

# Blood pressure and hypertension

## A global health perspective

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London

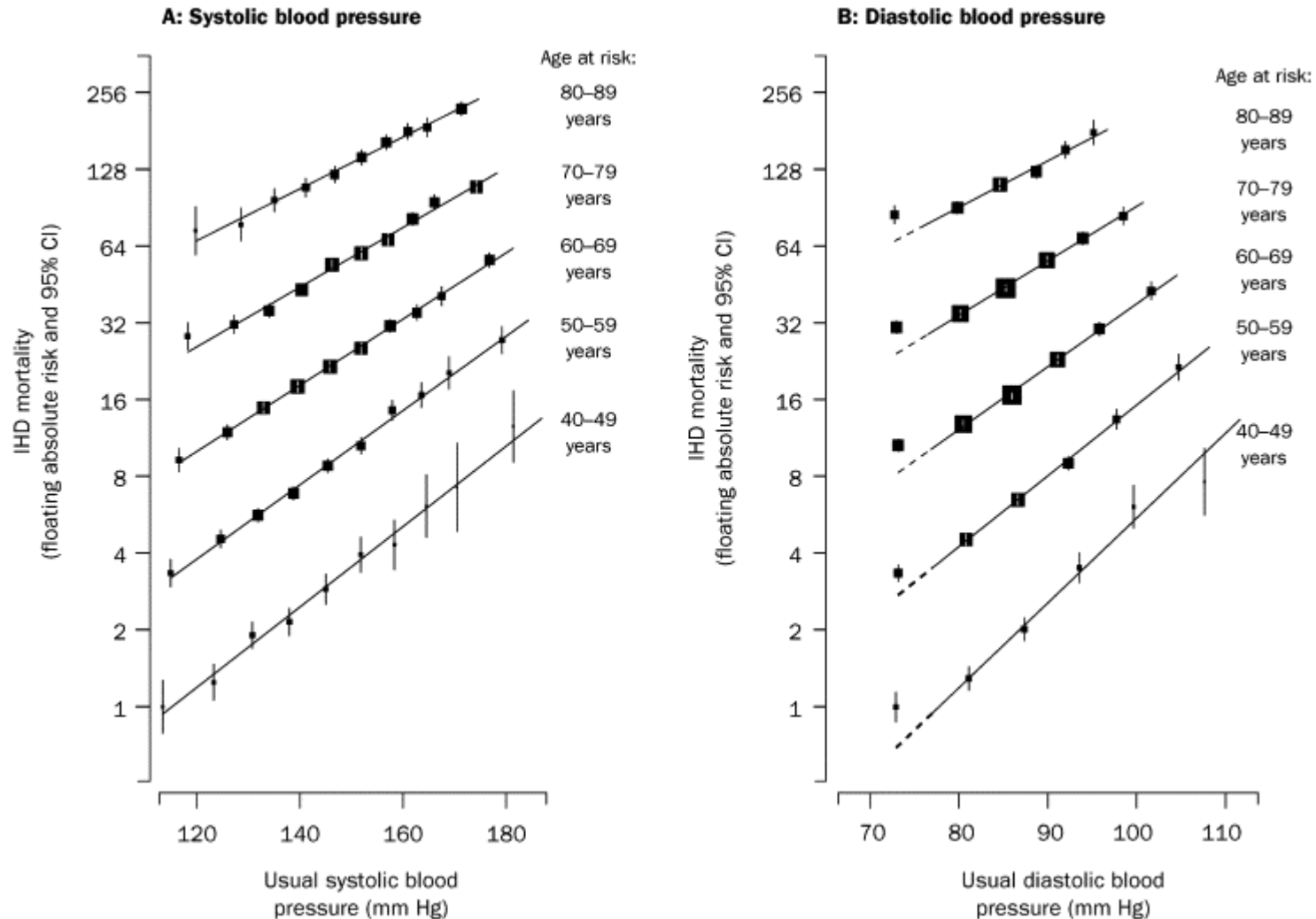


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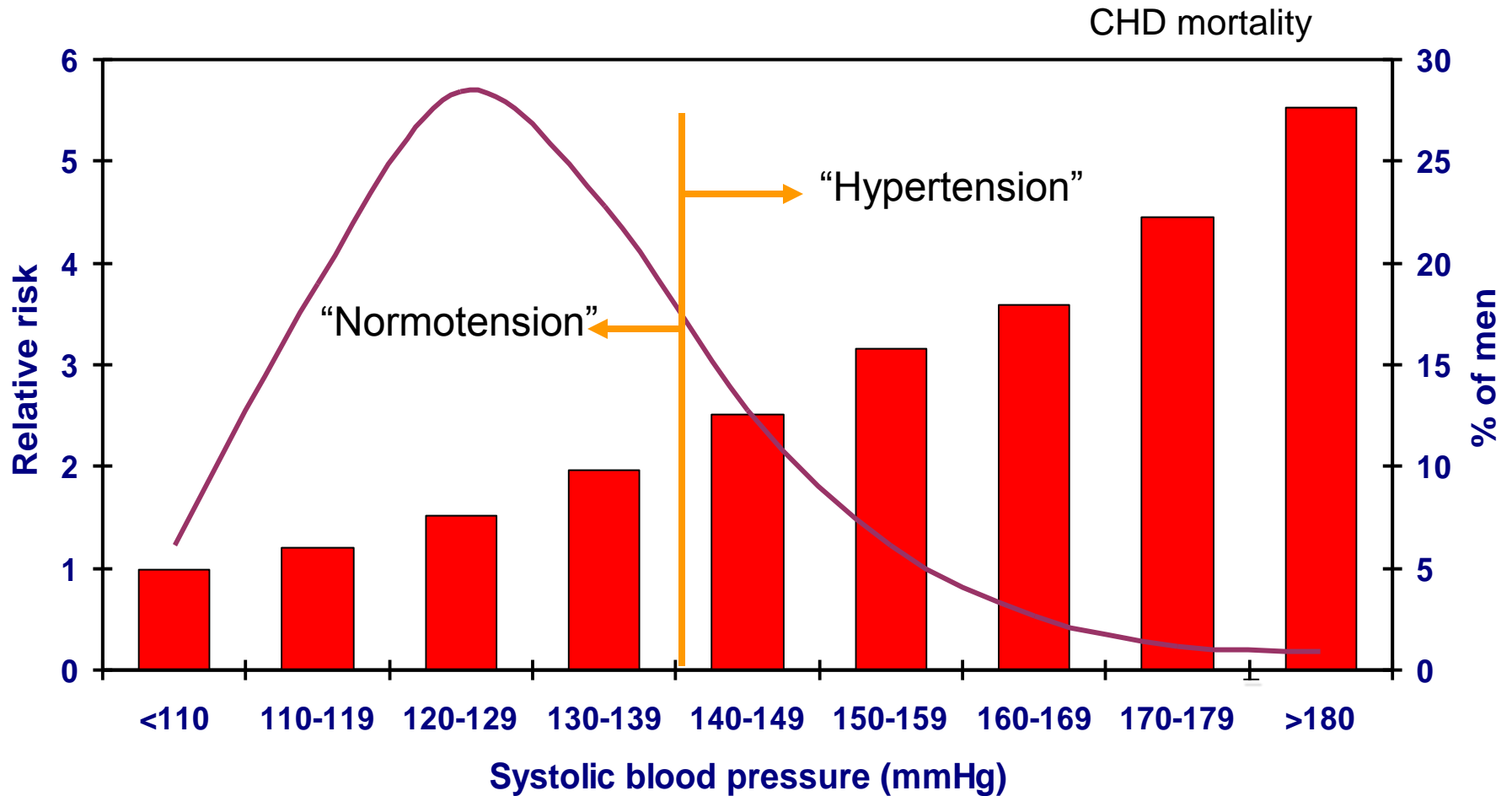


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# Blood pressure or hypertension: association of SBP and DPB with IHD



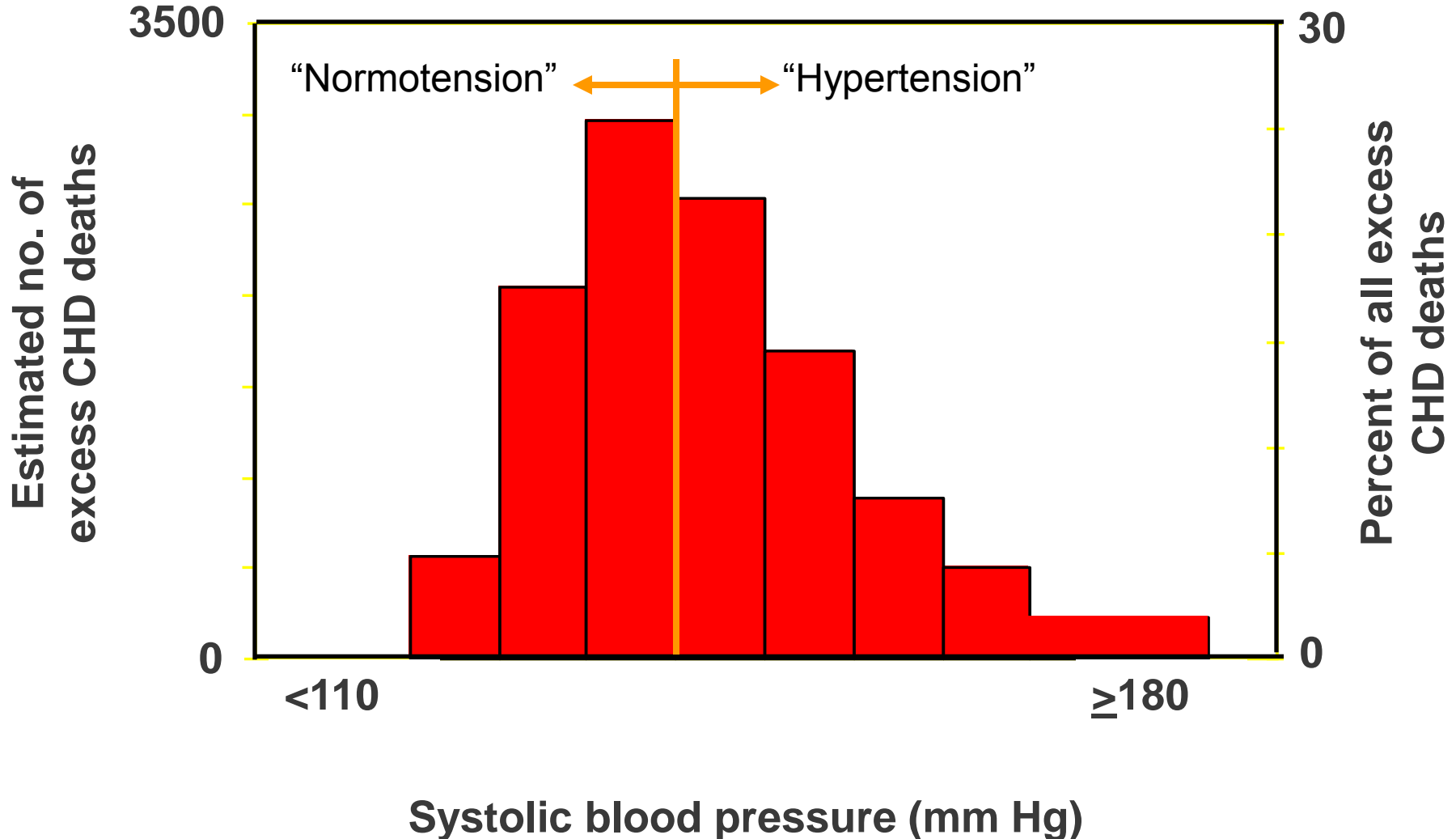
# MRFIT blood pressure distribution and risk of death at 25 years follow-up



347,978 men ages 35-57 at baseline

Adapted from Elliott & Stamler 2005

# MRFIT 25-year follow-up: Numbers and proportions of excess CHD deaths by SBP



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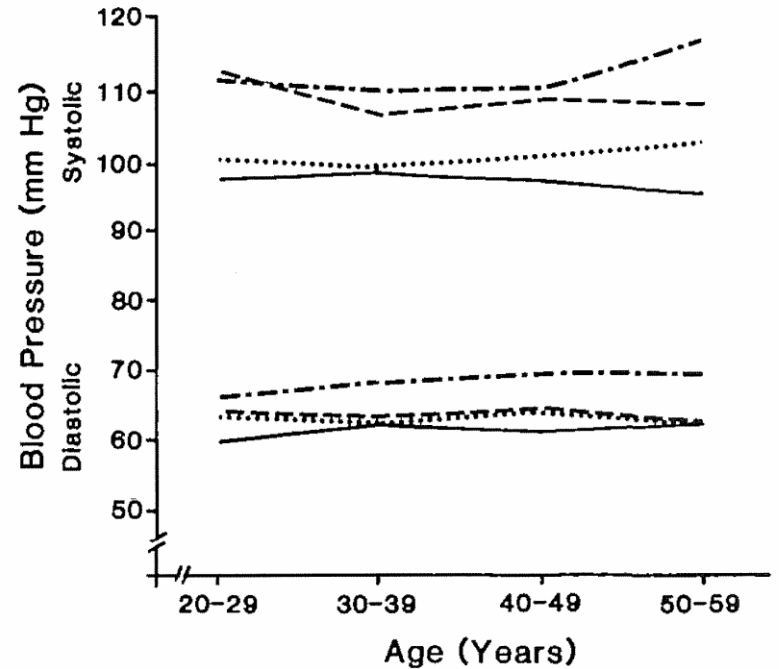
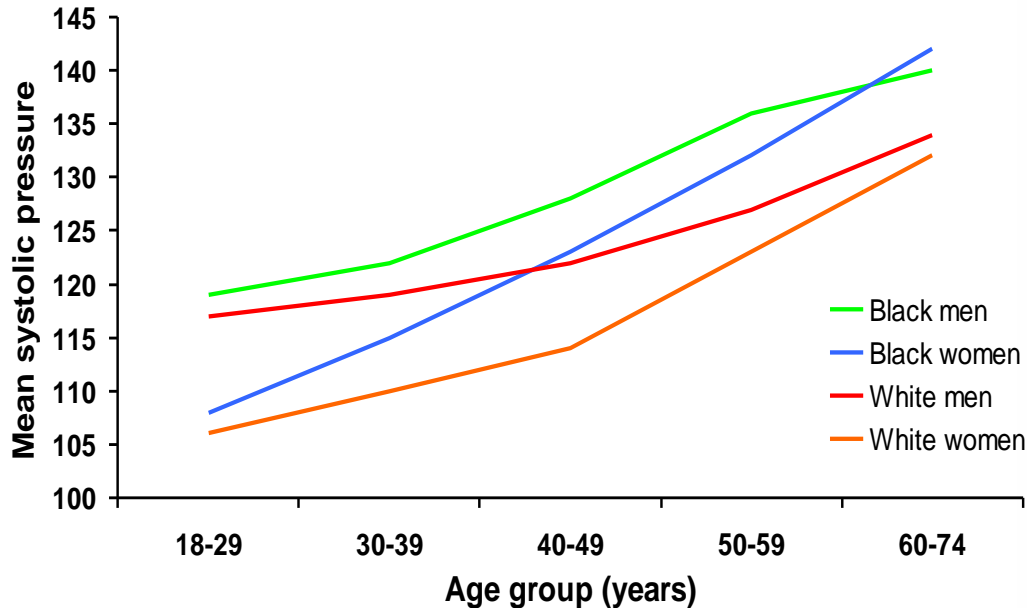
Adapted from Elliott & Stamler 2005

