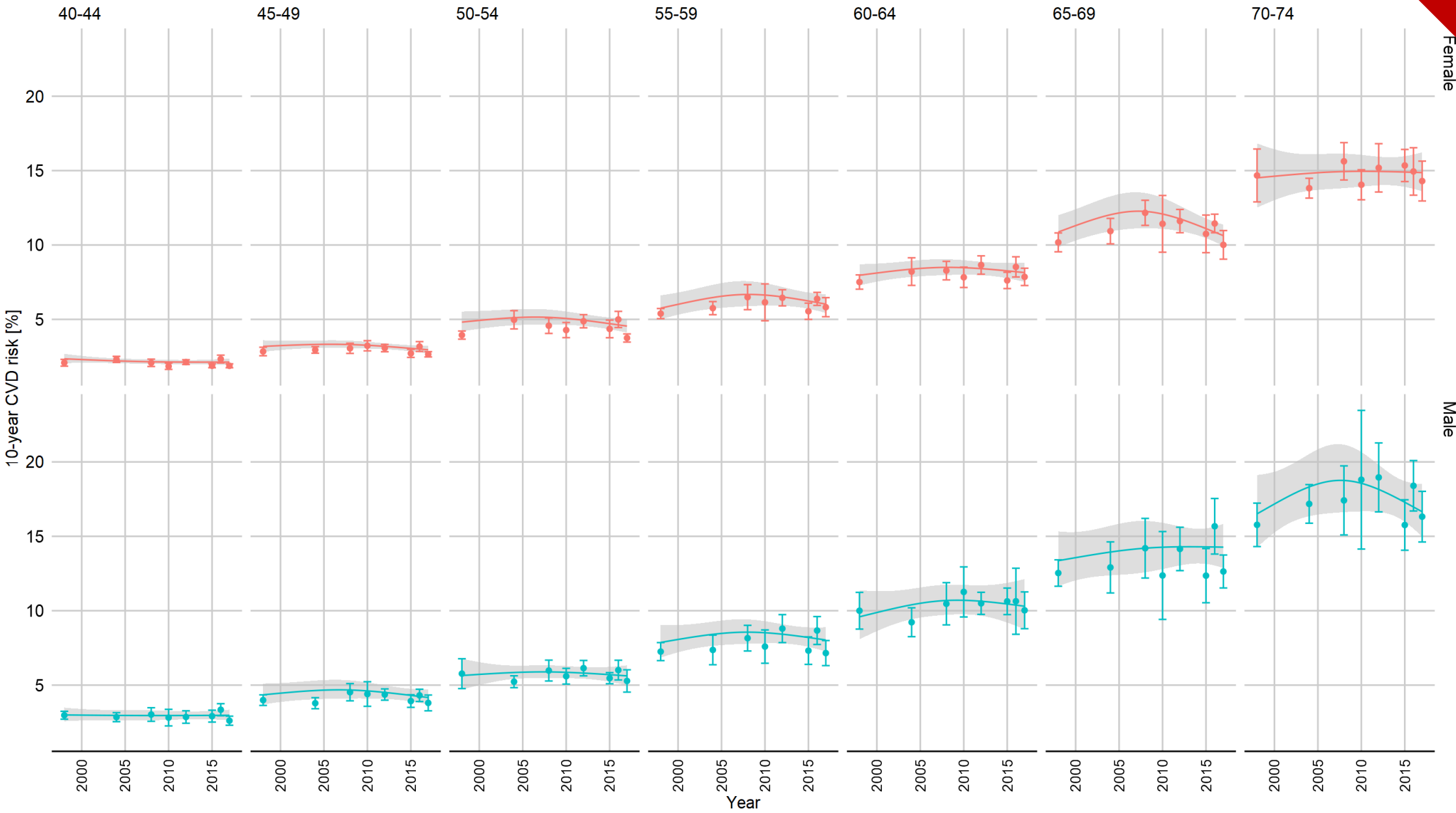
Estimated trend in CVD Risk. England and South African populations 40-74 years. By sex

WHO non-laboratory and WHO laboratory risk score. Estimates and 95% confidence intervals/bands.



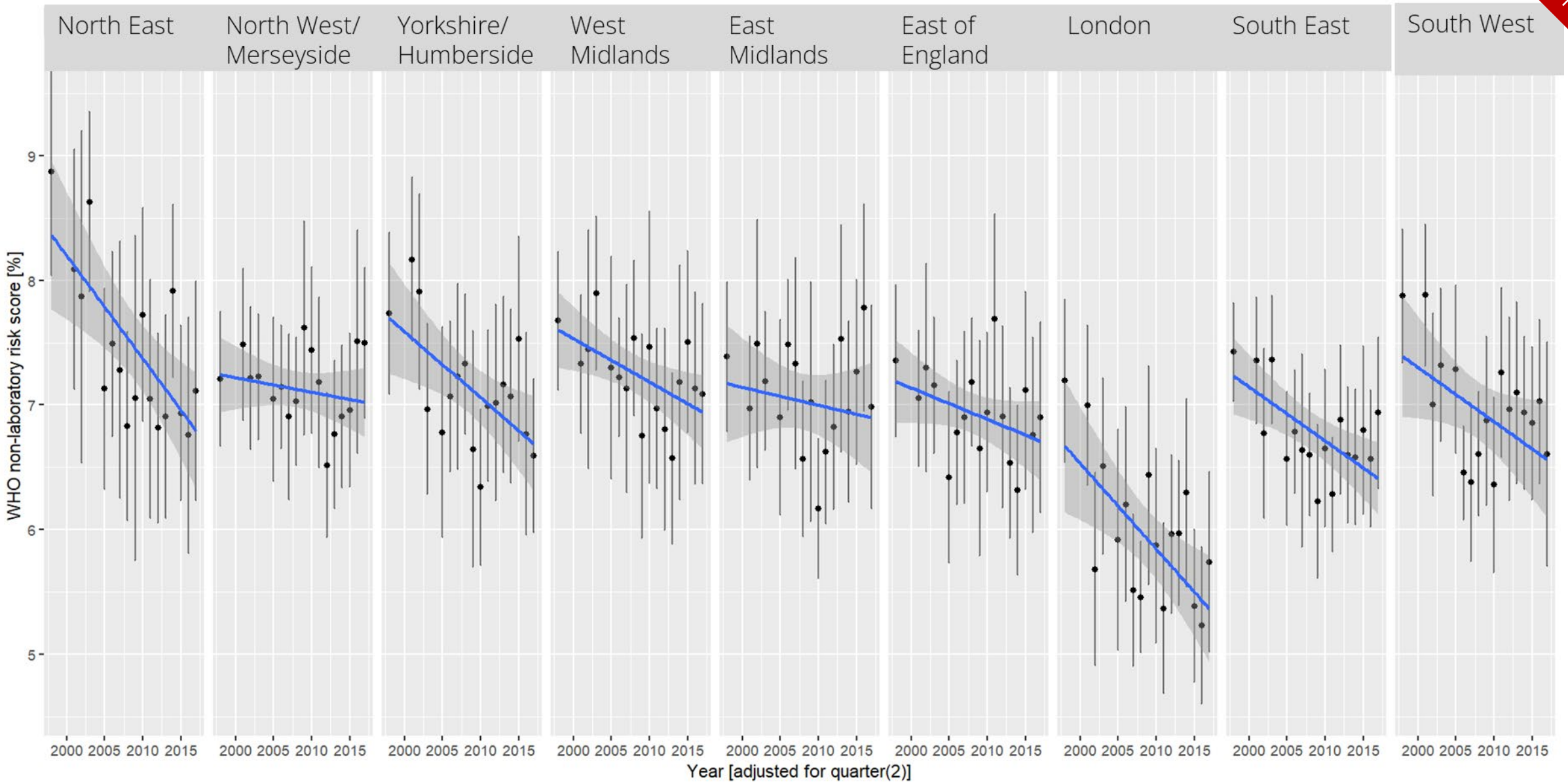
Estimated trend in CVD Risk. England population 40-74 years. By sex and age group.

WHO non-laboratory risk score. Estimates and 95% confidence intervals/bands.

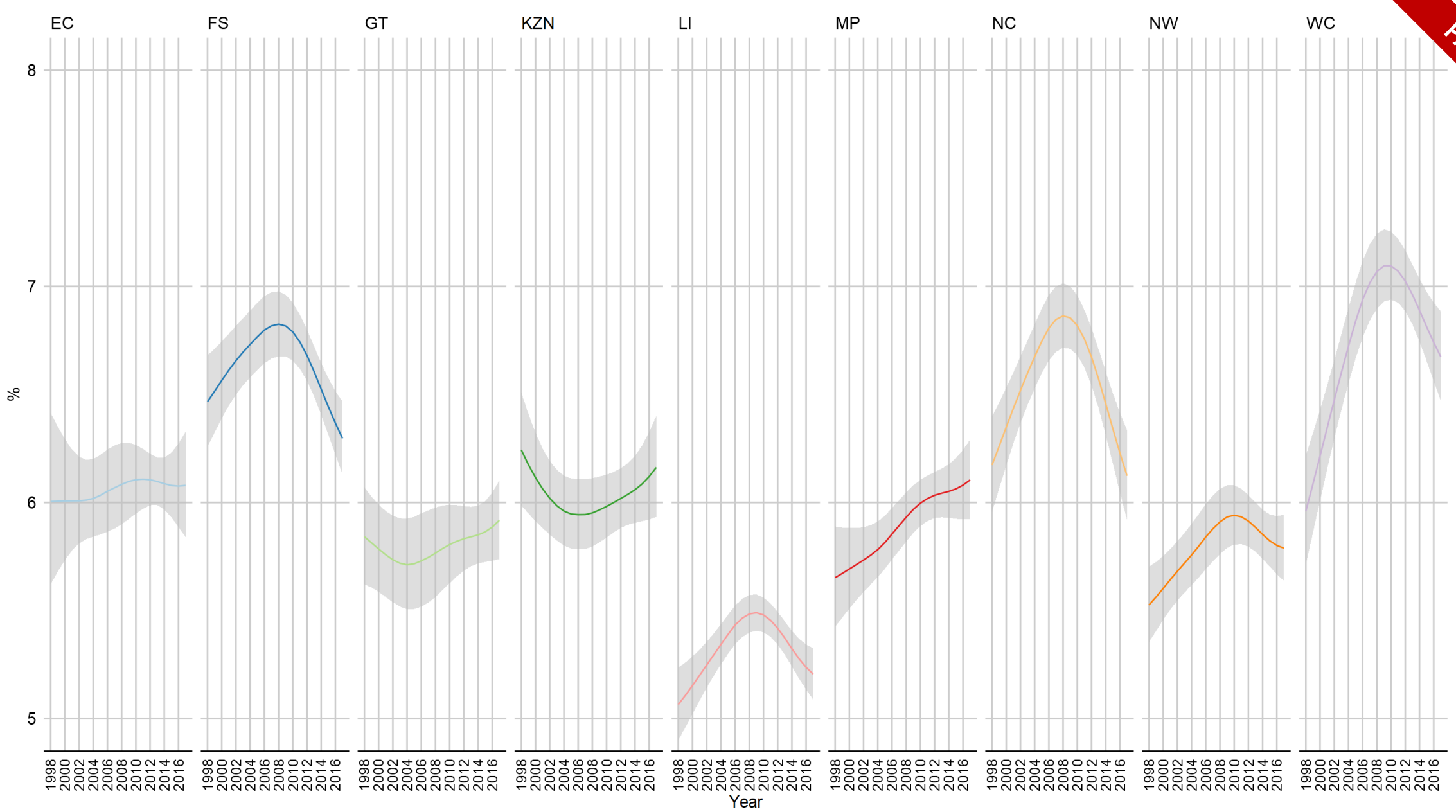


- Estimated trend in CVD Risk. South African population 40-74 years. By sex and age group.
- WHO non-laboratory risk score. Estimates and 95% confidence intervals/bands.