# What is hypertension?

- “Essential hypertension is a type of disease not hitherto recognised in medicine in which the defect is quantitative not qualitative. It is difficult for doctors to understand because it is a departure from the ordinary process of binary thought to which they are brought up. Medicine in its present state can count up to two but not beyond”  
Pickering 1968

# Does blood pressure rise with age?

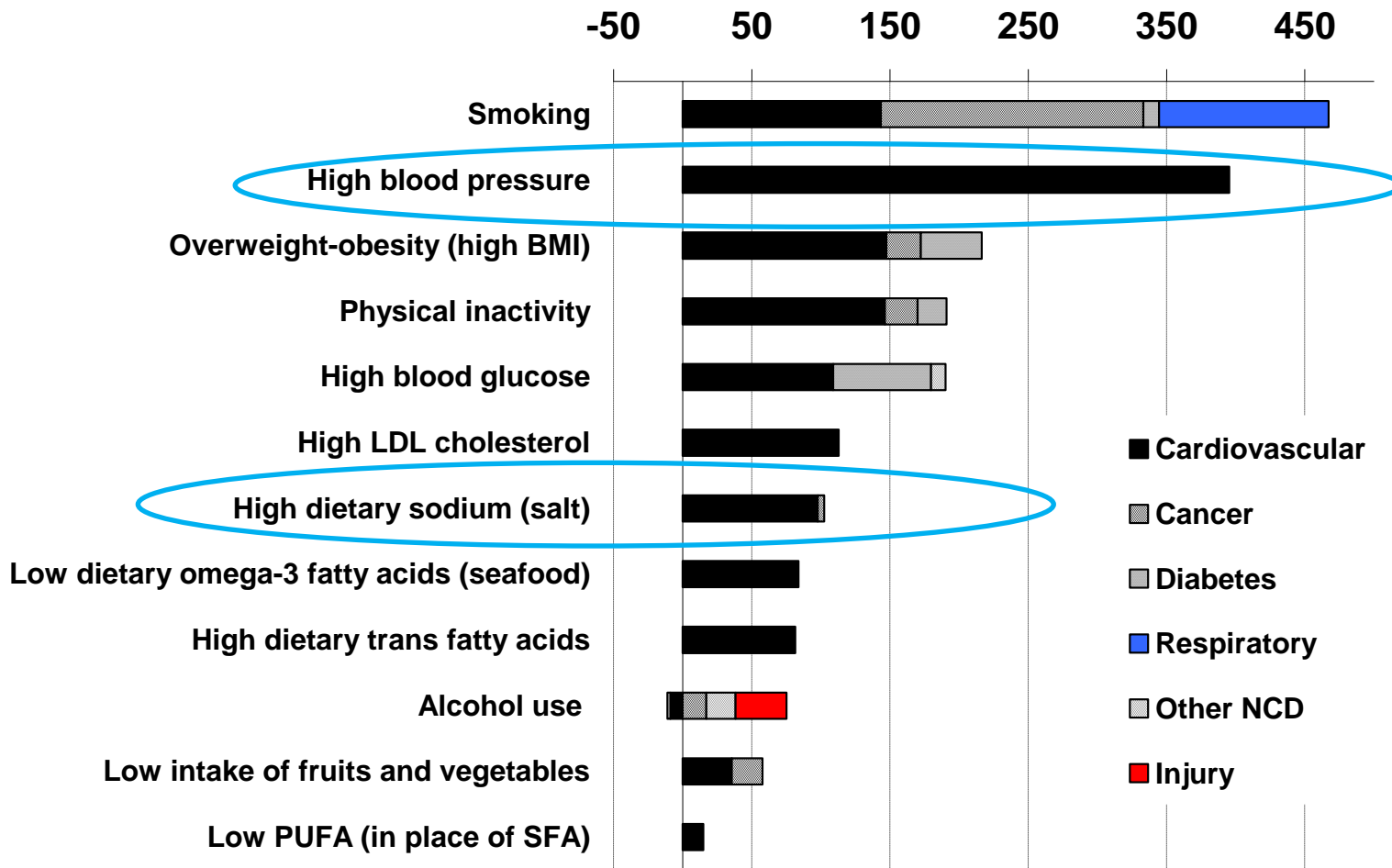
Mean systolic blood pressure (mmHg), US population, NHANES III Phase I (1988-1991) by age, ethnic group and gender



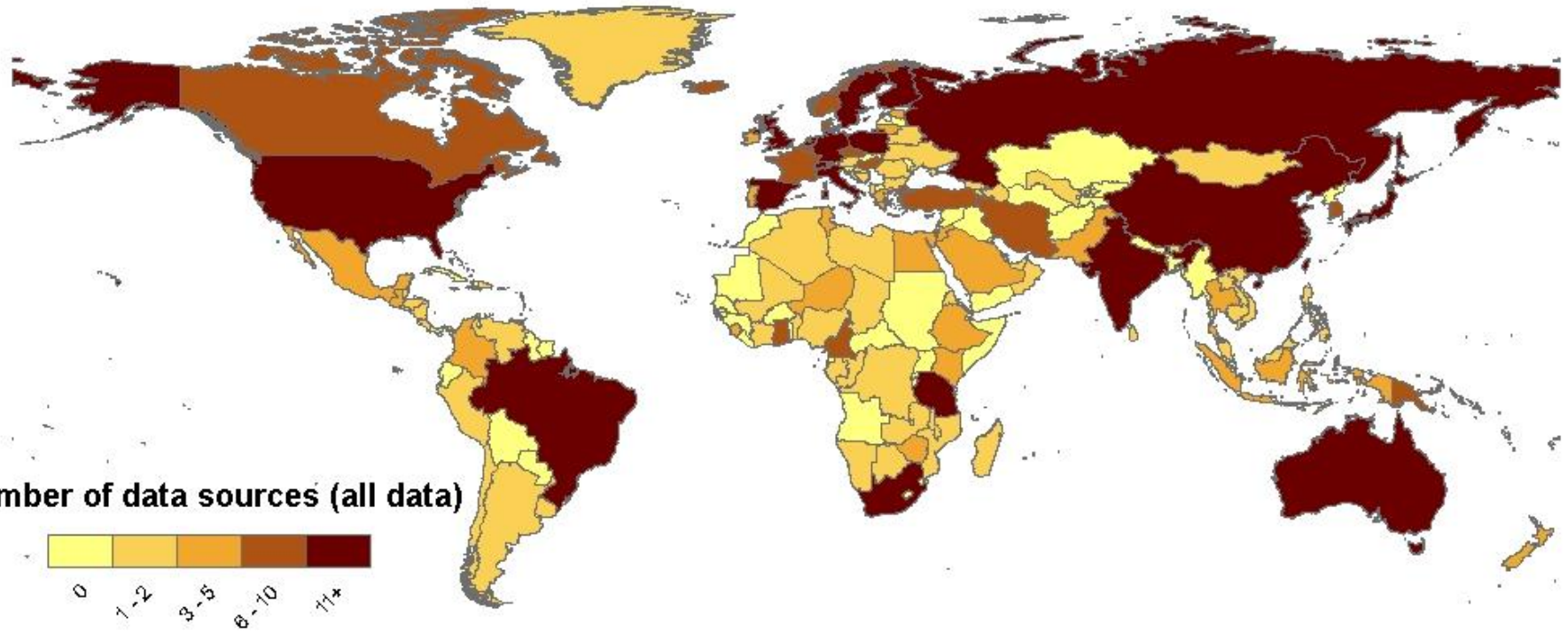
- Yanomamo
- ..... Xingu
- - - Papua New Guinea
- . - . Kenya

# Deaths attributable to individual risk factors in the USA in 2005

Deaths attributable to individual risks (thousands) in both sexes

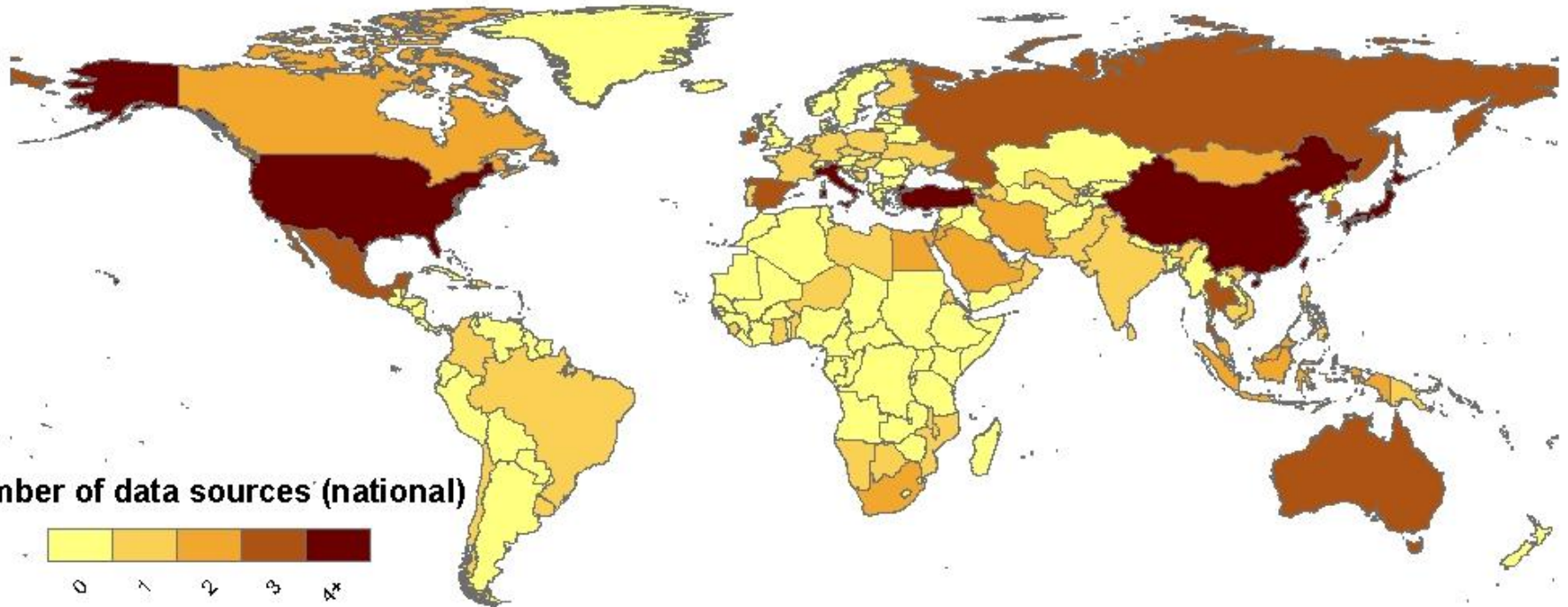


# SBP data availability between 1980 and 2008 (all data)

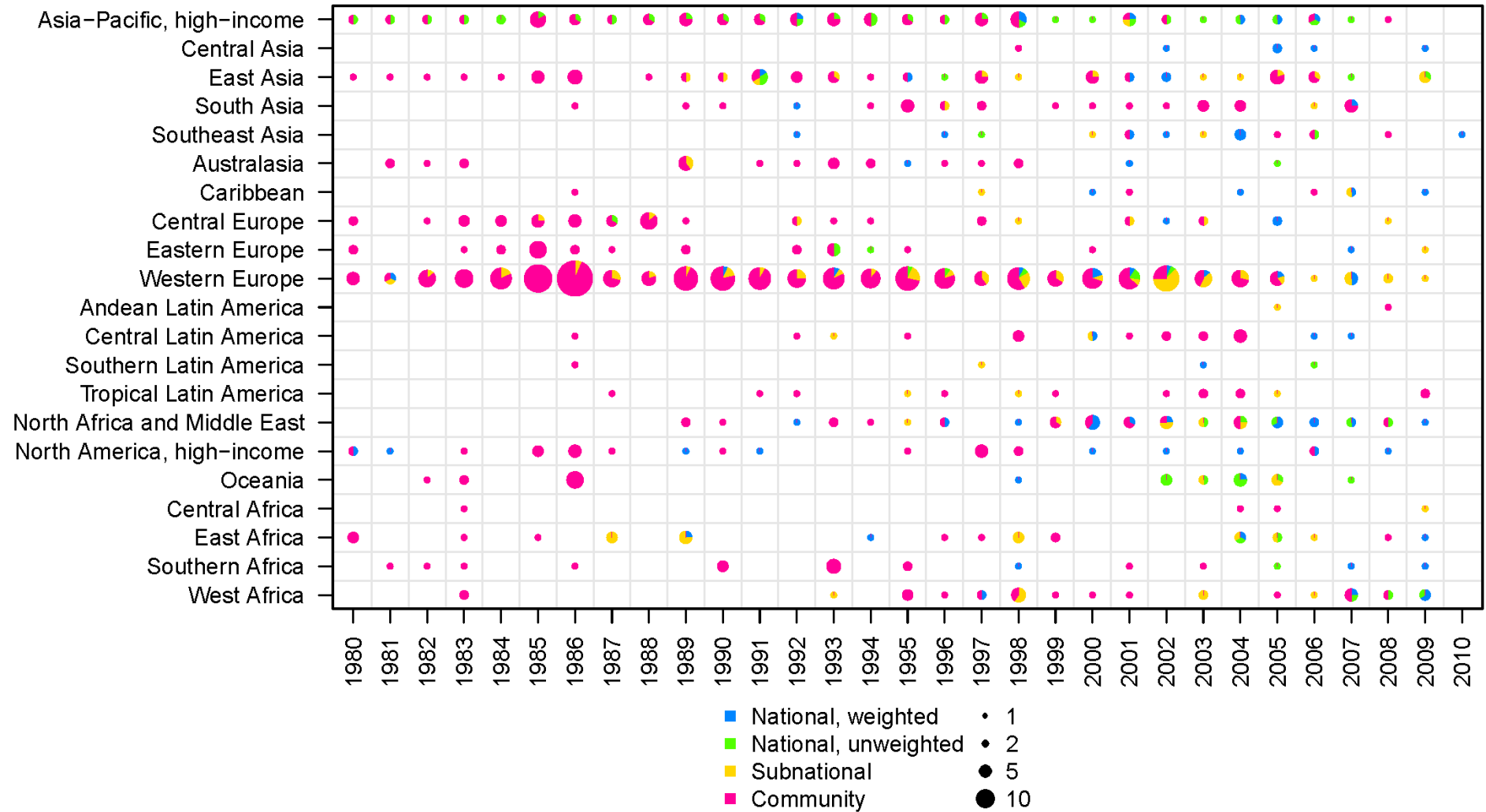




# SBP data availability between 1980 and 2008 (national data)



# SBP data availability by year and region

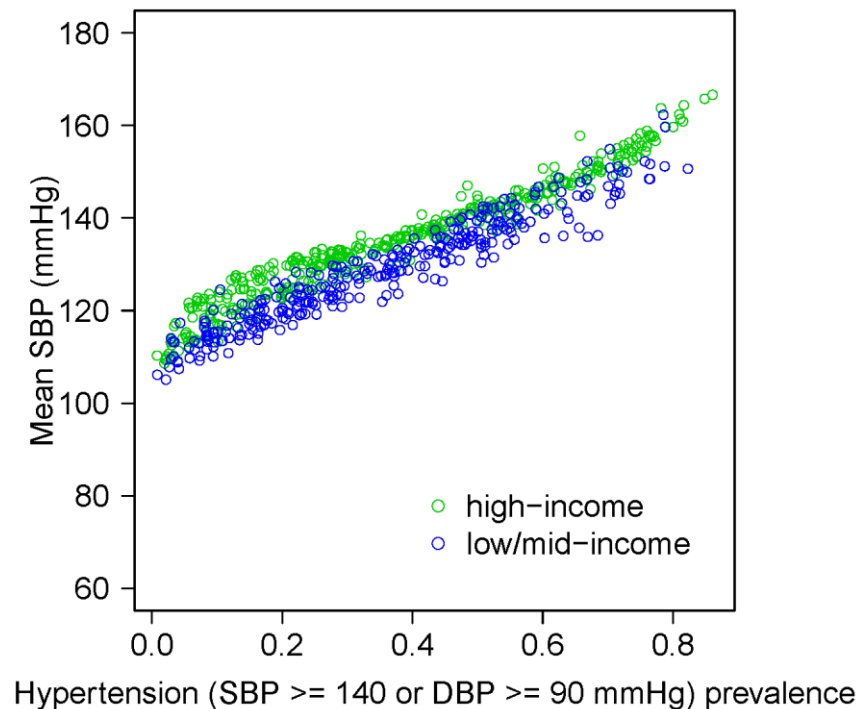


# Challenges in making estimates of BP trends for countries

- Data only on prevalence (vs. mean)

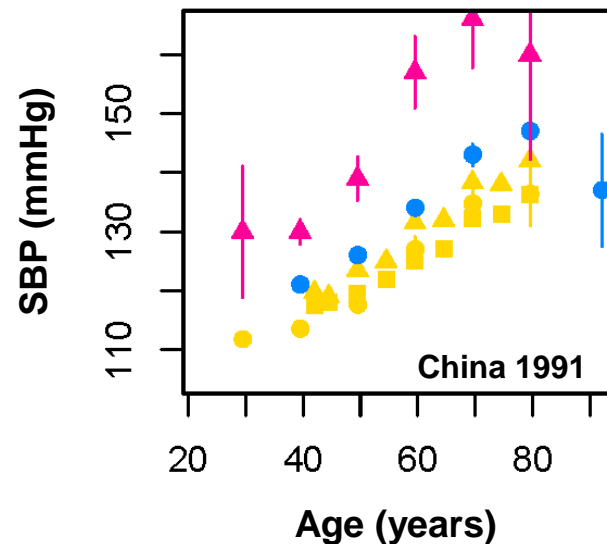
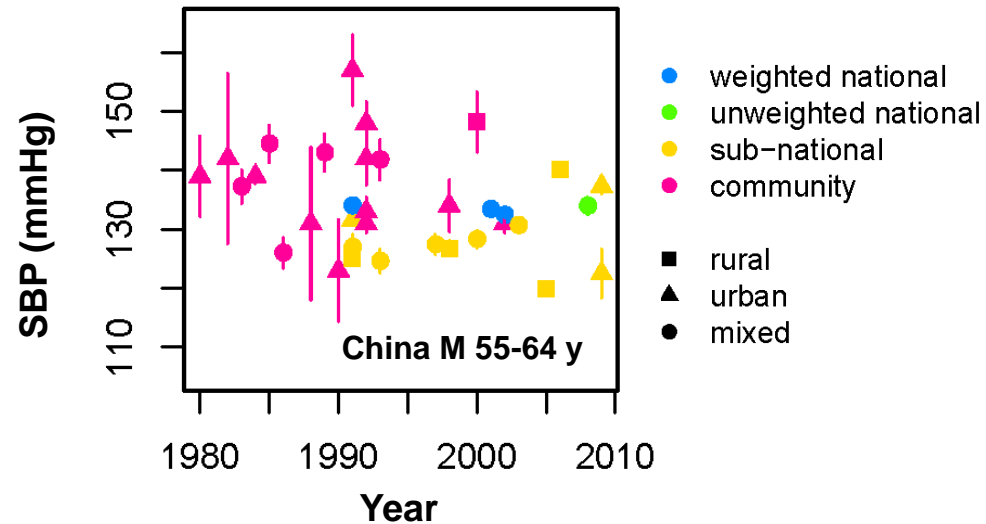
# Converting prevalence to mean

- Some studies report hypertension prevalence, but not population mean
- Develop regression models using sources with both mean and prevalence to estimate mean from prevalence (“cross-walking”)



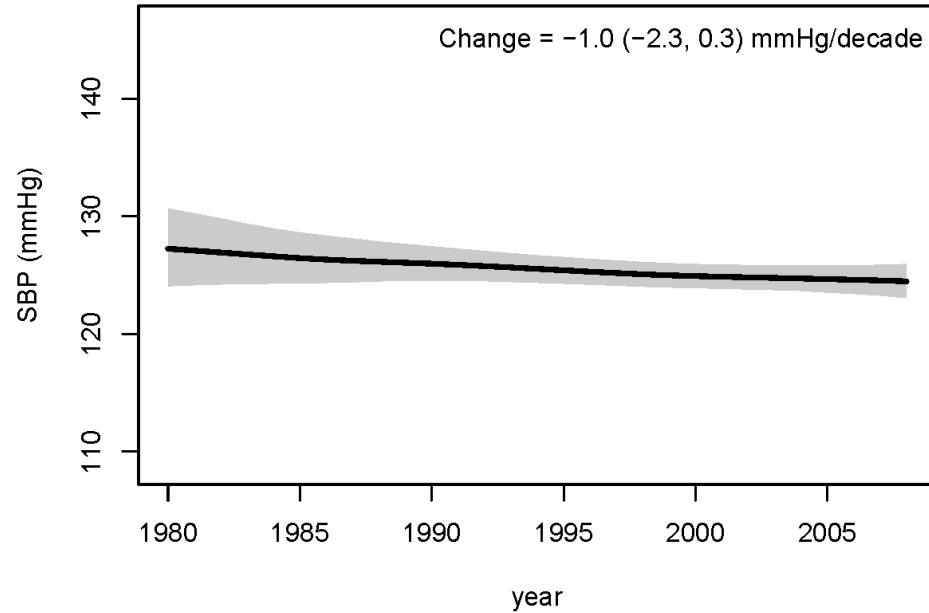
# Challenges in making estimates of BP trends for countries

- Data only on prevalence (vs. mean)
- Missing data for whole countries or across time
- Missing data in older ages in some countries
- Non-linear time trends
- Some data were not national

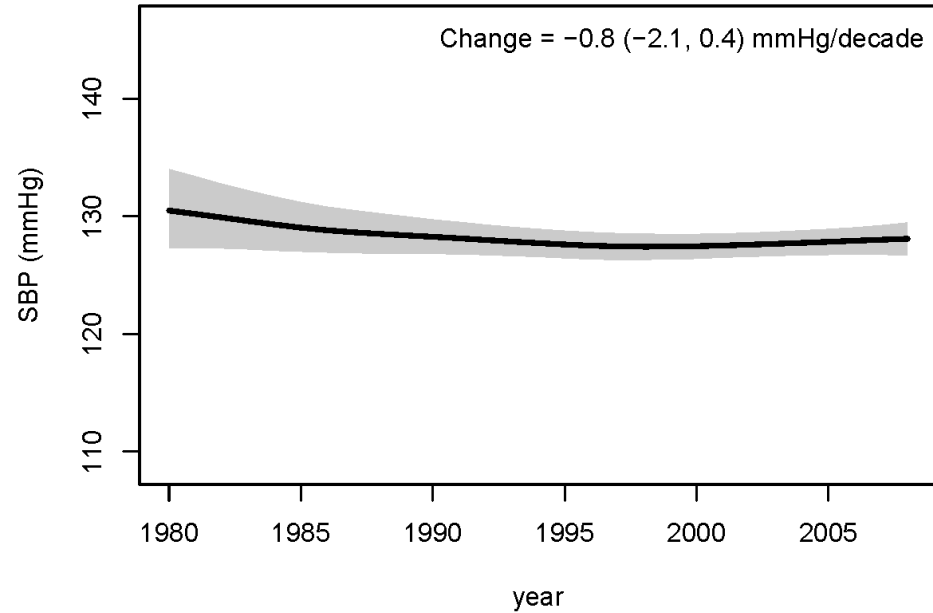


# World trends in age-standardized mean SBP

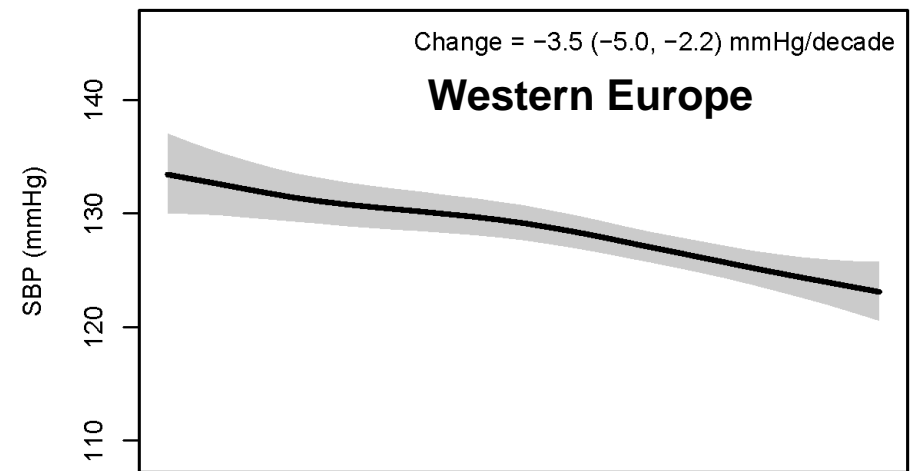
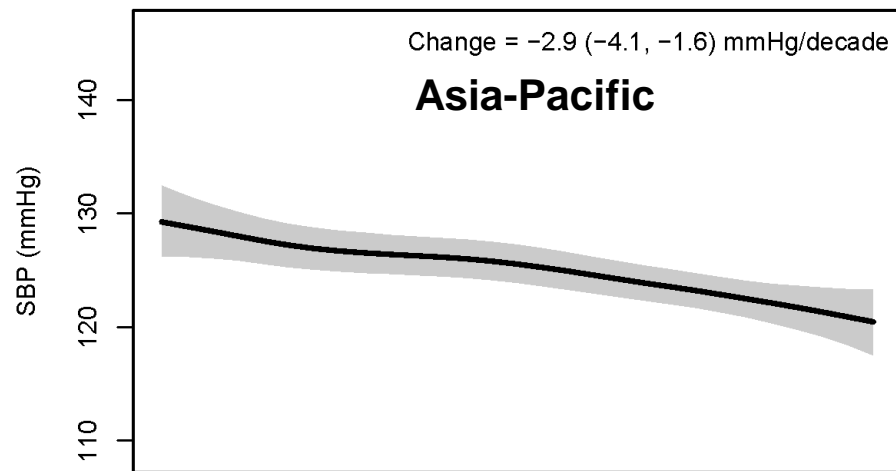
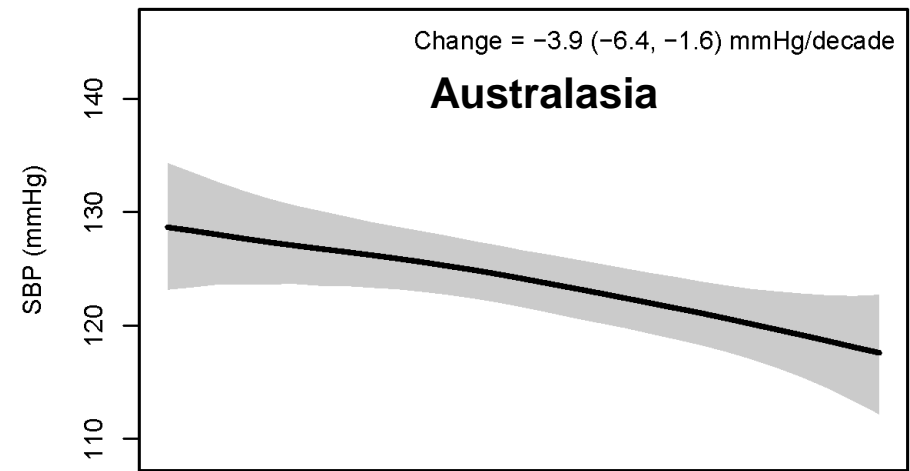
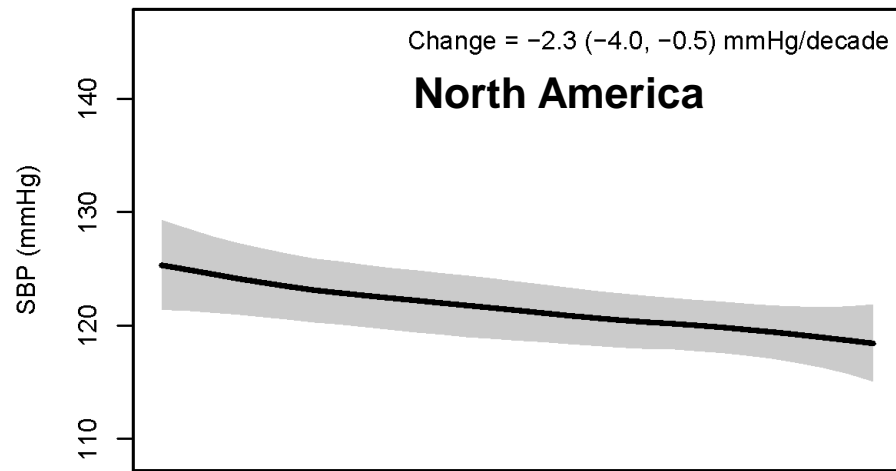
## Women