PATTERNS

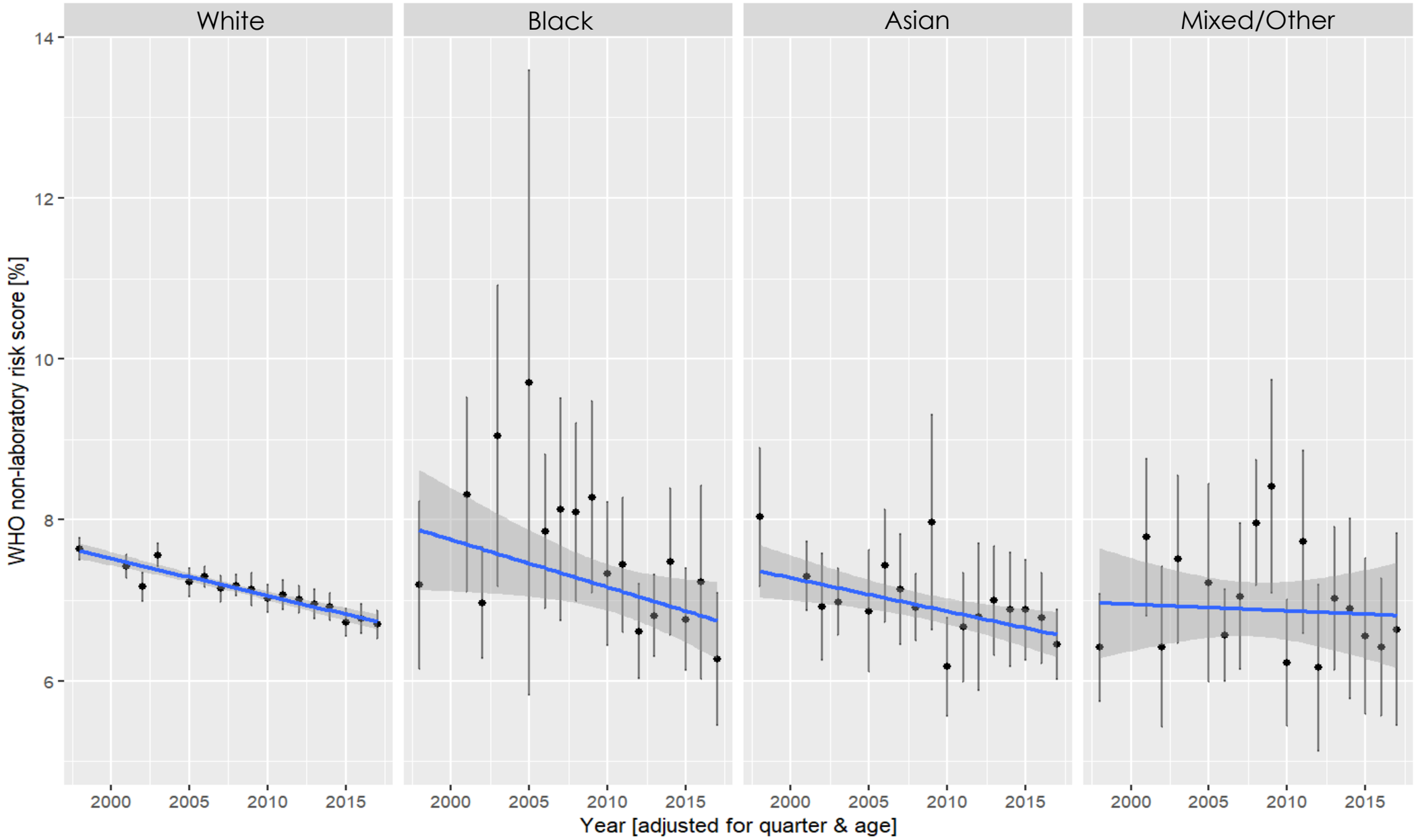


Estimated average cardiovascular risk England 40-74 years, by region.

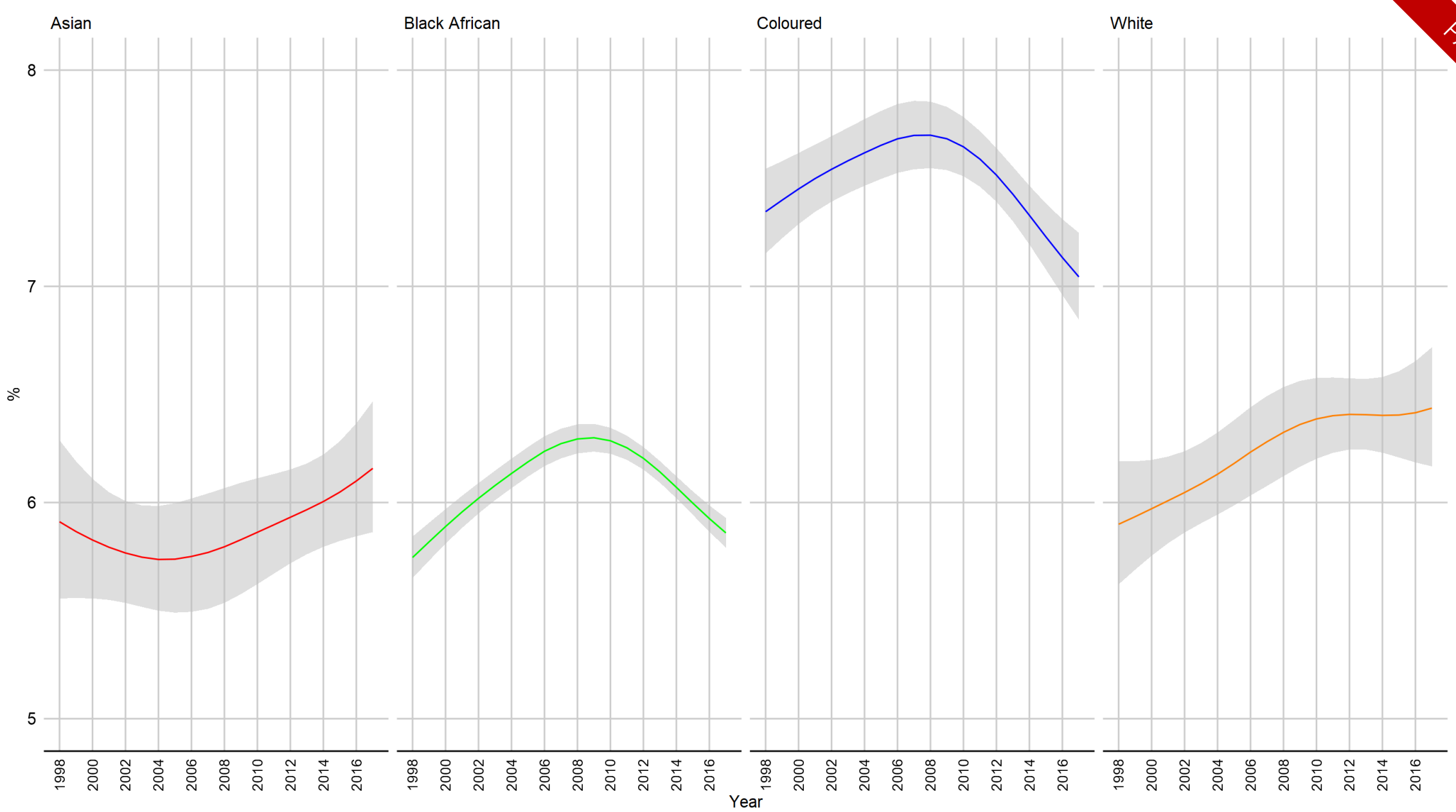


Estimated trend in CVD Risk. South African population 40-74. Age standardised, by province.

WHO non-laboratory risk score.

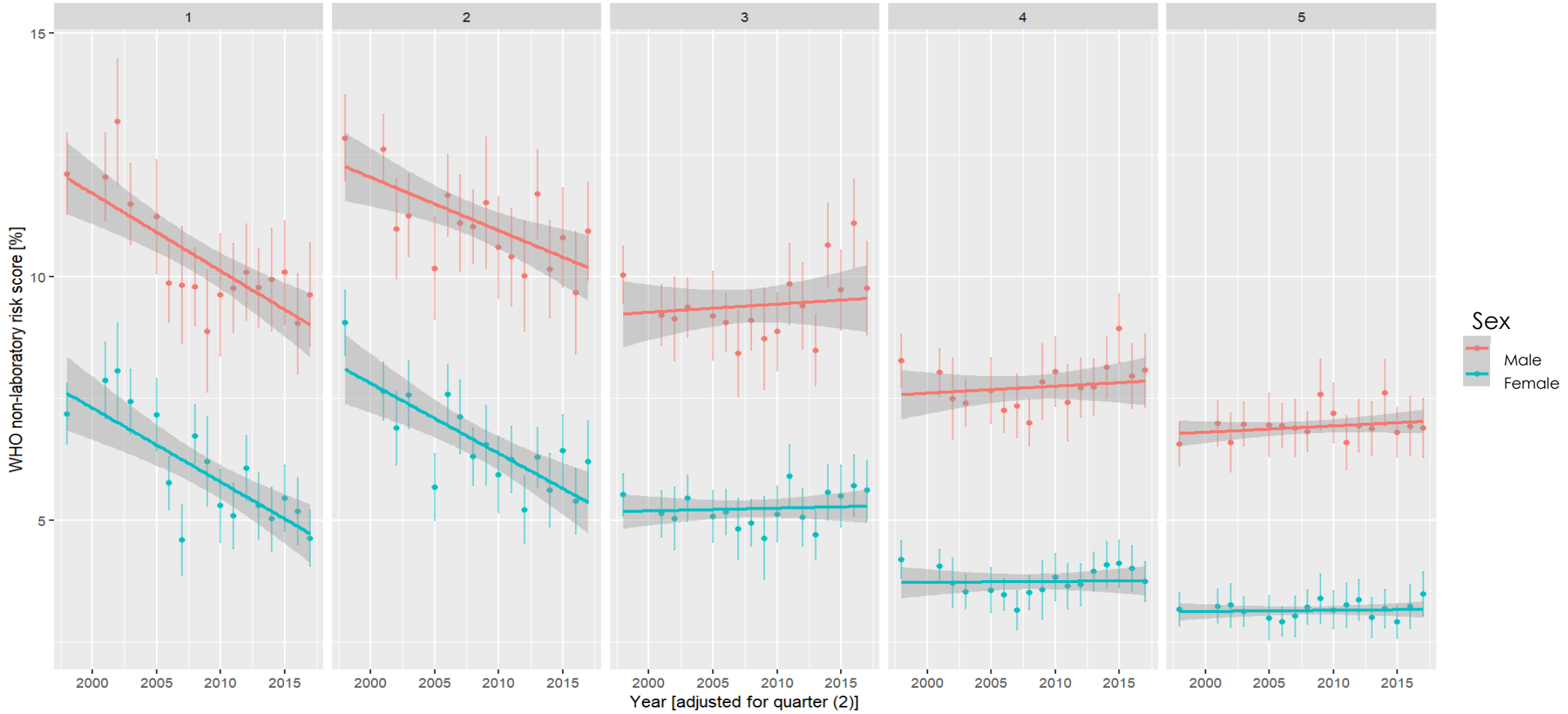


Estimated trends in CVD Risk scores by ethnicity. England population 40-74.