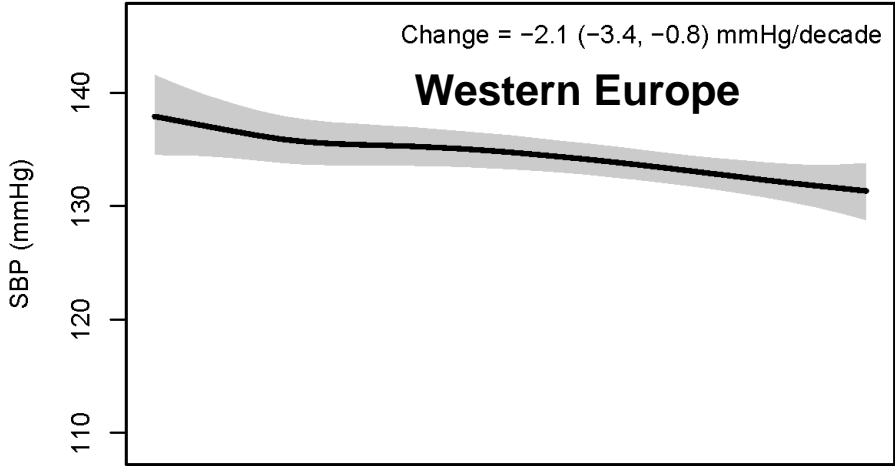
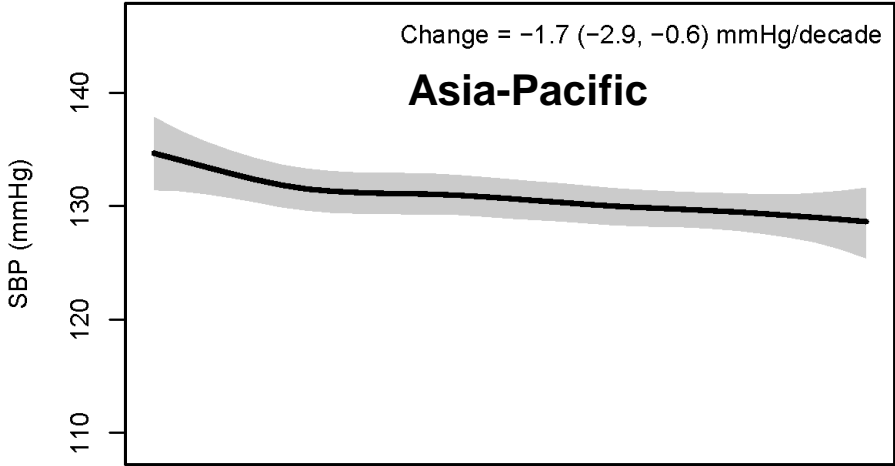
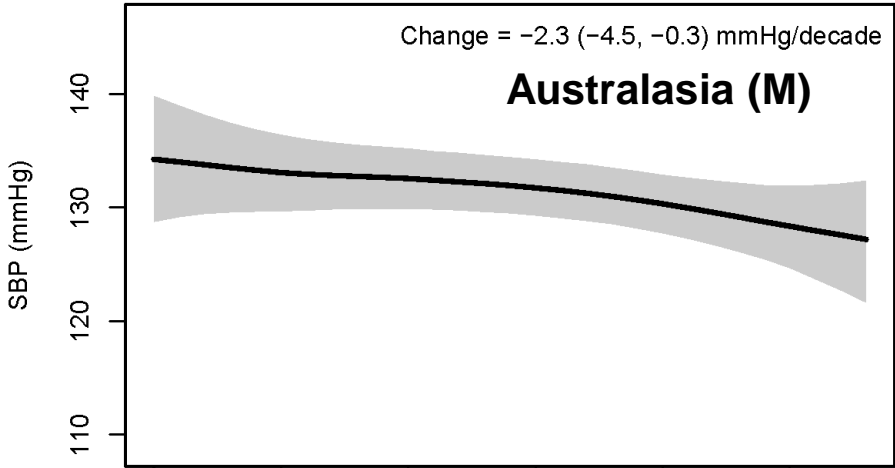
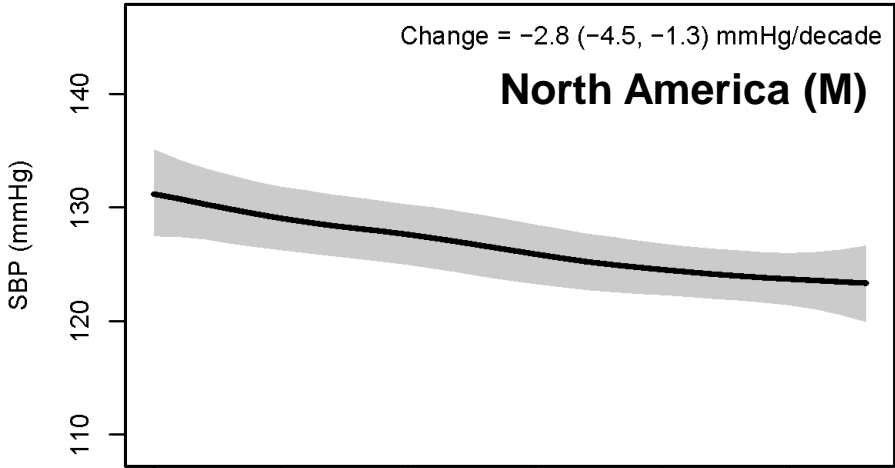
## Men



# SBP trends in high-income regions (women)

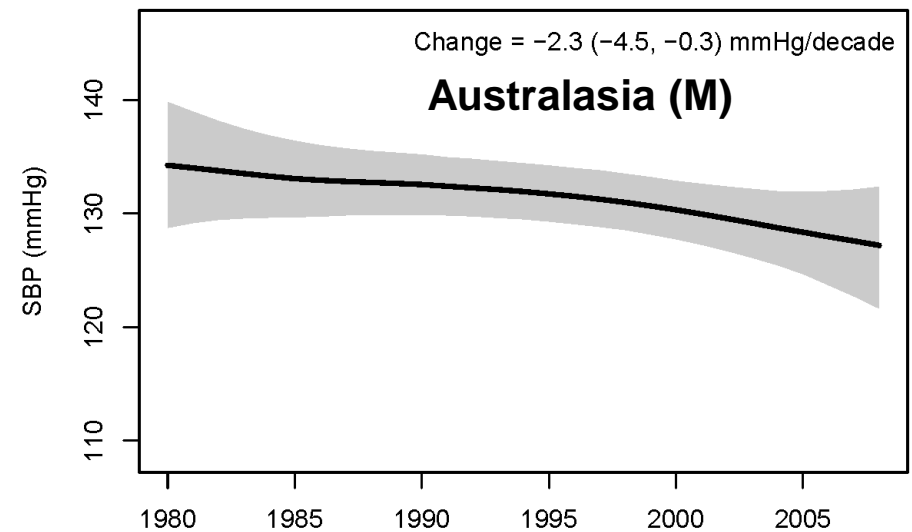
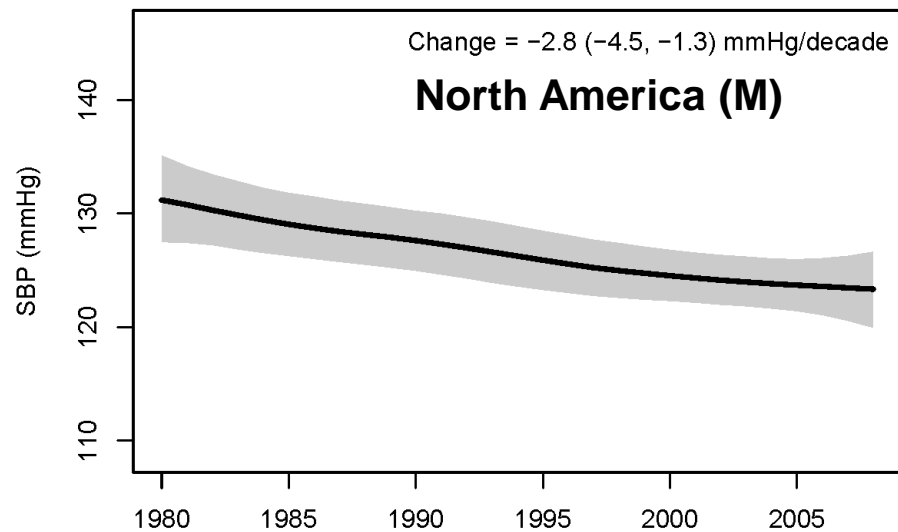
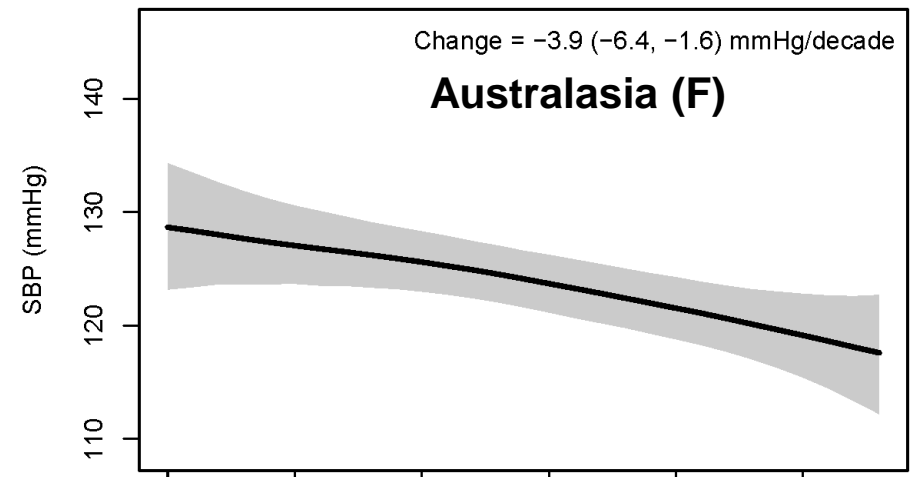
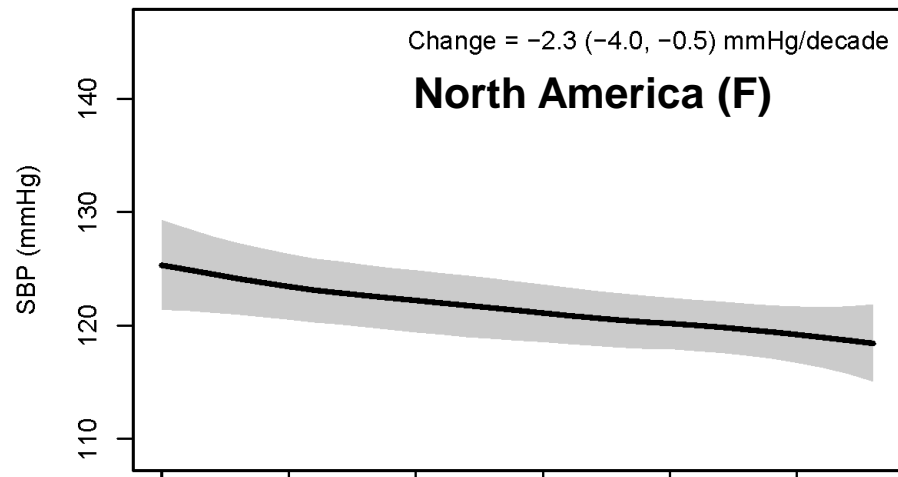


# SBP trends in high-income regions (men)

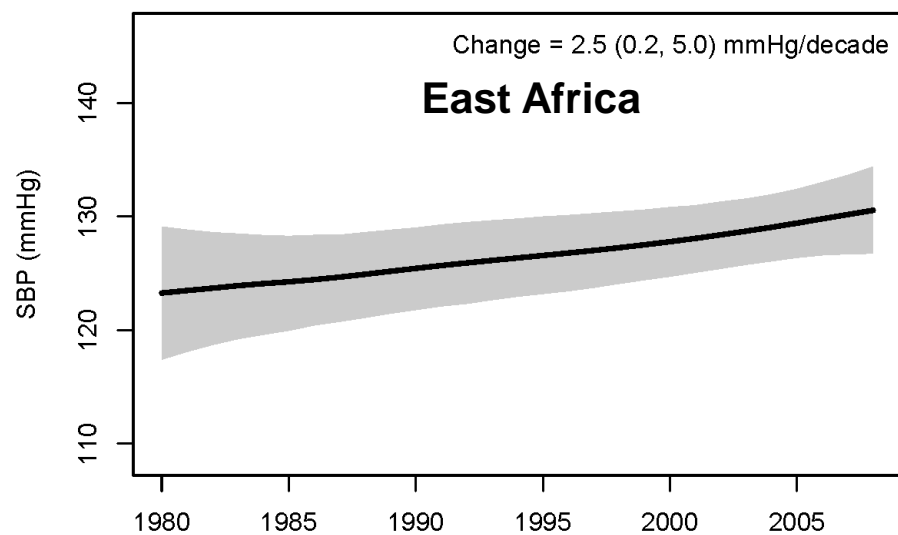
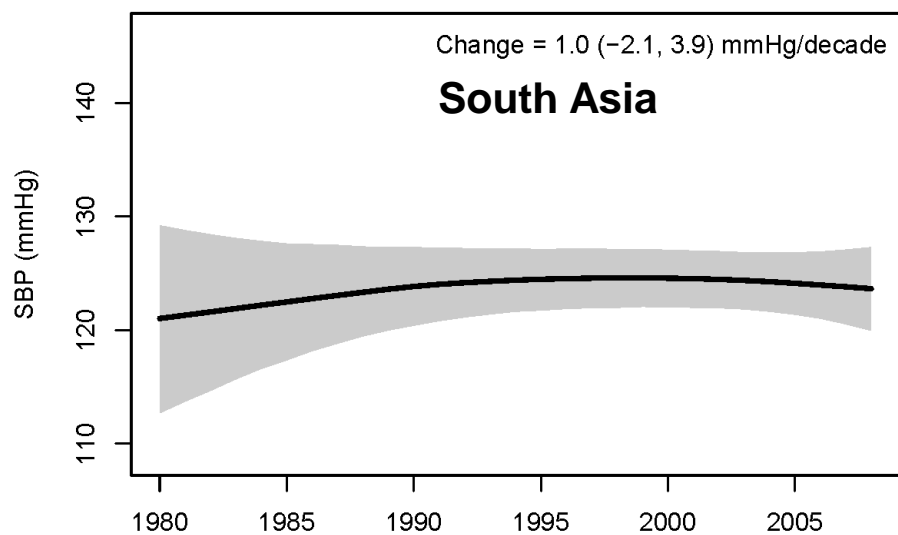
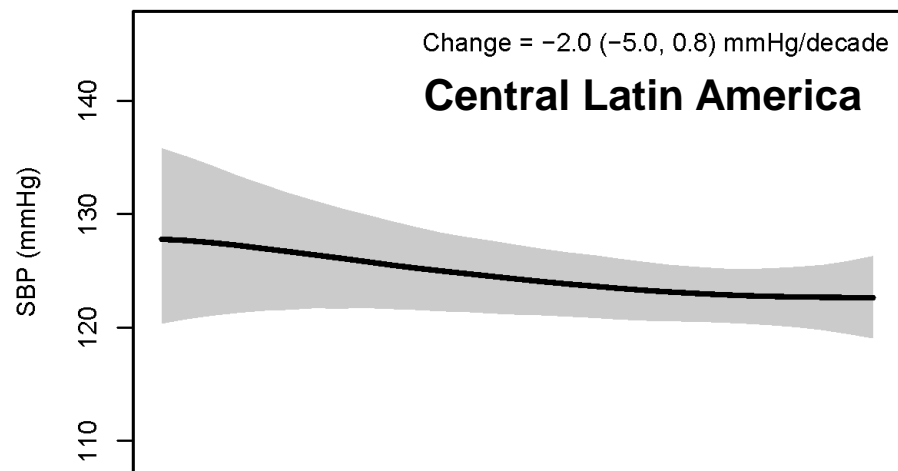
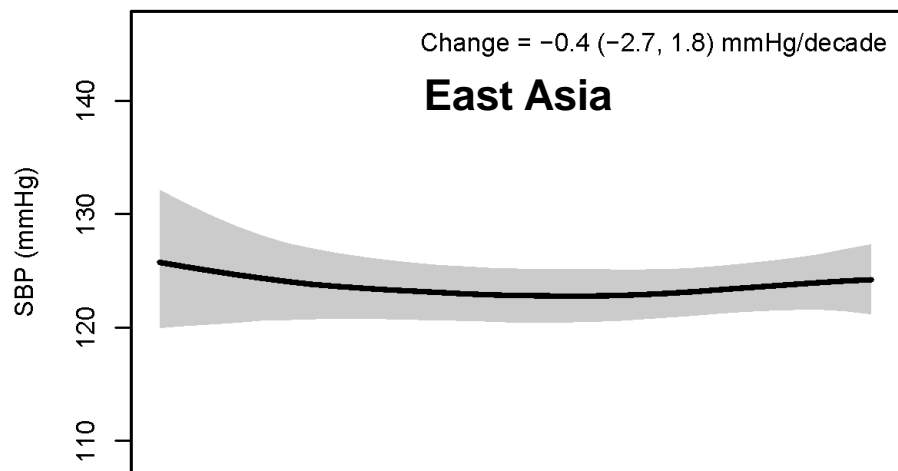




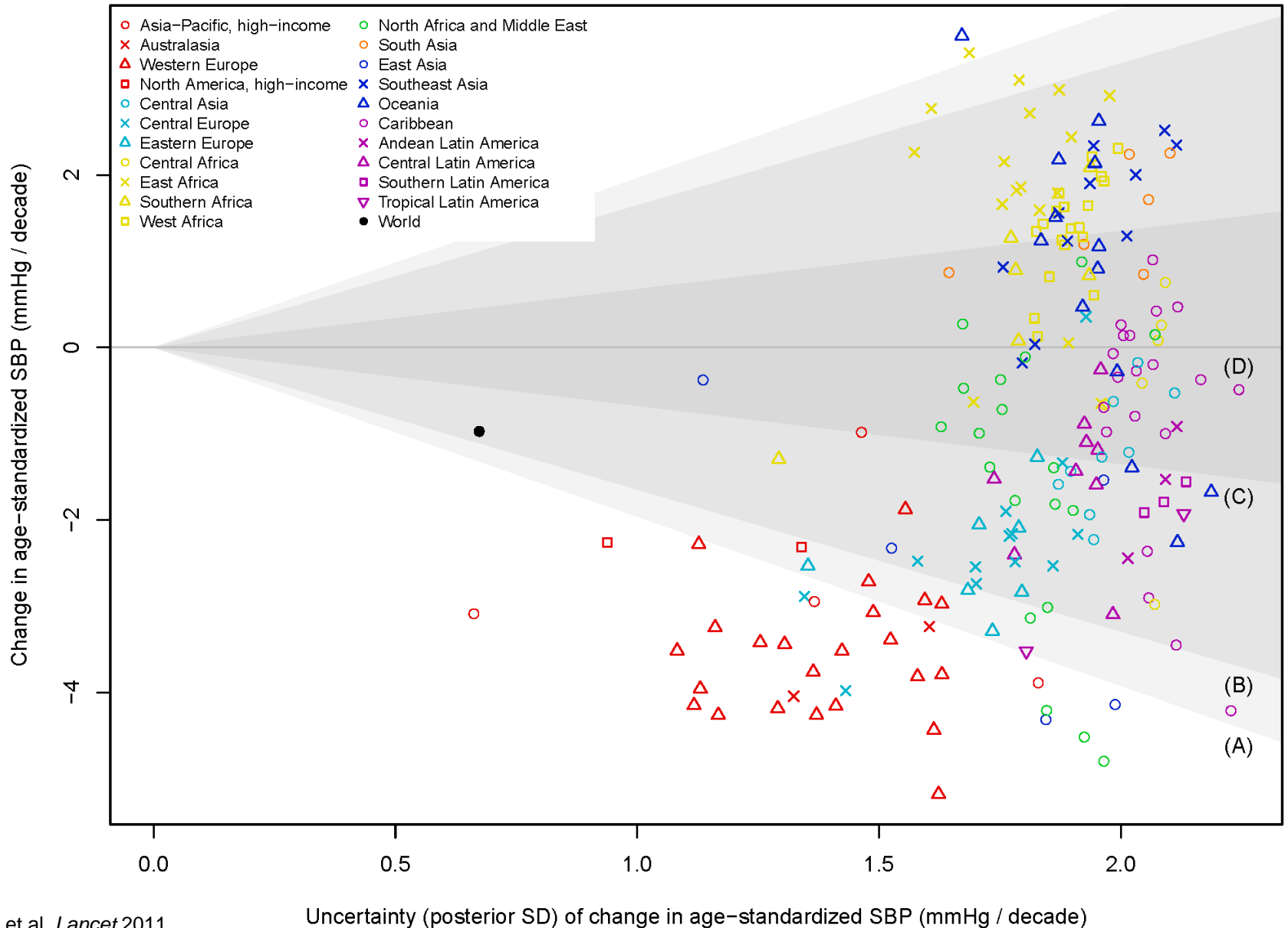
# SBP trends in selected high-income regions



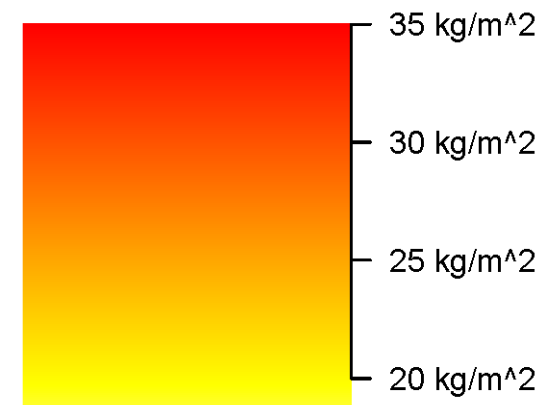
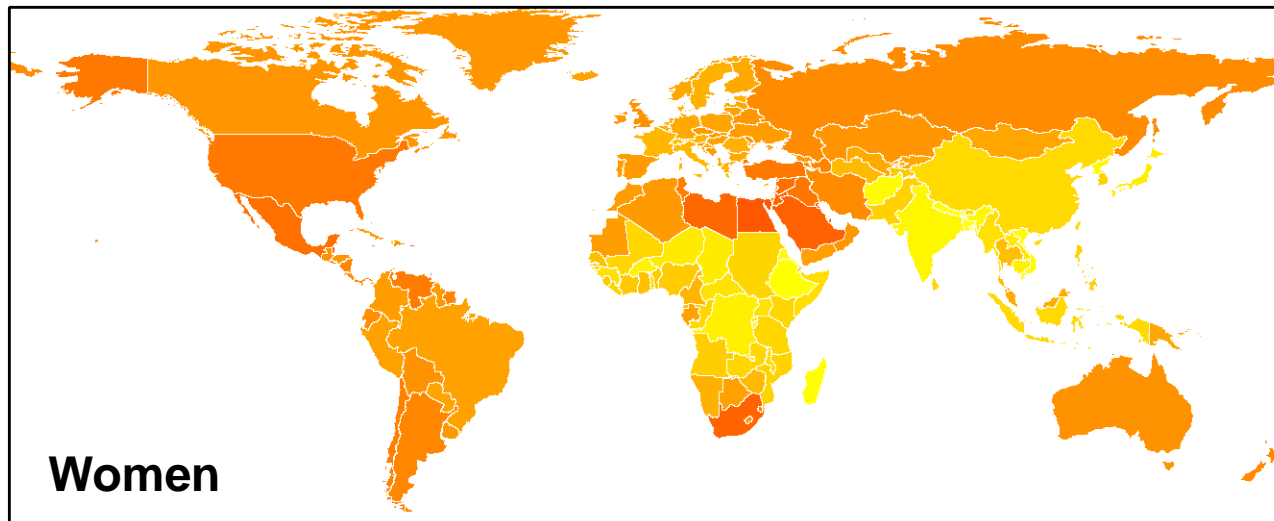
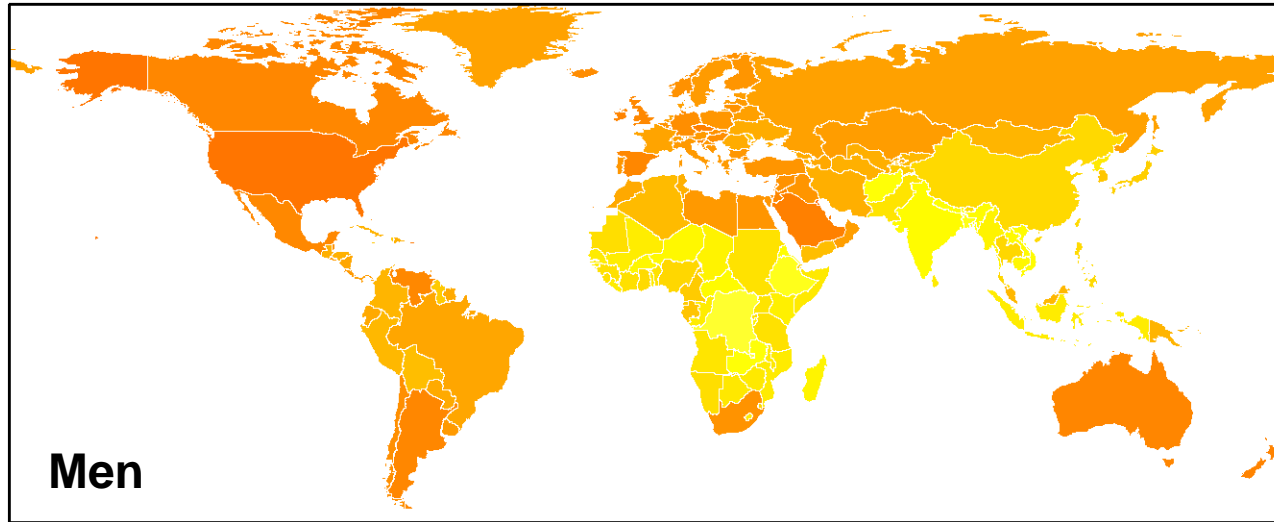
# SBP trends in selected regions (women)



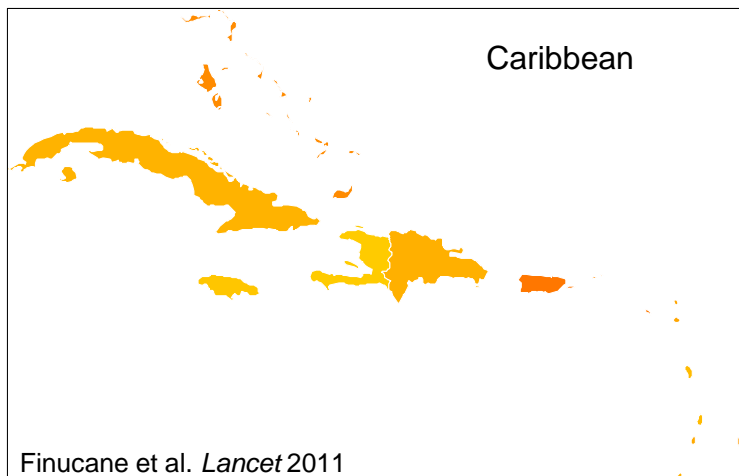
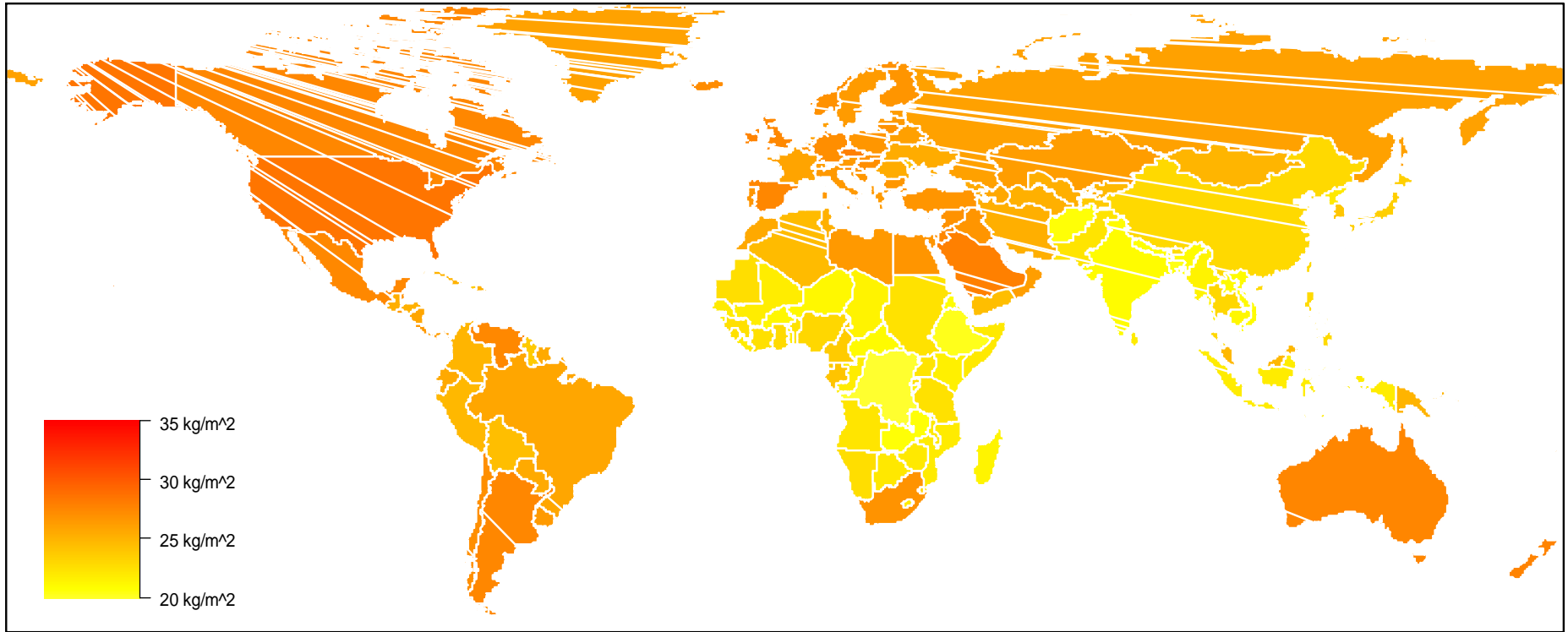
# Change in SBP in 199 countries (women)



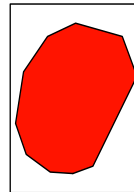
# Age-standardized mean BMI in 2008



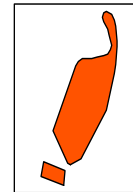
# Age-standardized mean BMI in 2008 (men)