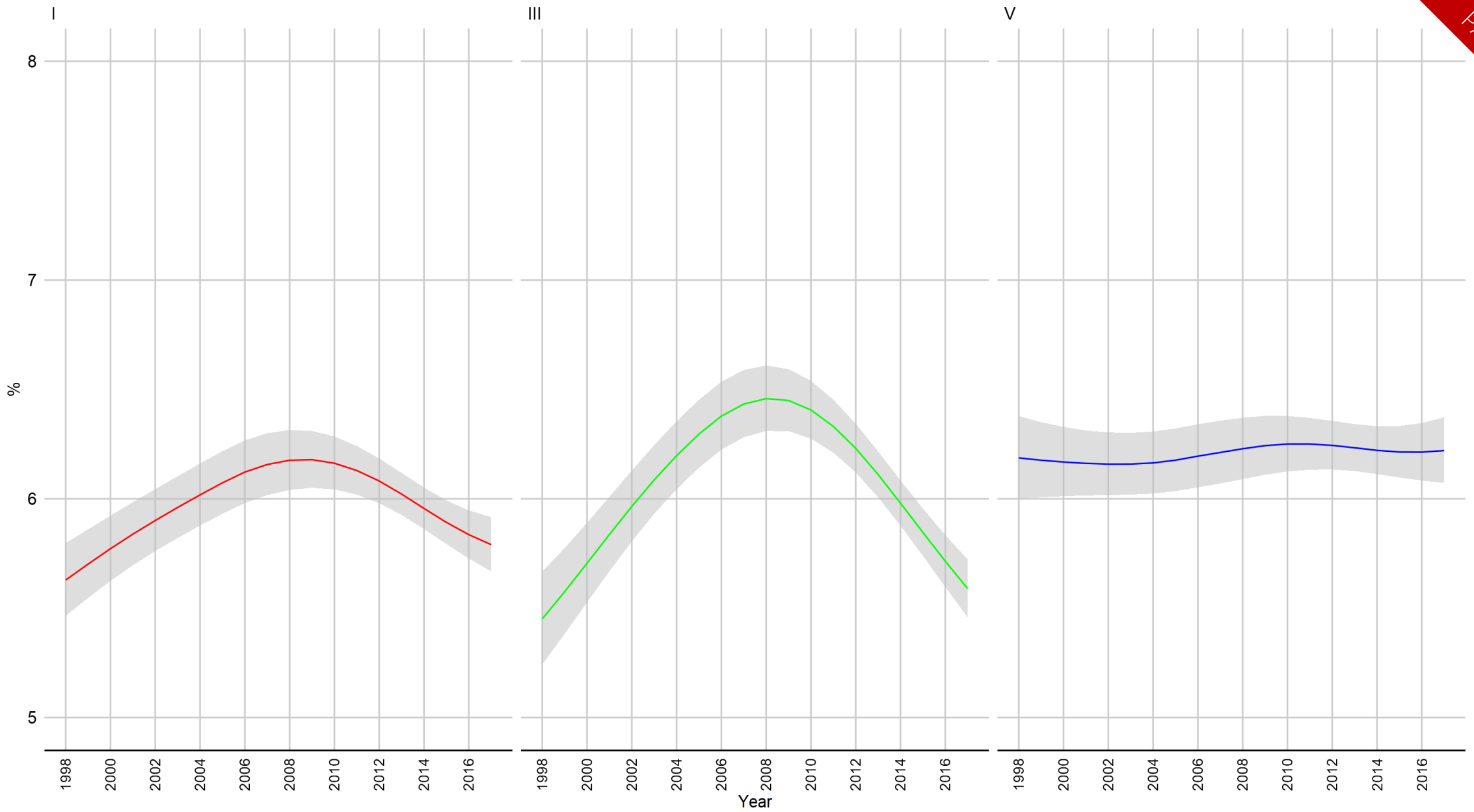


Estimated trend in CVD Risk. South African population 40-74. Age standardised. By population group and sex.

WHO non-laboratory risk score. Estimates and 95% confidence intervals/bands.



Estimated trends in CVD risk by equivalised household income quintile and sex, England ages 40-74

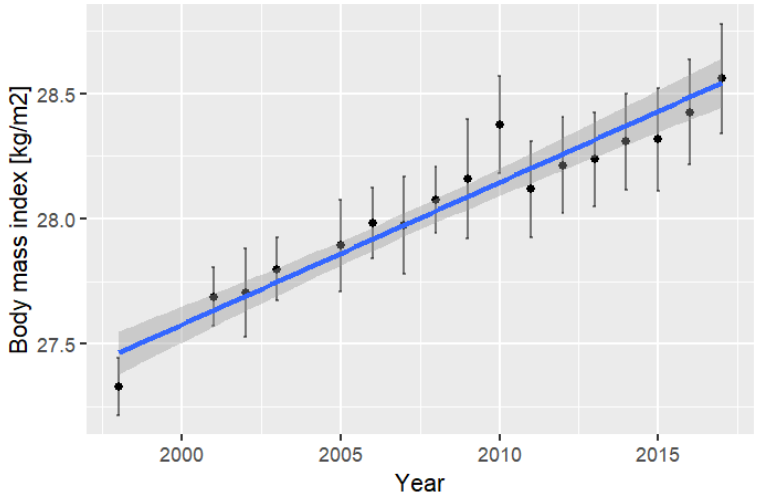


Estimated trend in CVD Risk. South African population 40-74 Age standardised. By household wealth index and sex.

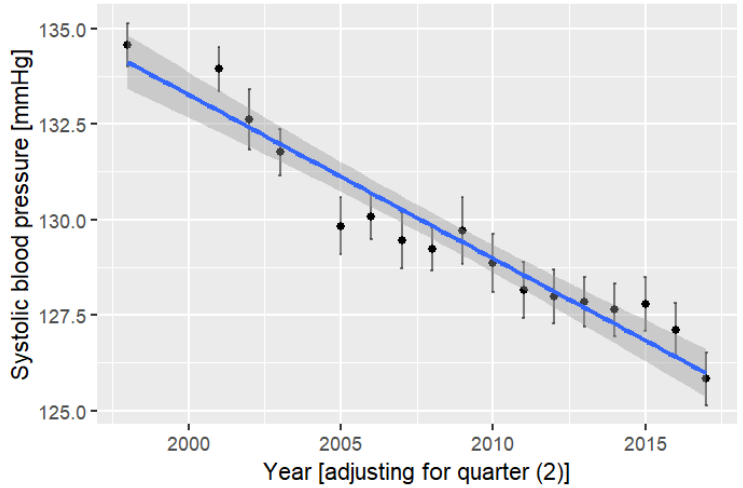
WHO non-laboratory risk score. Estimates and 95% confidence intervals/bands.

EXPLAINING

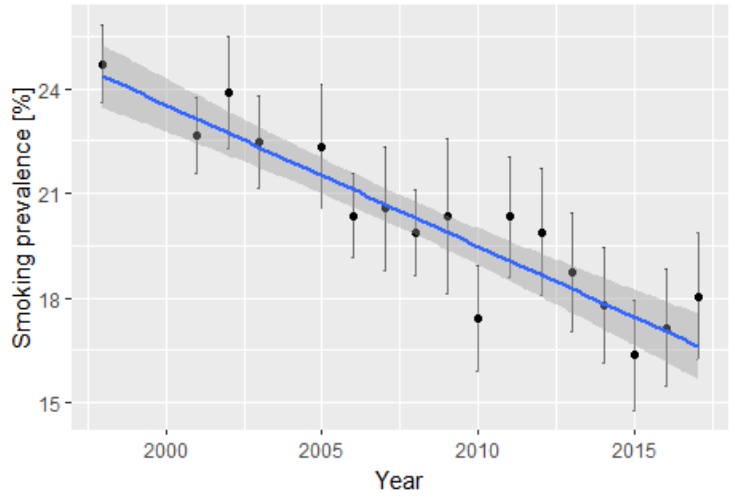
Body mass index [kg/m^2]



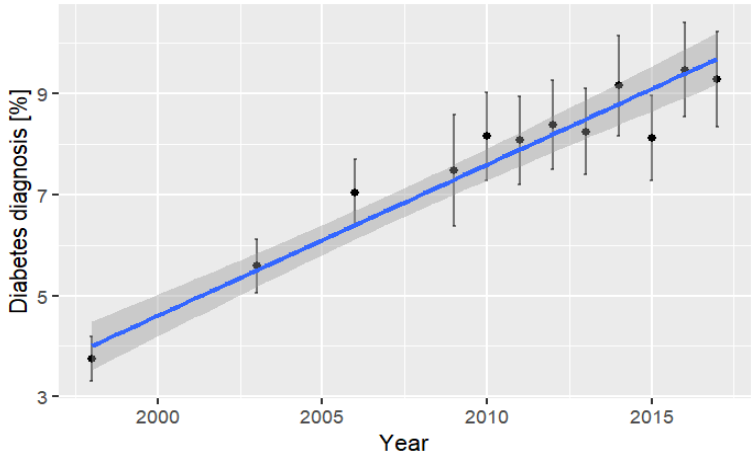
Systolic blood pressure [mmHg]



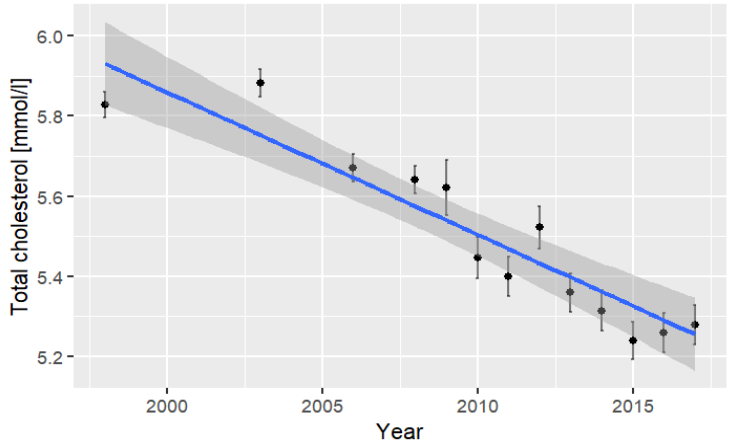
Smoking [%]



Diabetes diagnosis [%]



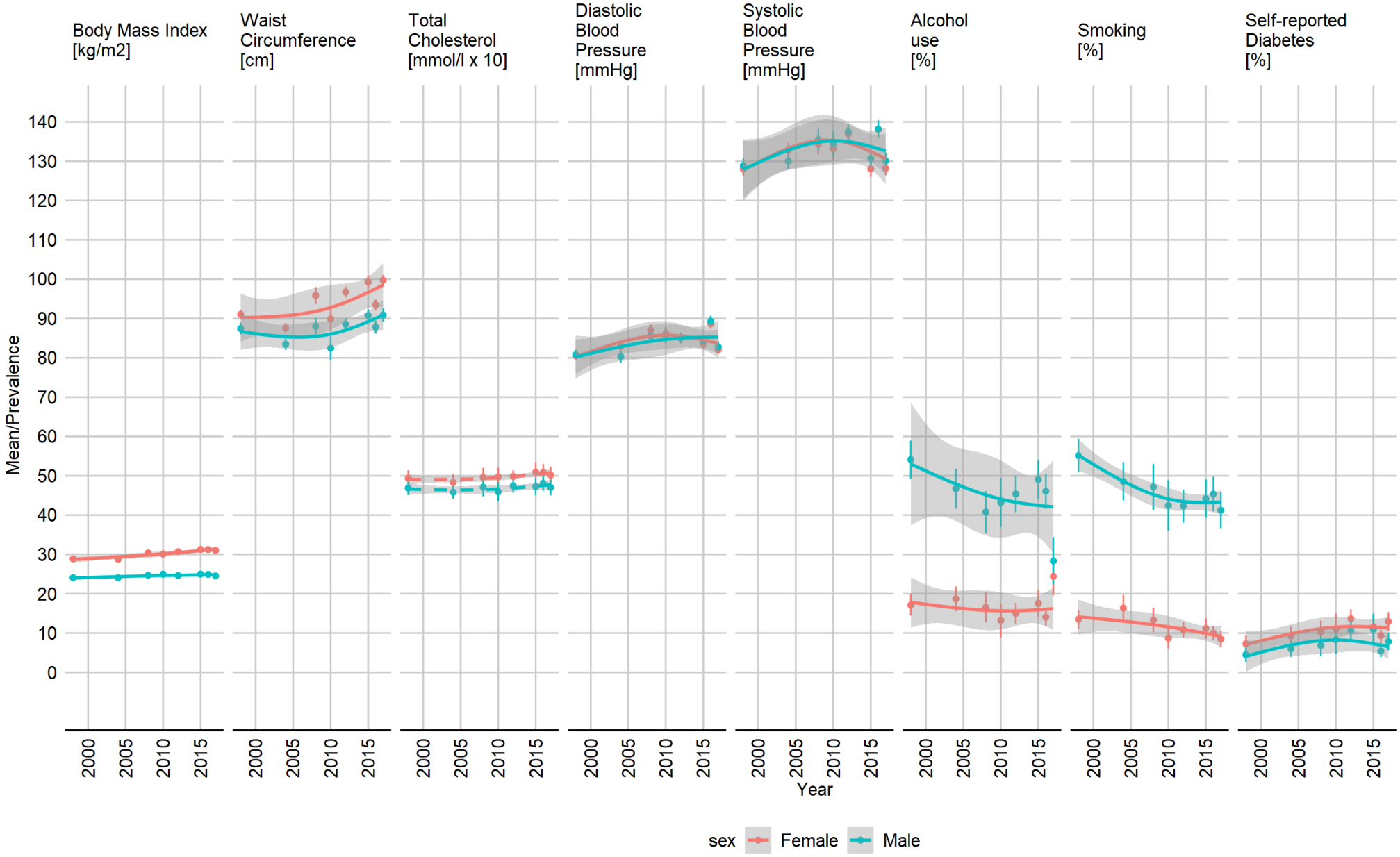
Total cholesterol [mmol/l]



Modifiable CVD risk score components, England, 40-74-year olds.

Estimates and smoothed trends with 95% confidence intervals/bands

EXPLAINING

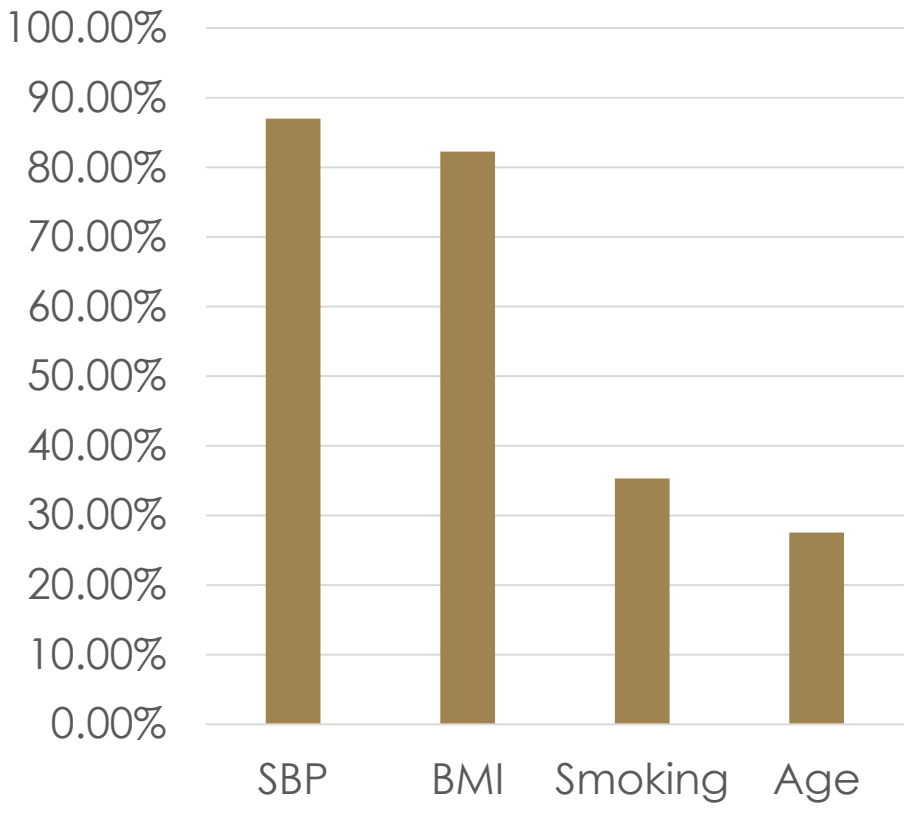


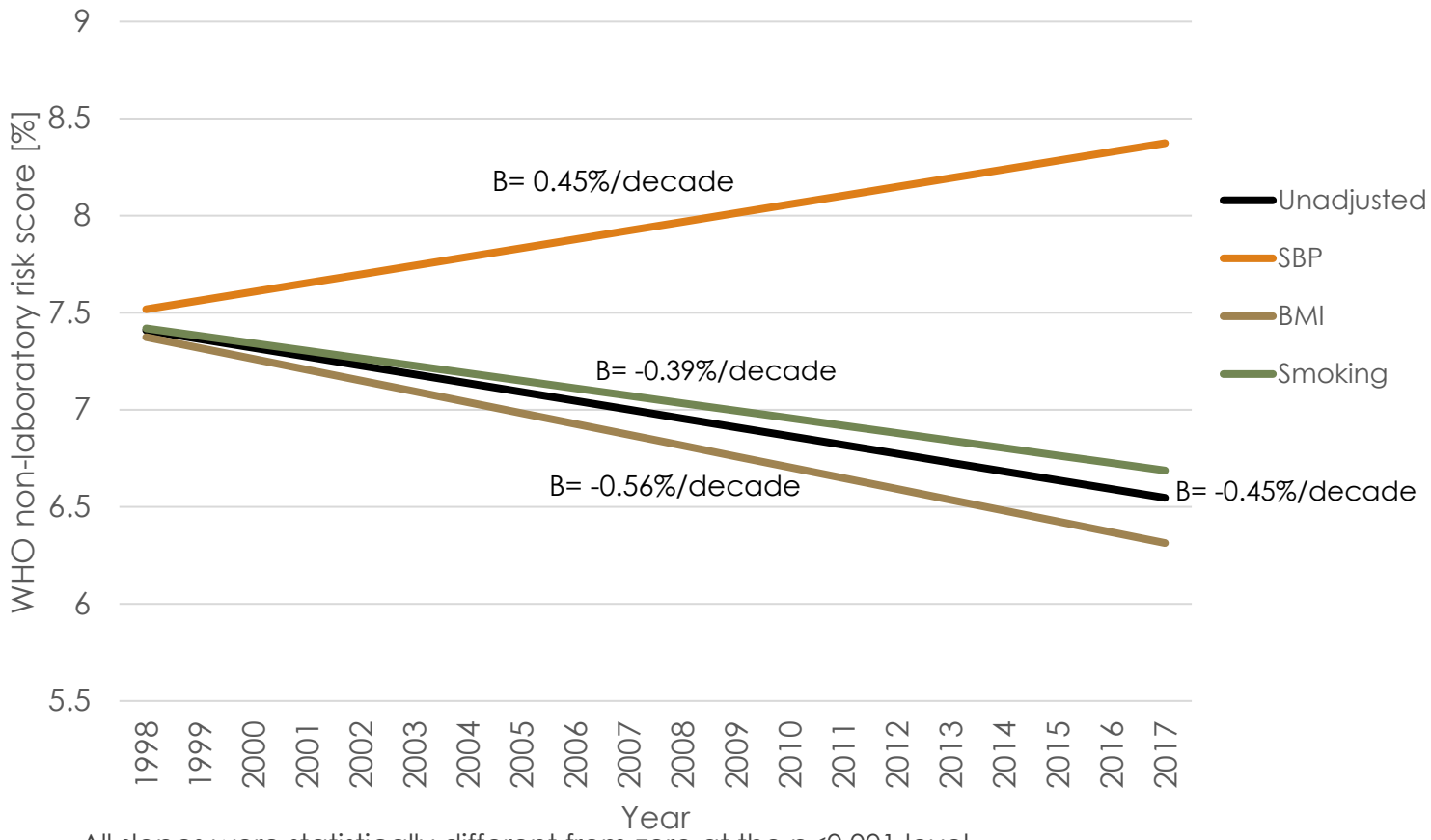
Trends in major CVD risk factors. South African population 40-74 years. By sex.

Estimates with 95% confidence intervals and smoothed trends..