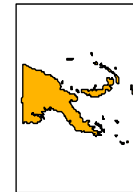
Nauru



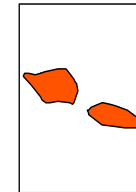
Palau



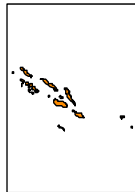
Papua New Guinea



Samoa



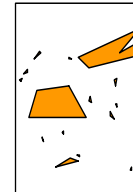
Solomon Islands



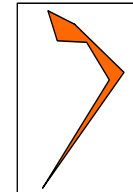
Vanuatu



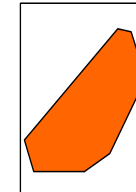
Fiji



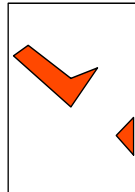
Kiribati



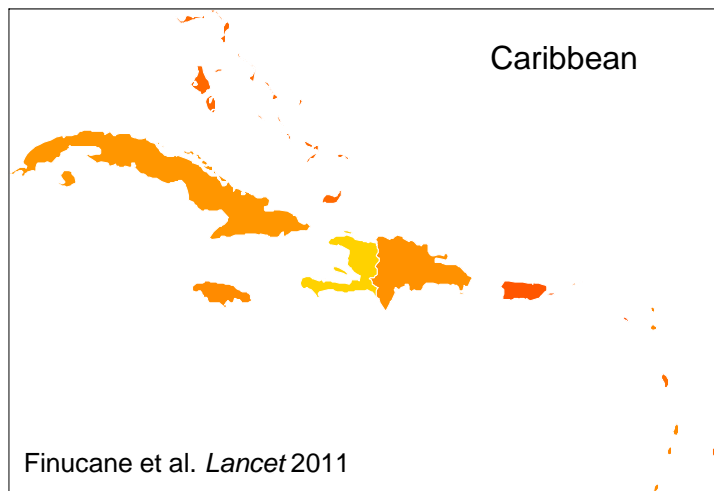
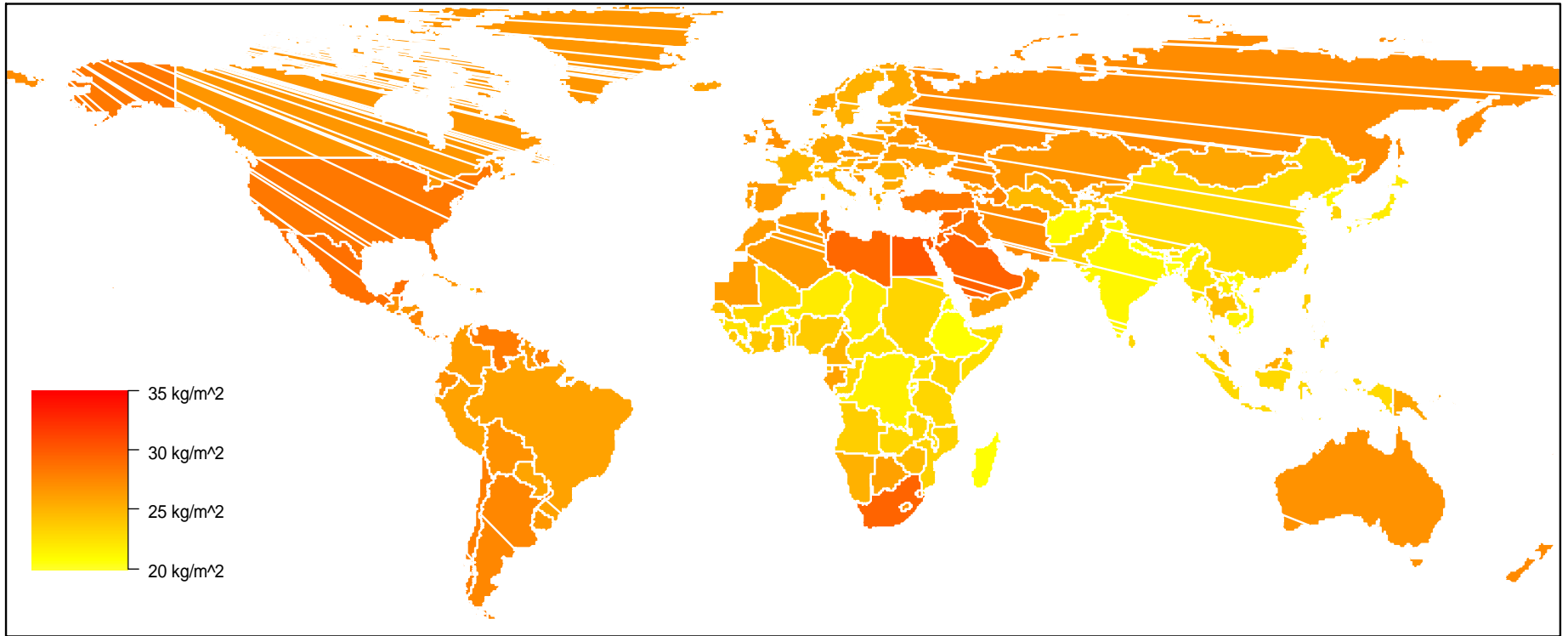
Marshall Islands



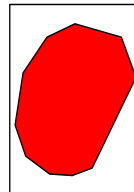
Tonga



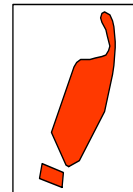
# Age-standardized mean BMI in 2008 (women)



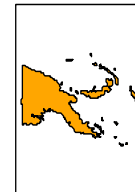
Nauru



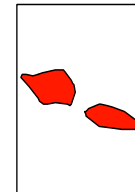
Palau



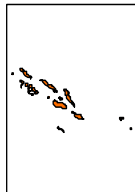
Papua New Guinea



Samoa



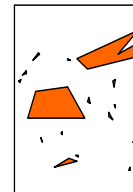
Solomon Islands



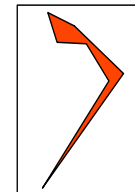
Vanuatu



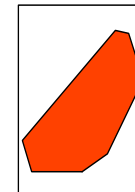
Fiji



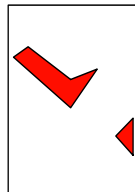
Kiribati



Marshall Islands

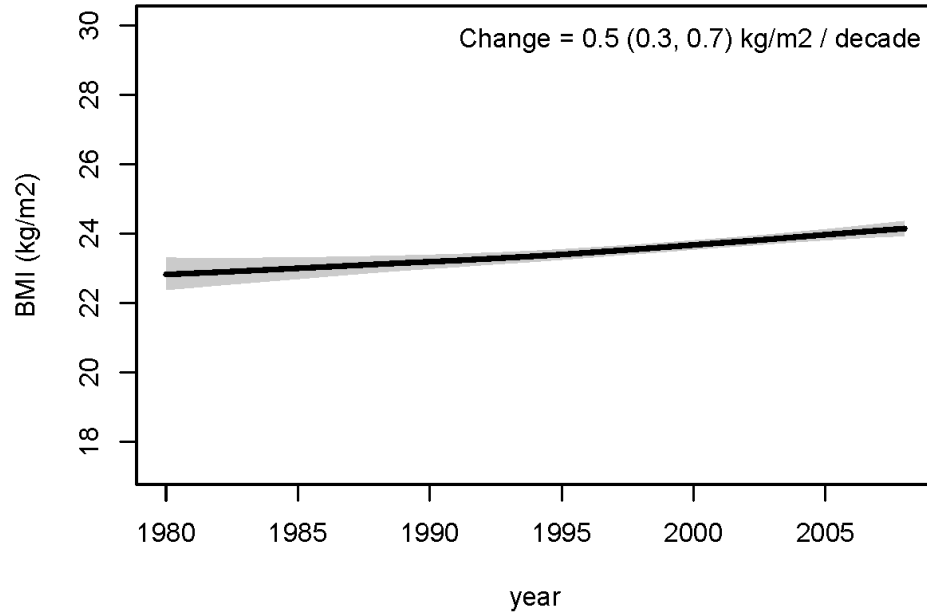


Tonga

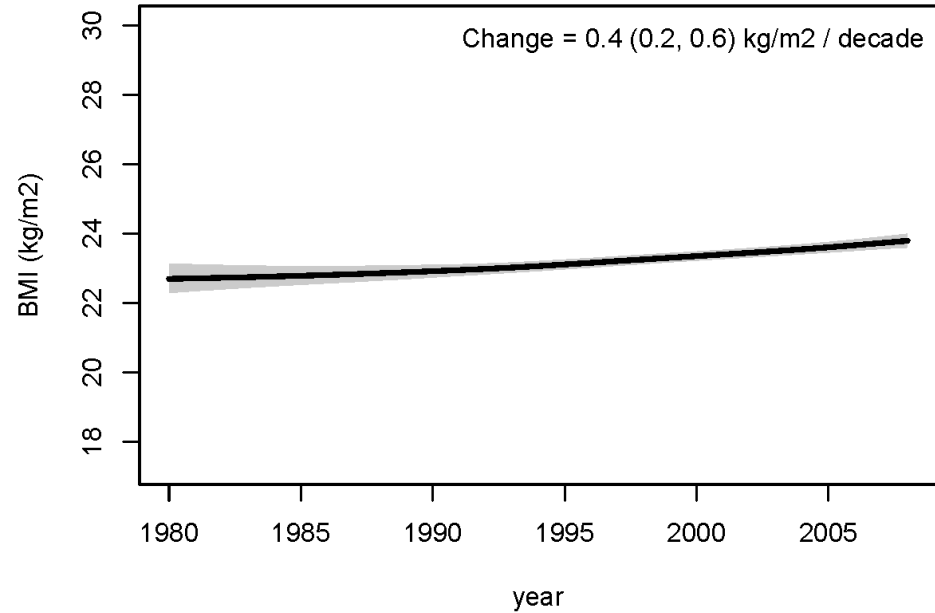


# World trends in age-standardized mean BMI

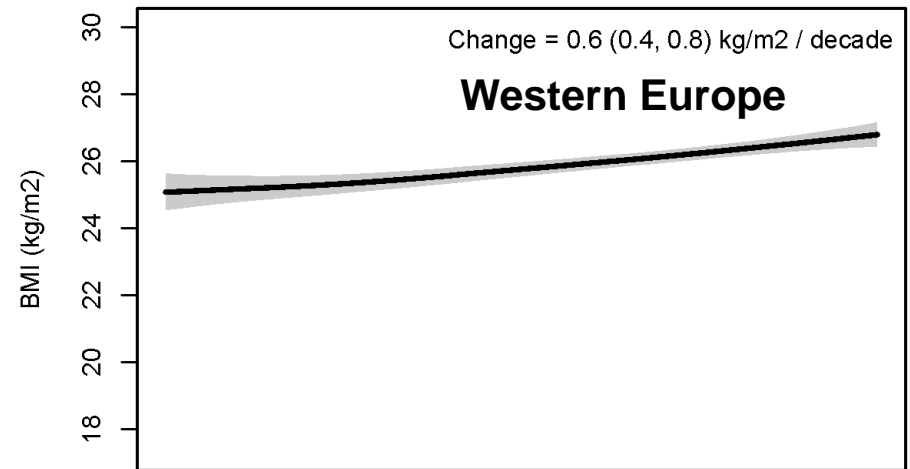
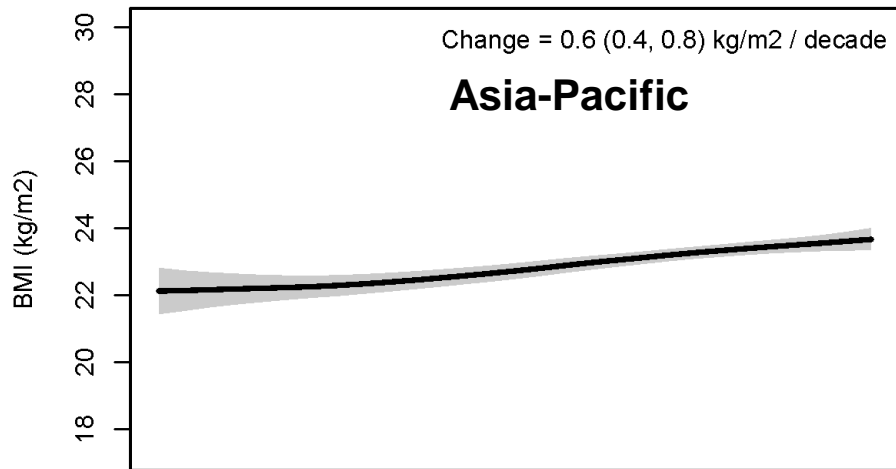
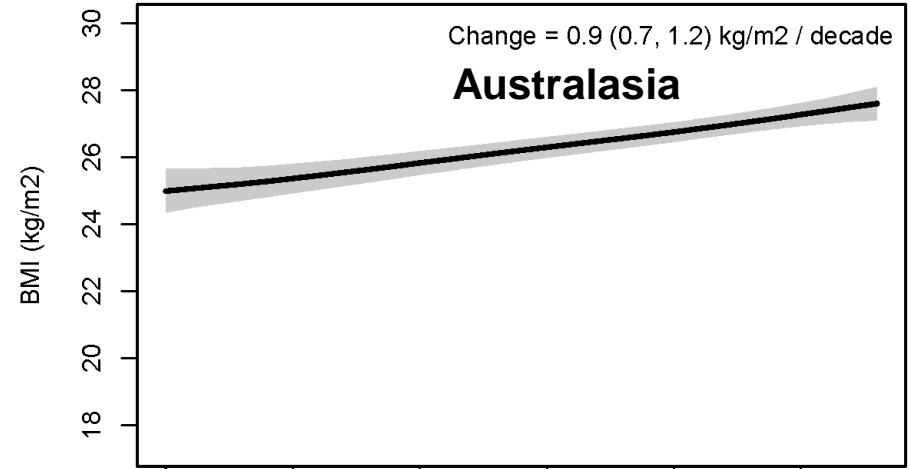
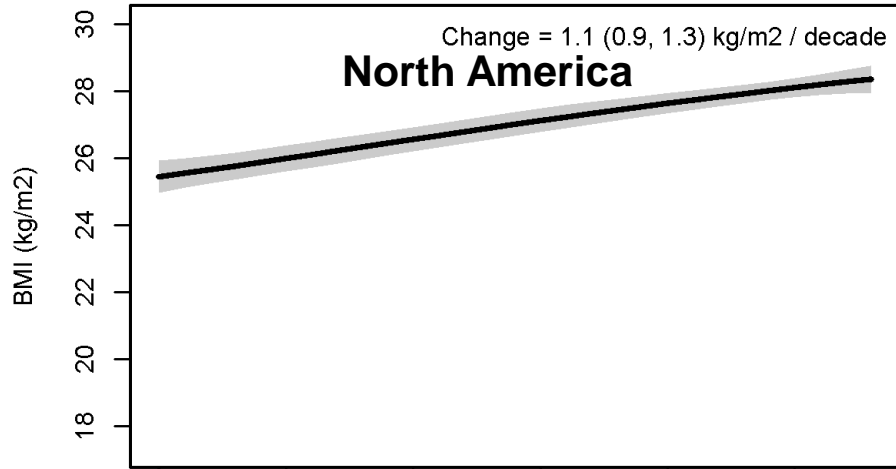
## Women