EXPLAINING

Analysis of year variation in WHO non-laboratory CVD risk score explained by risk score components, England population aged 40-74 years

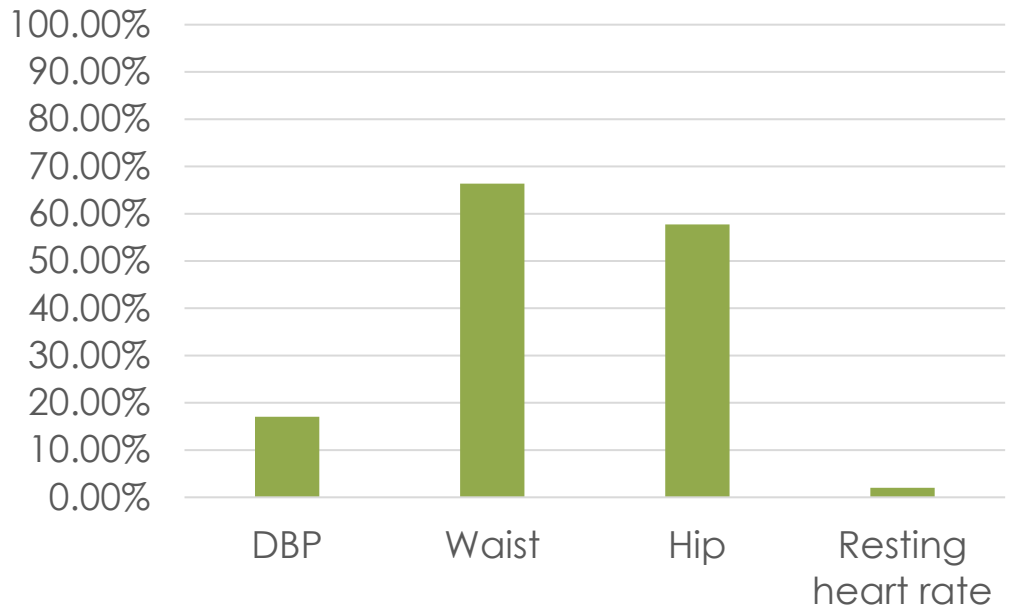


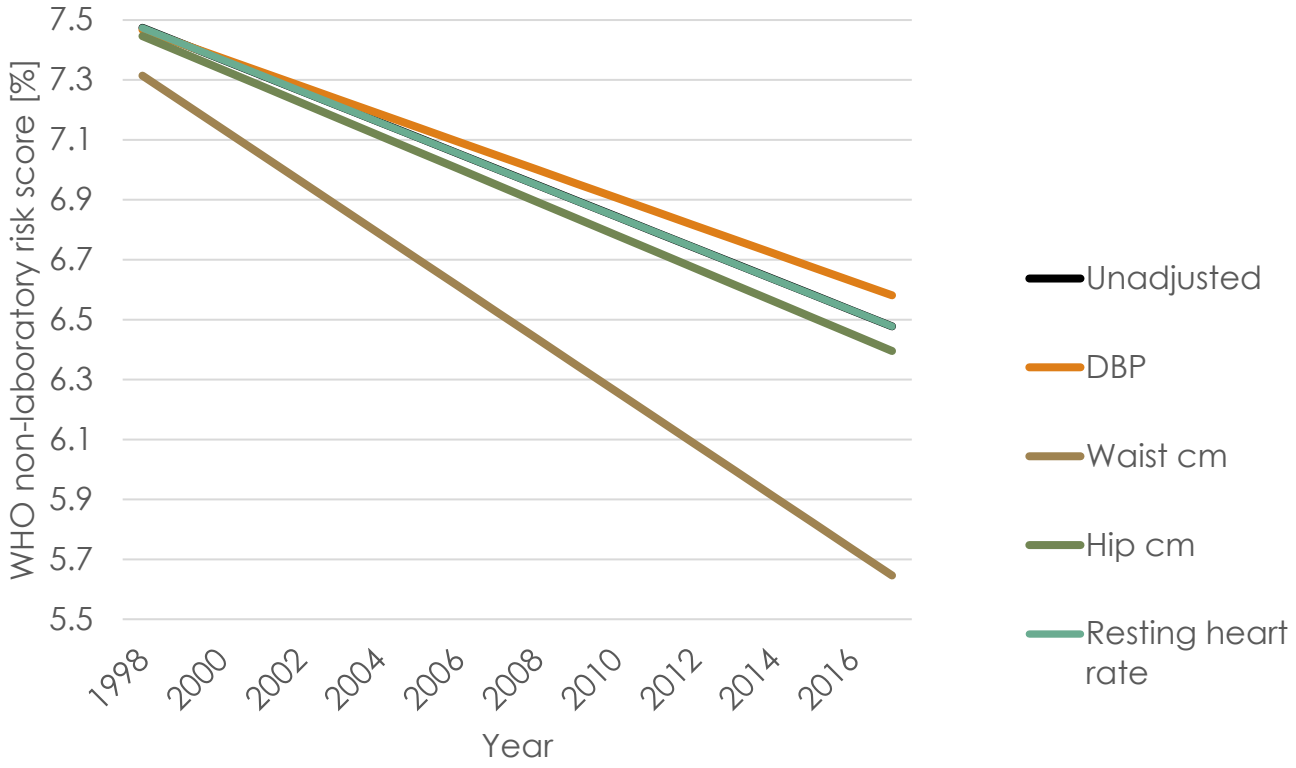


All slopes were statistically different from zero at the p<0.001 level.

EXPLAINING

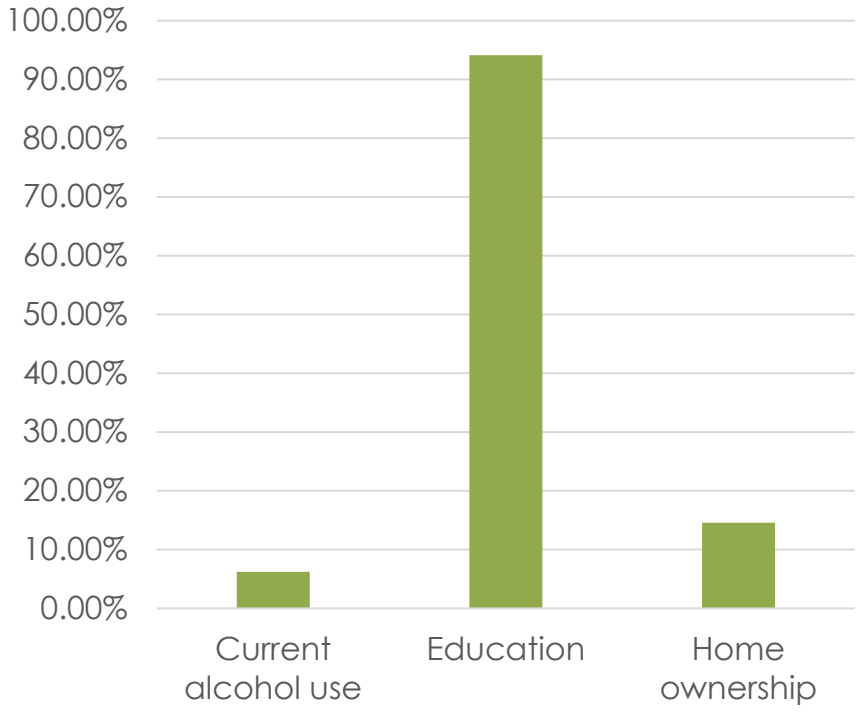
Analysis of year variation in WHO non-laboratory CVD risk score explained by biological and metabolic factors, England population aged 40-74 years

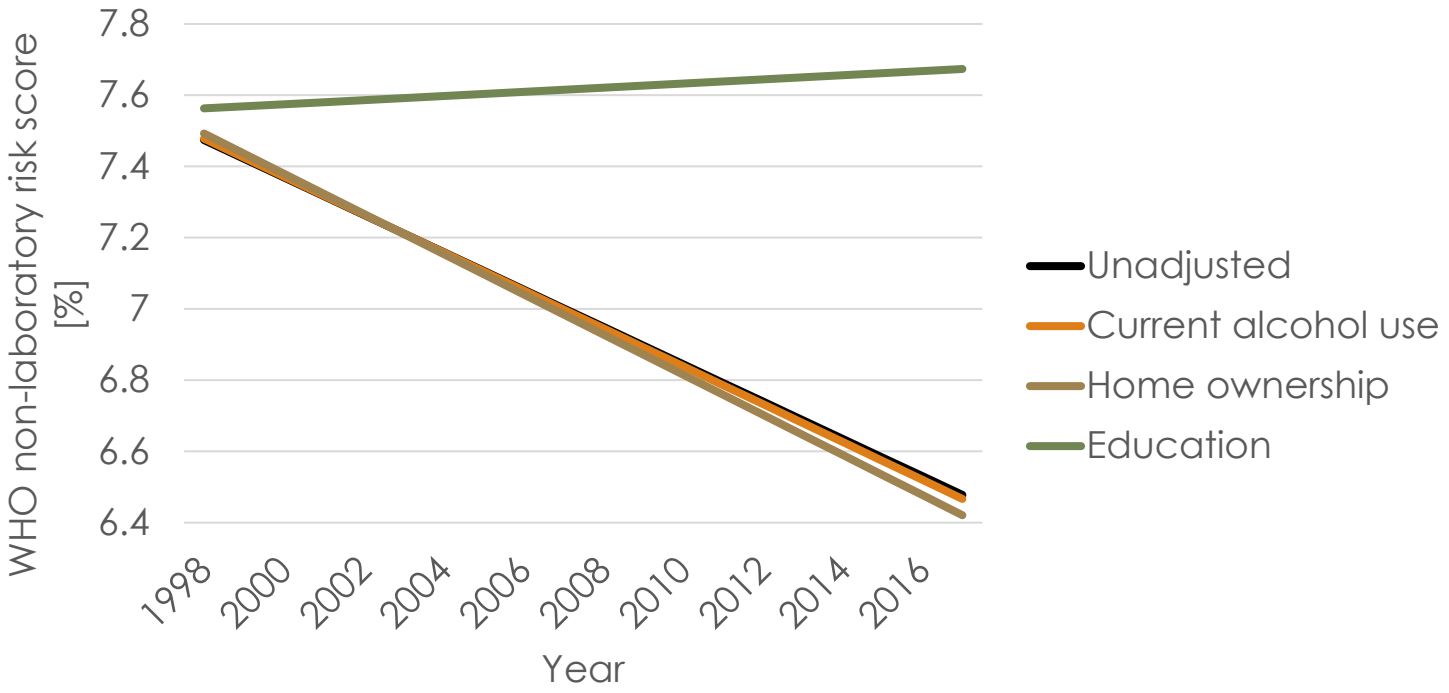




EXPLAINING

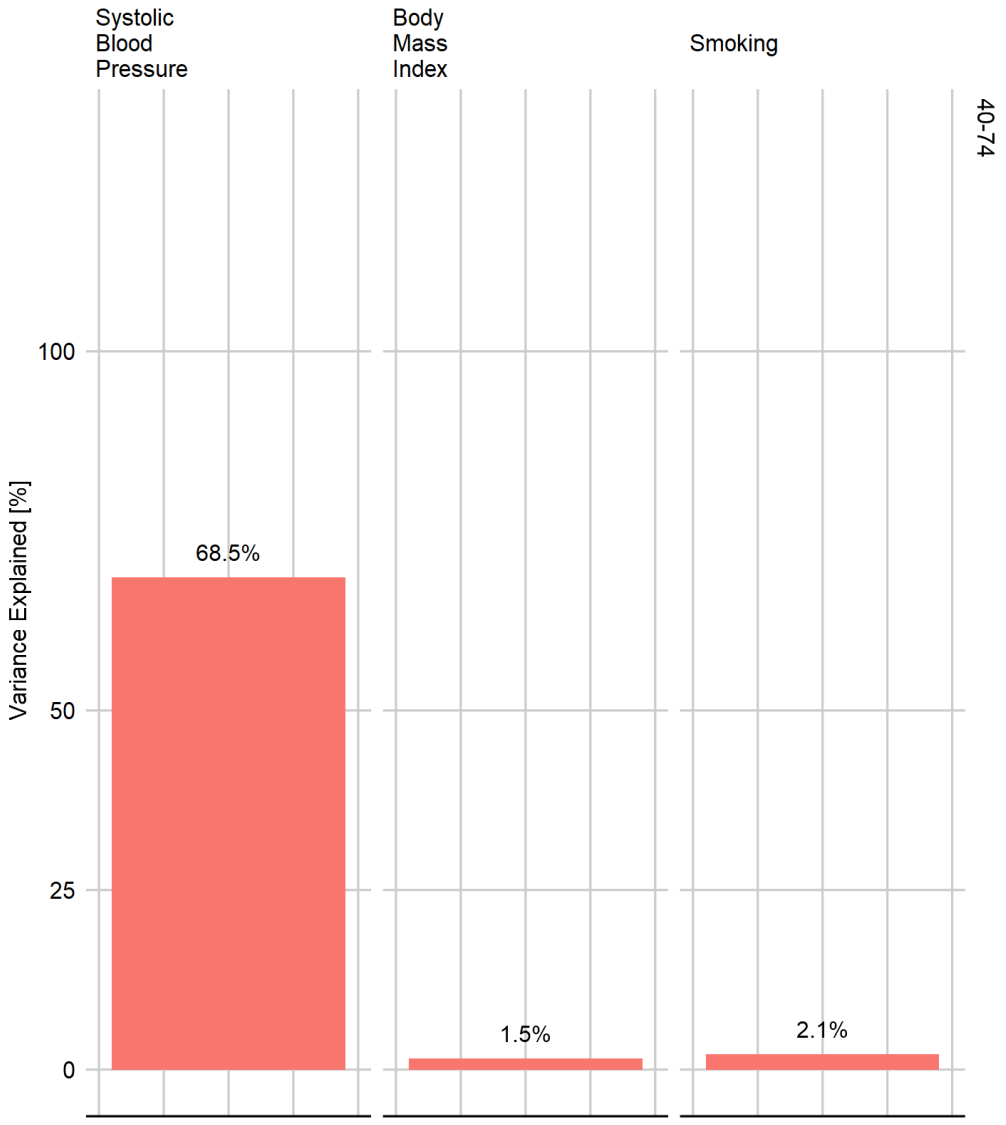
Analysis of year variation in WHO non-laboratory CVD risk score explained by select behavioural and socioeconomic factors, England population aged 40-74 years

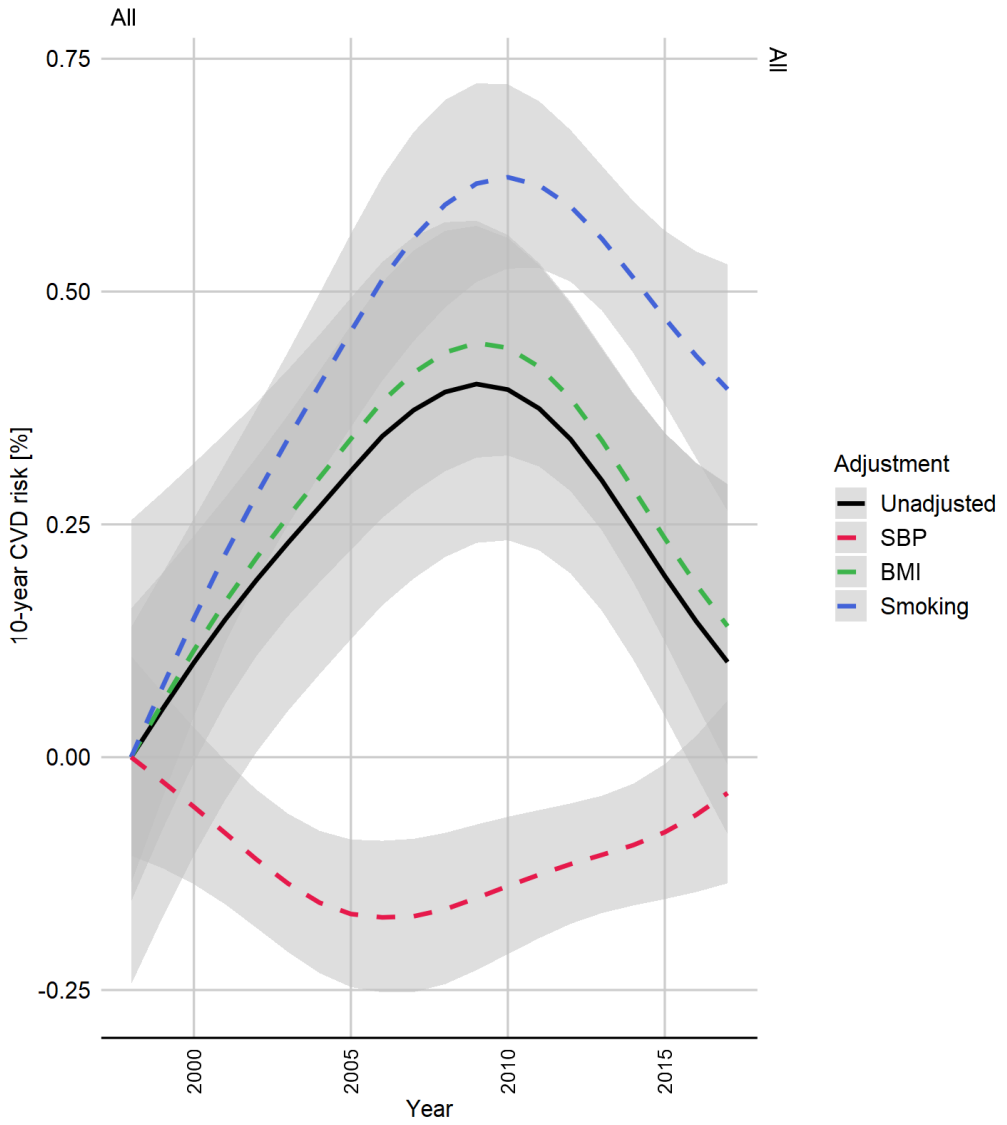




EXPLAINING

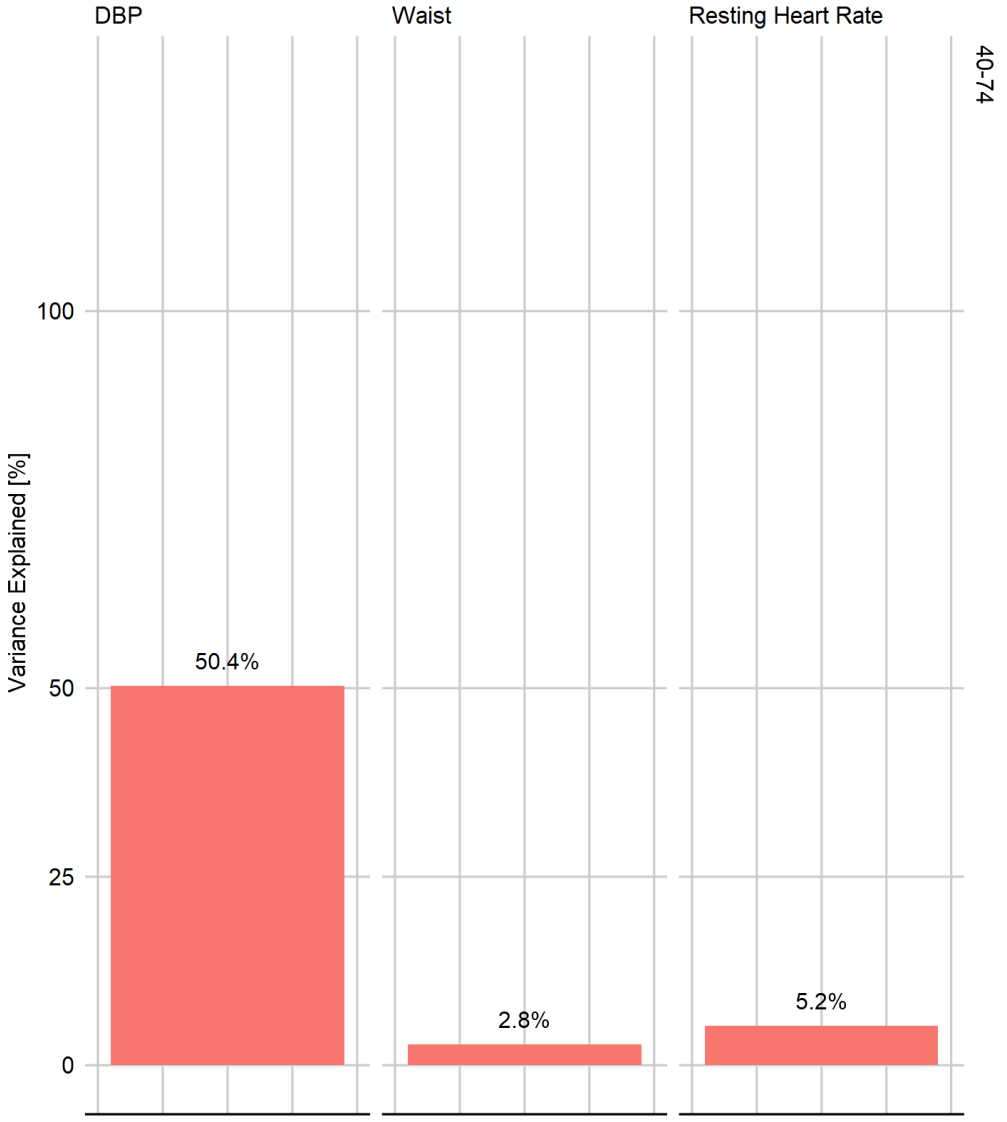
Analysis of year variation in WHO non-laboratory CVD risk score explained by risk score components, South African population aged 40-74 years