## Men

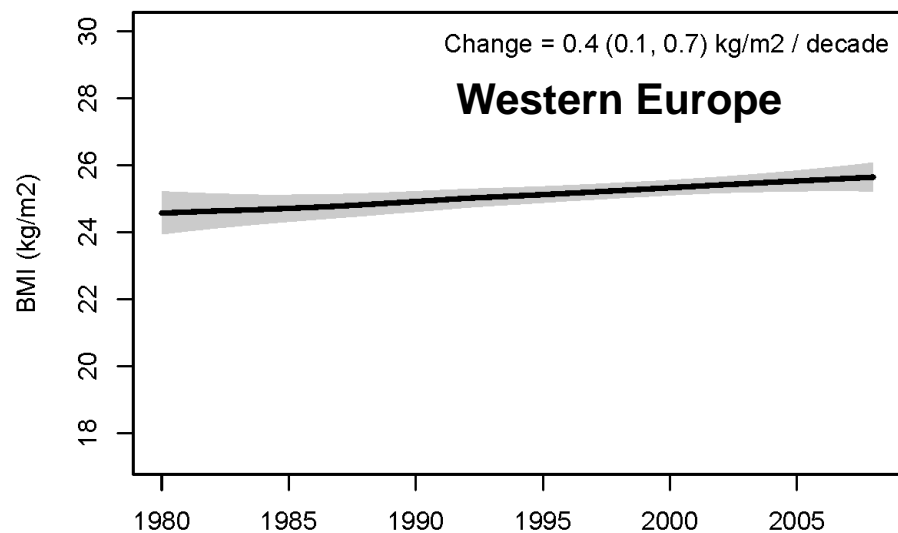
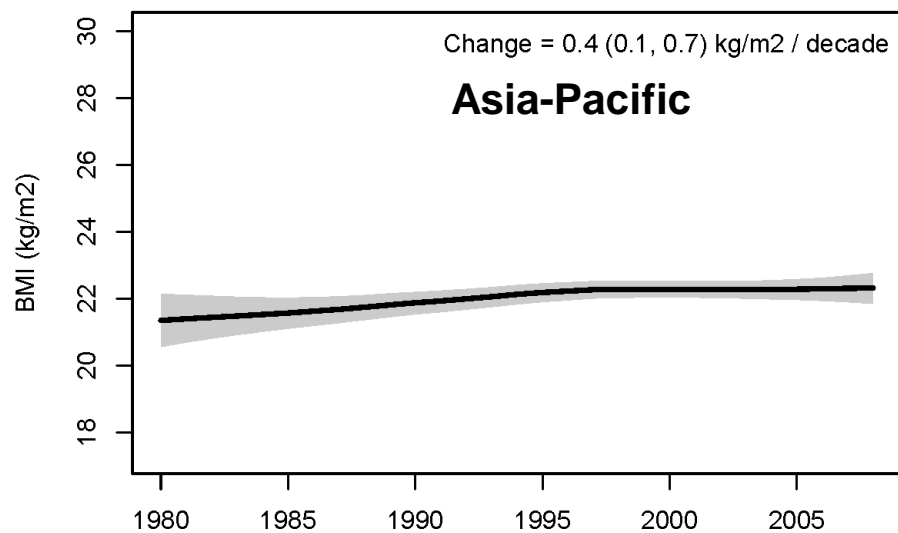
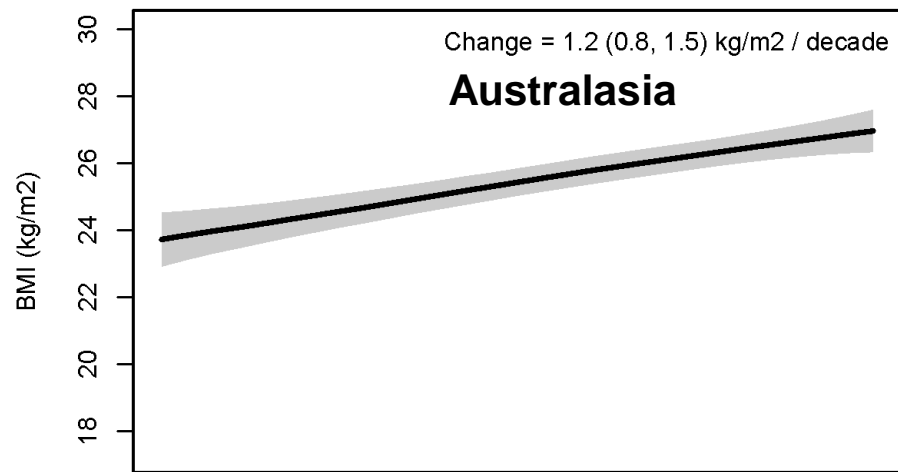
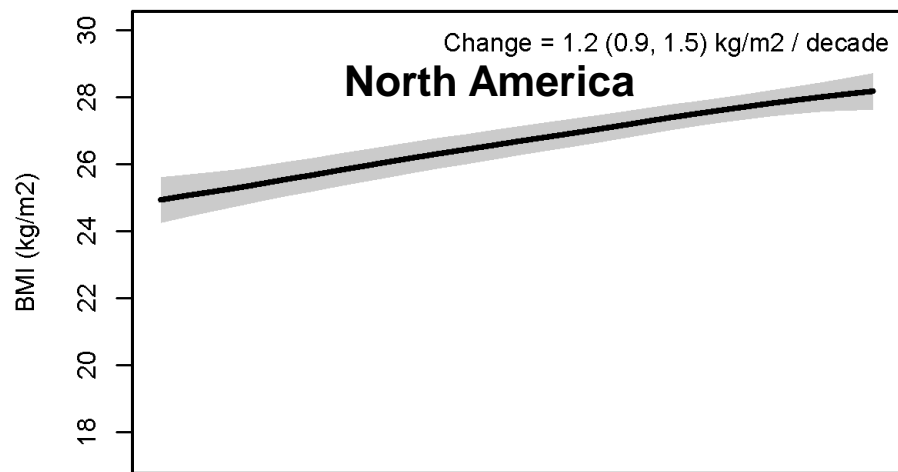


# BMI trends in high-income regions (men)

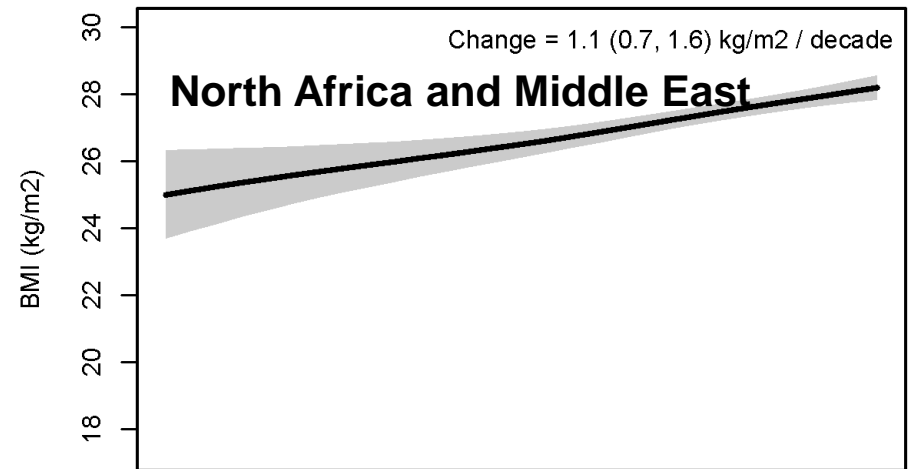
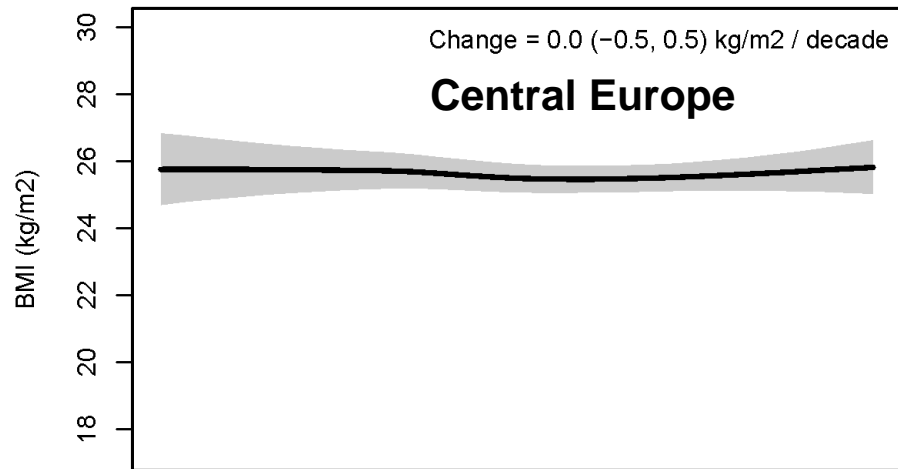
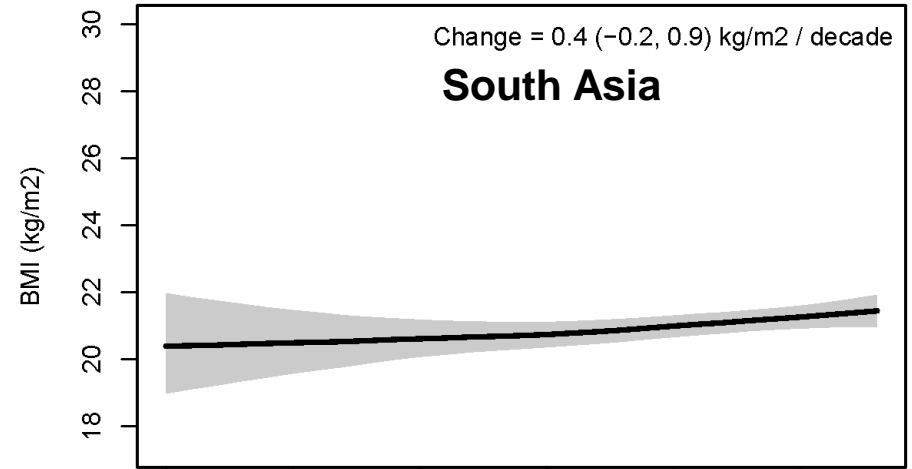
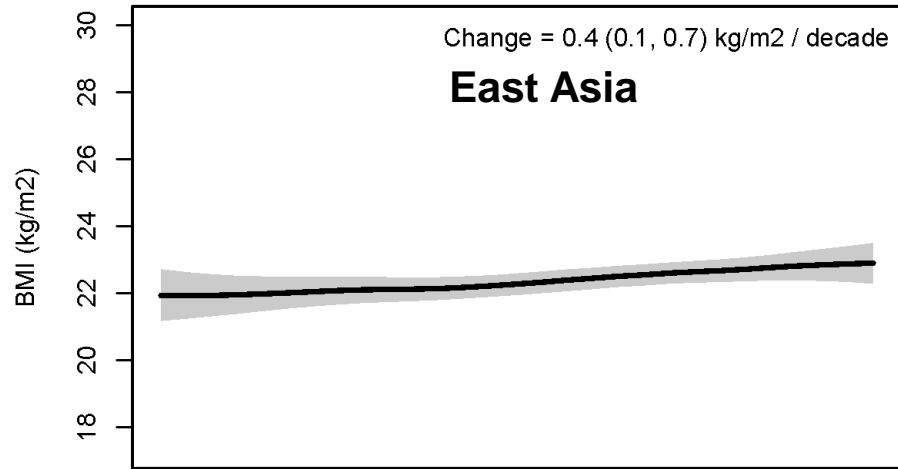




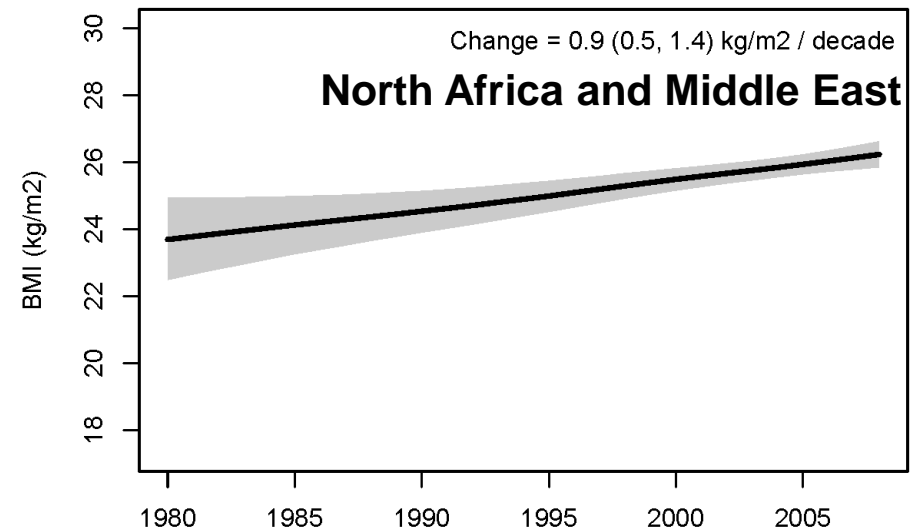
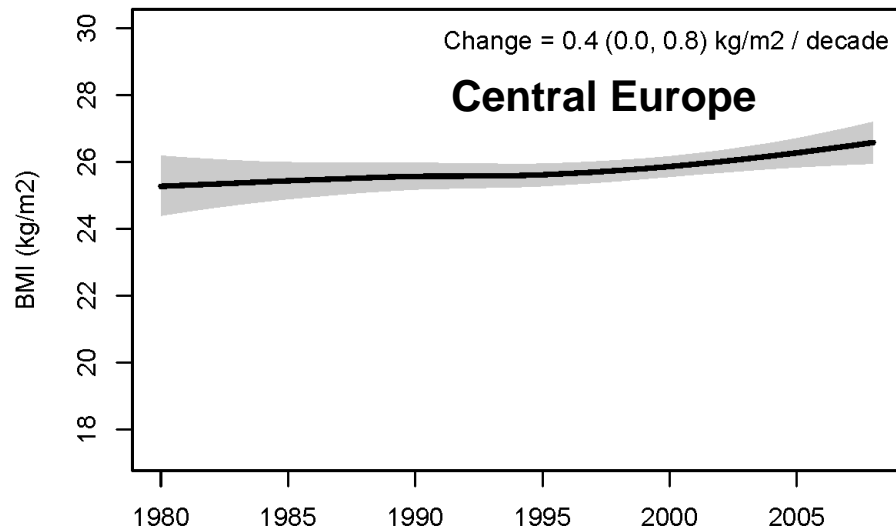
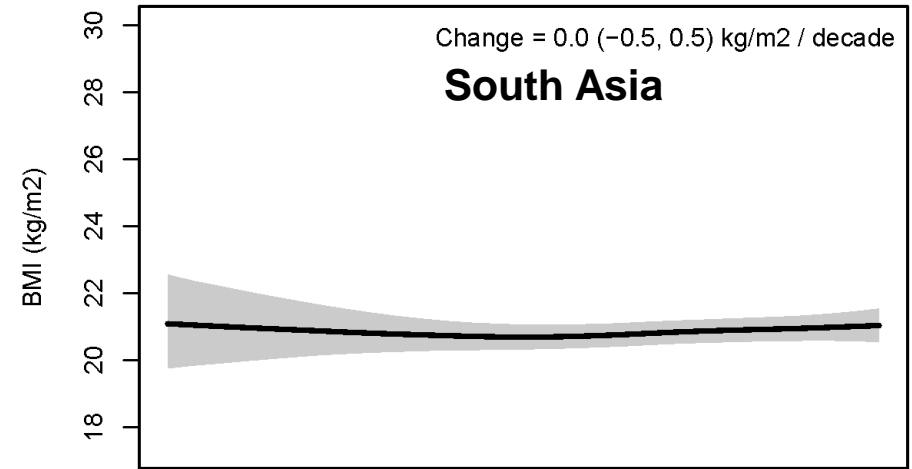
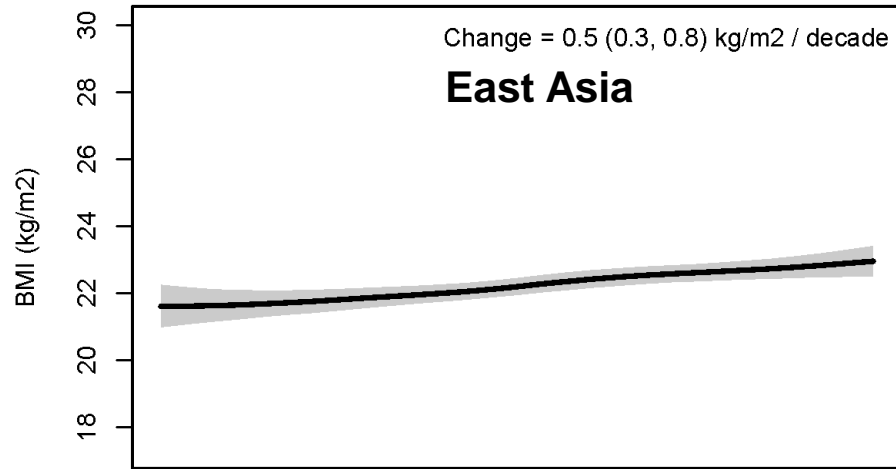
# BMI trends in high-income regions (women)