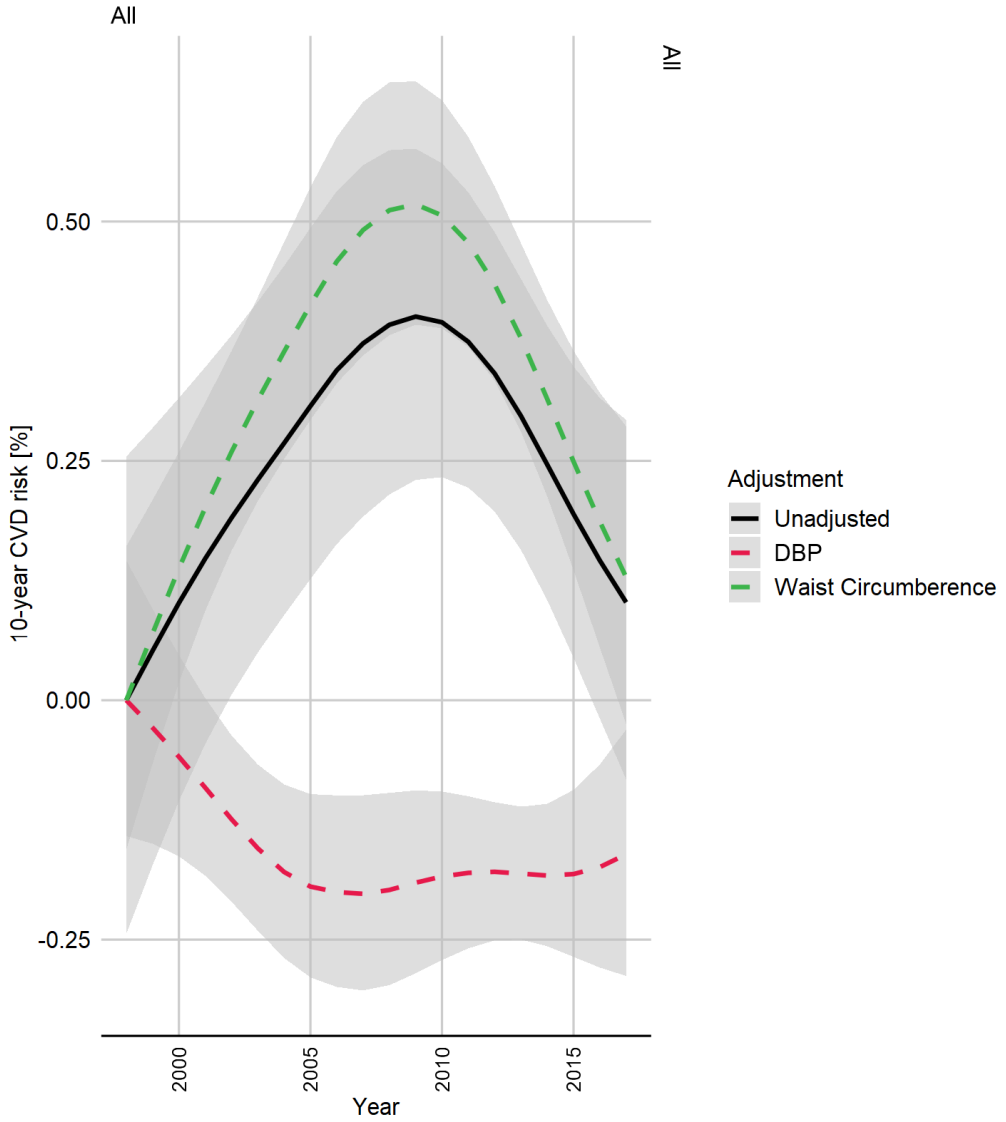




EXPLAINING

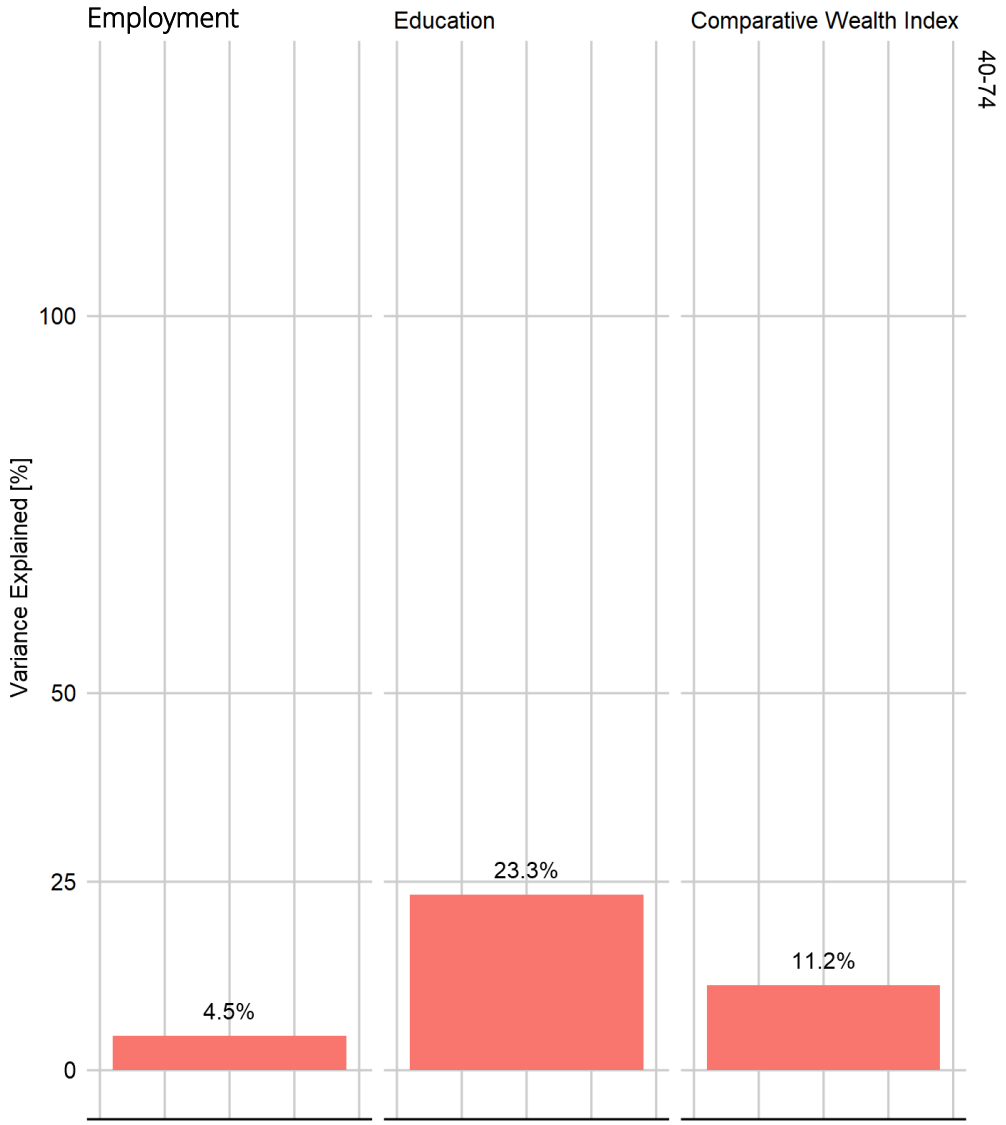
Analysis of year variation in WHO non-laboratory CVD risk score explained by biological and metabolic factors, South African population aged 40-74 years