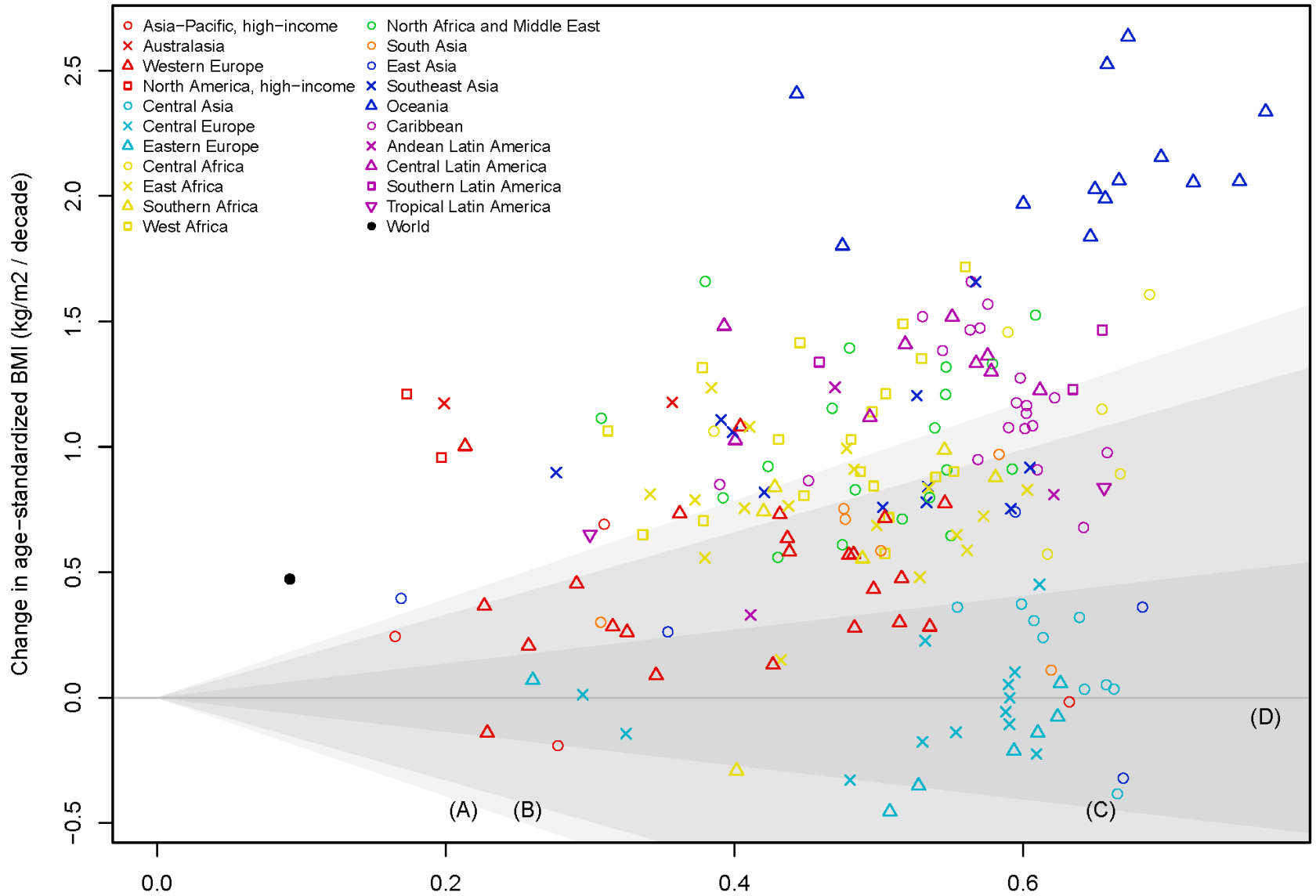
# BMI trends in selected regions (women)



# BMI trends in selected regions (men)

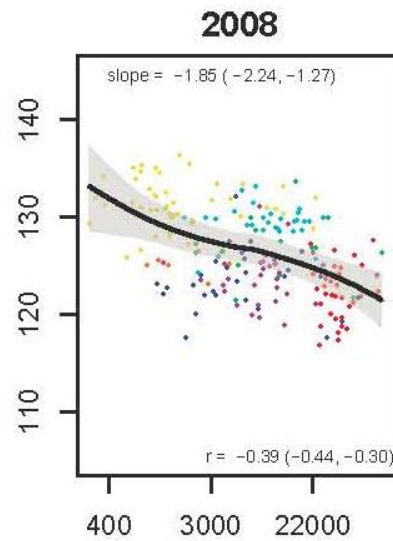
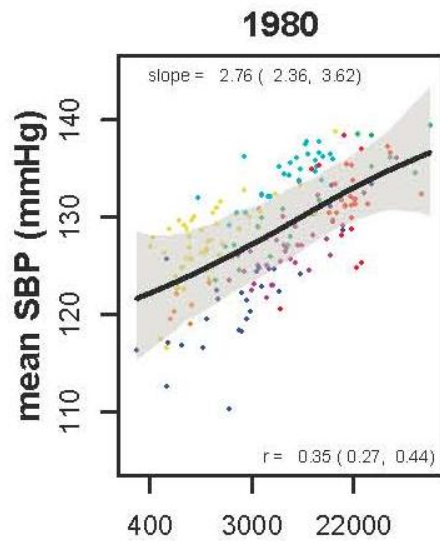


# Change in BMI in 199 countries (women)

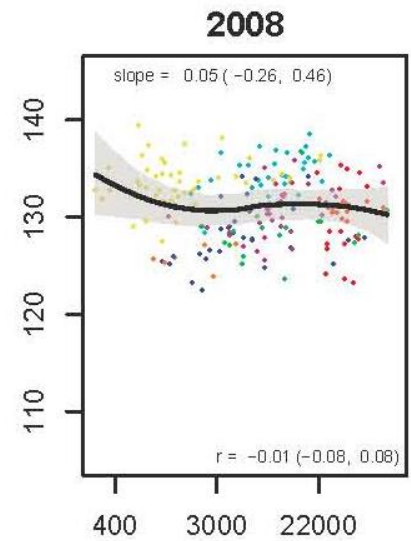
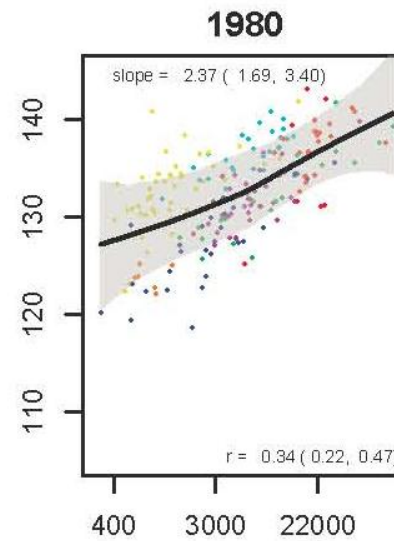


# SBP in relation to national income 1980-2008 (women)

Female



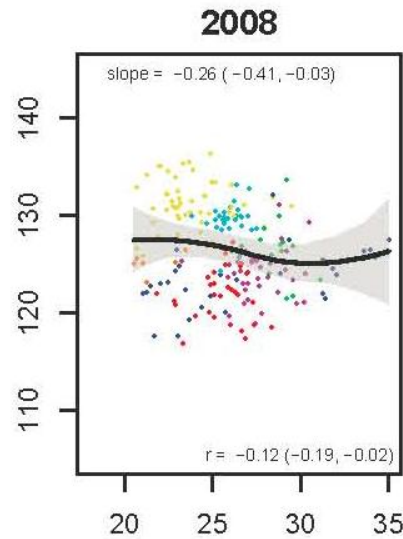
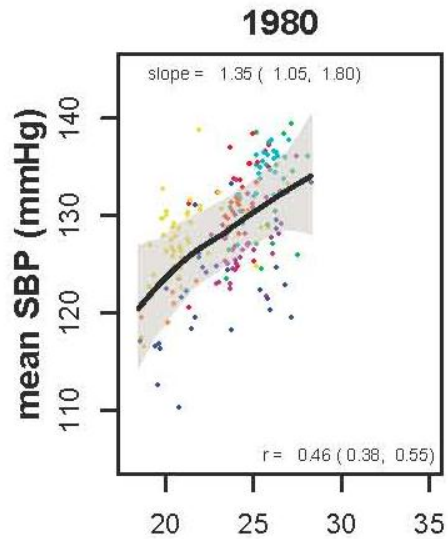
Male



GDP (2005 Int \$)

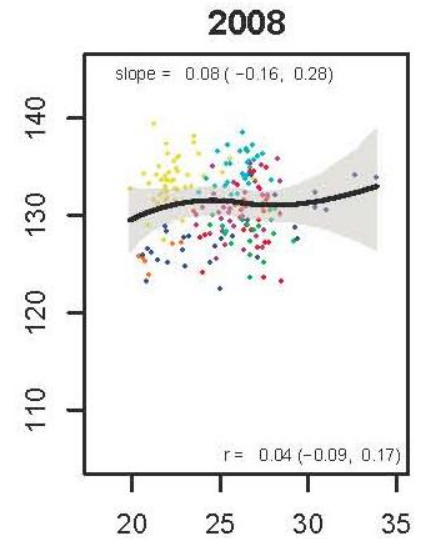
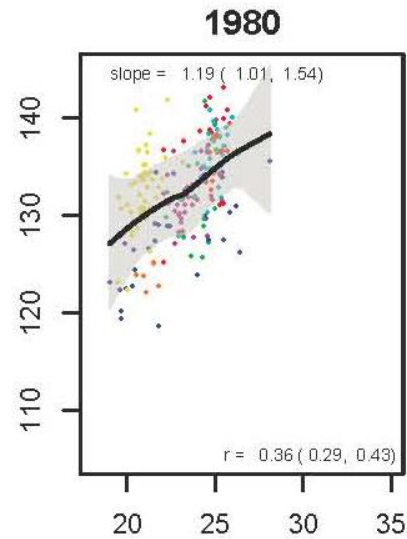
# SBP in relation to BMI 1980-2008 (women)

Female



mean BMI (kg/m<sup>2</sup>)

Male



# Risk factors in the eight subgroups of US population: men $\geq$ 60 years

America	SBP (mmHg)	BMI (kg/m <sup>2</sup> )	FPG (mg/dL)	Current smoking (%)	Former smoking (%)
Asians	135 (4.4)	<b>27 (0.81)</b>	<b>106 (1.9)</b>	<b>5 (3.5)</b>	<b>35 (11.7)</b>
Northland rural whites	<b>133 (1.2)</b>	28.6 (0.34)	110 (1.0)	11 (2.3)	<b>59 (3.7)</b>
Middle America	<b>133 (0.3)</b>	27.9 (0.09)	109 (0.3)	11 (0.6)	56 (1.0)
Whites in Appalachia and Mississippi Valley	<b>133 (0.8)</b>	27.9 (0.21)	110 (0.6)	14 (1.4)	56 (2.2)
Western Native Americans	138 (4.0)	<b>29.4 (1.14)</b>	<b>116 (3.6)</b>	<b>21 (9.2)</b>	40 (9.8)
Black middle America	138 (2.0)	28.3 (0.52)	112 (1.4)	19 (4.3)	45 (6.1)
Southern rural blacks	<b>140 (2.0)</b>	28.7 (0.57)	113 (1.8)	17 (3.7)	44 (5.6)
High-risk urban blacks	138 (2.9)	28.0 (0.78)	110 (2.1)	<b>21 (5.9)</b>	39 (7.5)

# Risk factors in the eight subgroups of US population: women $\geq$ 60 years

America	SBP (mmHg)	BMI (kg/m <sup>2</sup> )	FPG (mg/dL)	Current smoking (%)	Former smoking (%)
Asians	143 (4.8)	<b>27.6 (1.37)</b>	<b>103 (2.4)</b>	<b>3 (2.0)</b>	21 (7.2)
Northland rural whites	<b>139 (1.2)</b>	29.7 (0.39)	104 (0.6)	8 (1.5)	27 (2.7)
Middle America	<b>139 (0.3)</b>	28.9 (0.12)	104 (0.2)	11 (0.5)	34 (0.7)
Whites in Appalachia and Mississippi Valley	<b>139 (0.6)</b>	29.2 (0.25)	105 (0.4)	14 (1.1)	26 (1.4)
Western Native Americans	140 (3.6)	30.1 (1.79)	108 (2.9)	<b>15 (5.7)</b>	<b>36 (10.1)</b>
Black middle America	143 (1.6)	31.9 (0.67)	108 (1.1)	14 (2.7)	27 (3.4)
Southern rural blacks	<b>144 (1.5)</b>	<b>32.7 (0.7)</b>	<b>110 (1.3)</b>	10 (2.4)	<b>20 (3.0)</b>
High-risk urban blacks	<b>144 (2.3)</b>	31.0 (0.87)	106 (1.6)	12 (3.2)	32 (5.5)



# Blood pressure and hypertension

## A global health perspective

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