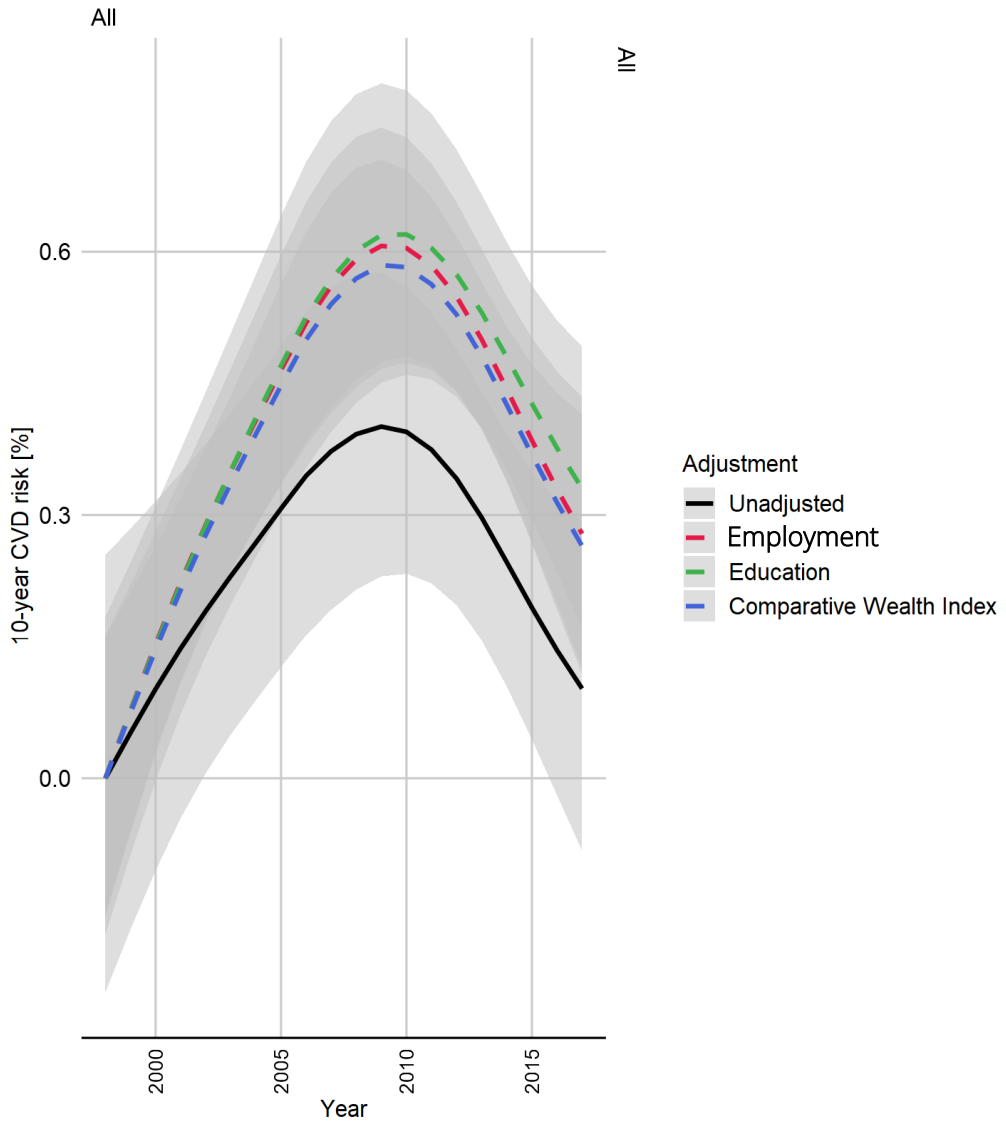




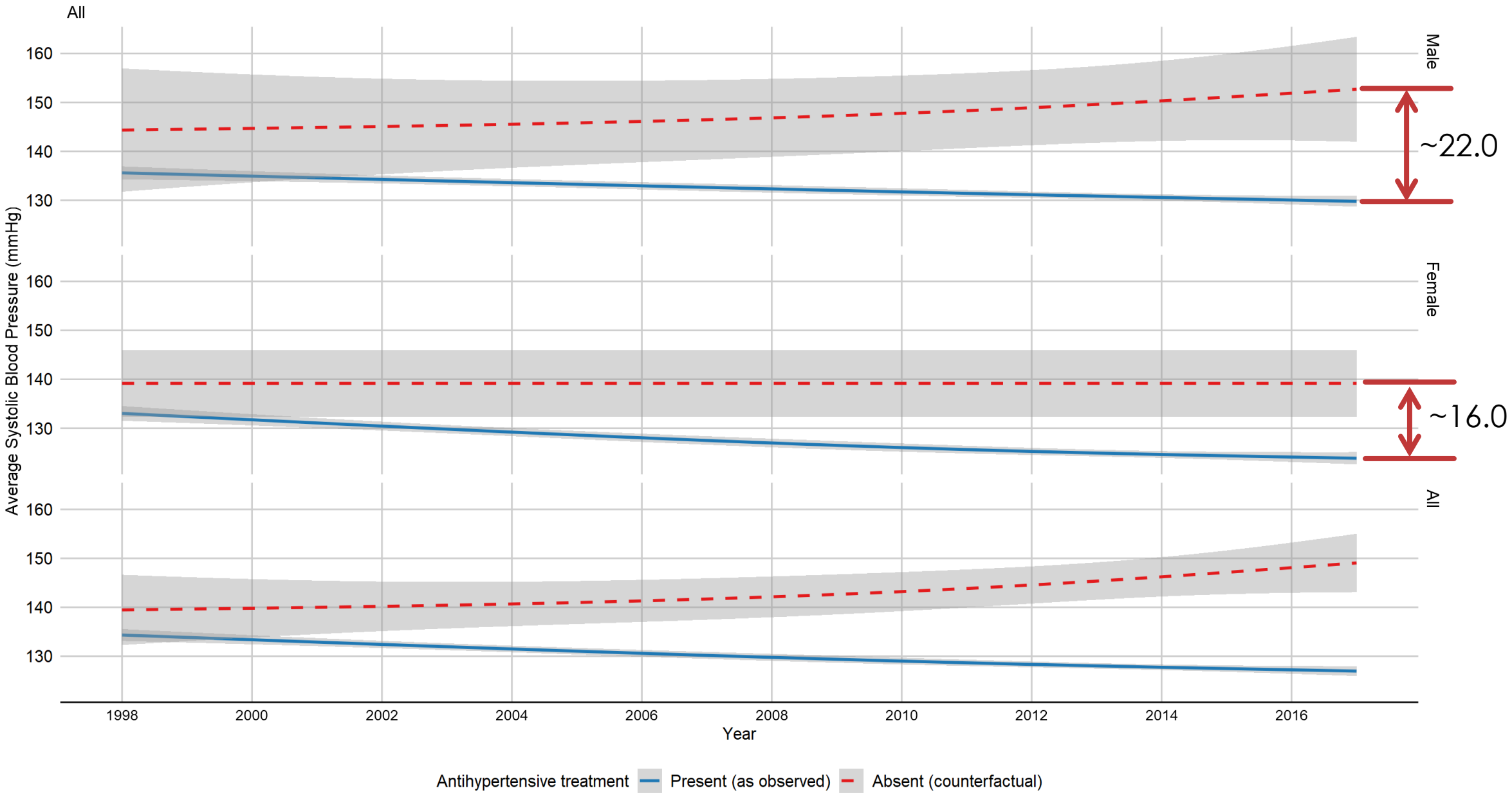
EXPLAINING

Analysis of year variation in WHO non-laboratory CVD risk score explained by select behavioural and socioeconomic factors, South African population aged 40-74 years

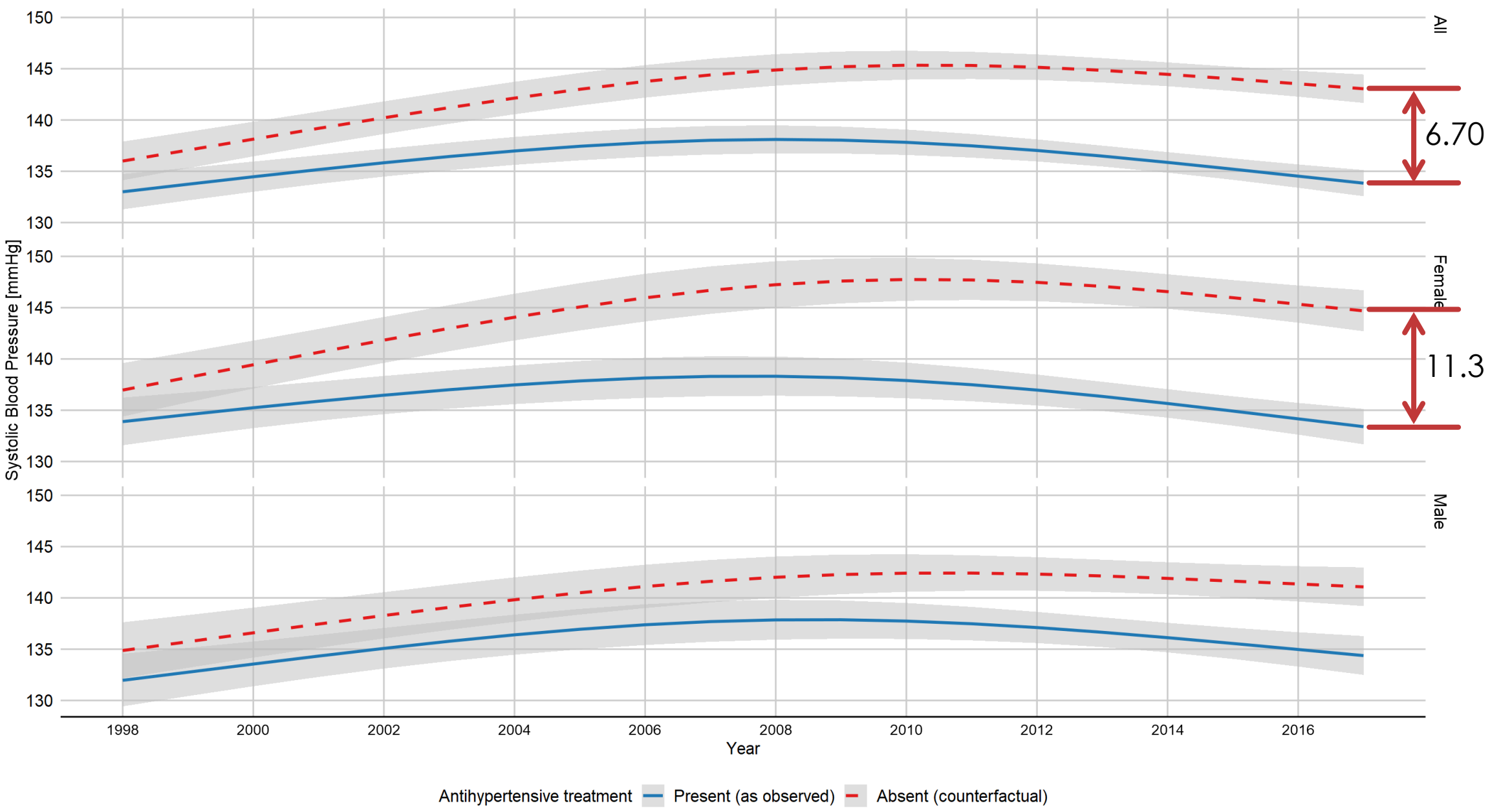




Treatment ?

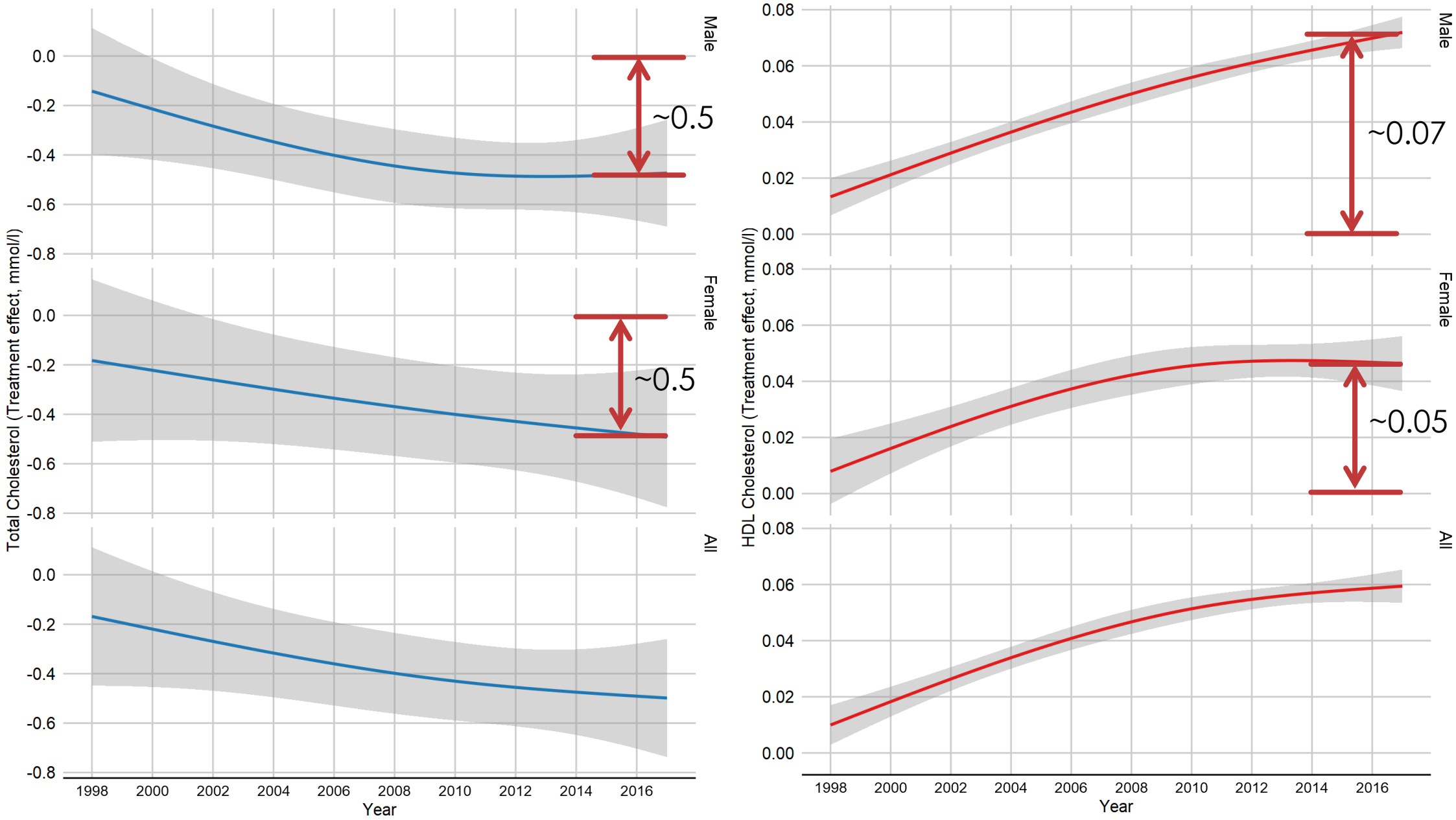


Estimated trend in systolic blood pressure. England population 40-74 years. Observed and in absence of treatment. By sex.



Estimated trend in systolic blood pressure. South African population 40-74 years. Observed and in absence of treatment. By sex.

WHO non-laboratory risk score. Estimates and 95% confidence intervals/bands.



Trends in treatment effects on cholesterol. England population 40-74 years. by year and sex

Conclusions

- CVD risk scores declined in England from 1998-2017, potentially flattening in recent years. This contrasts with South Africa which showed an increasing and then decreasing pattern.
- CVD risk scores show gender, ethnic, geographic and socioeconomic patterns, with some potential signs of convergence over time. Absolute risk is consistently higher among males.
- Trends in CVD risk scores seemed to be influenced most strongly by variations in SBP, and to a lesser extent by BMI and smoking.
- Trends in average blood pressure seem to be significantly affected by increasing diffusion (and, possibly, improved effectiveness) of antihypertensive treatment.
- Addressing BMI and further reductions in smoking may lead to further improvements in CVD health.
- Increasing treatment penetration/quality may contribute the risk reduction and help to reduce sex disparities
- Improving socioeconomic circumstances, especially education, may also lead to population improvements in CVD risk.

Questions?
Comments?

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ExPoSE

Explaining **Po**pulation trends in cardiovascular risk: A comparative analysis of health transitions in **S**outh Africa and **E**ngland

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