

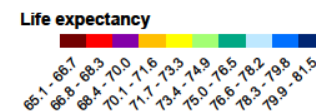
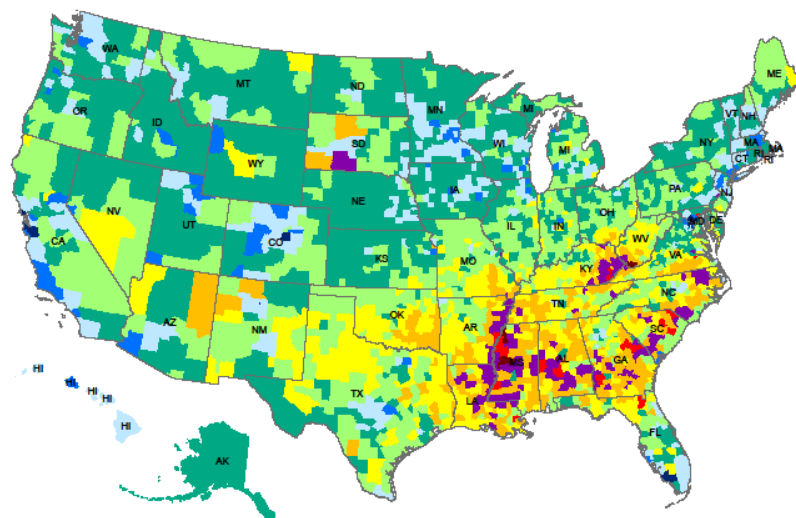
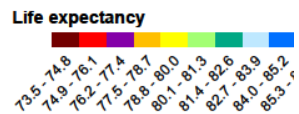
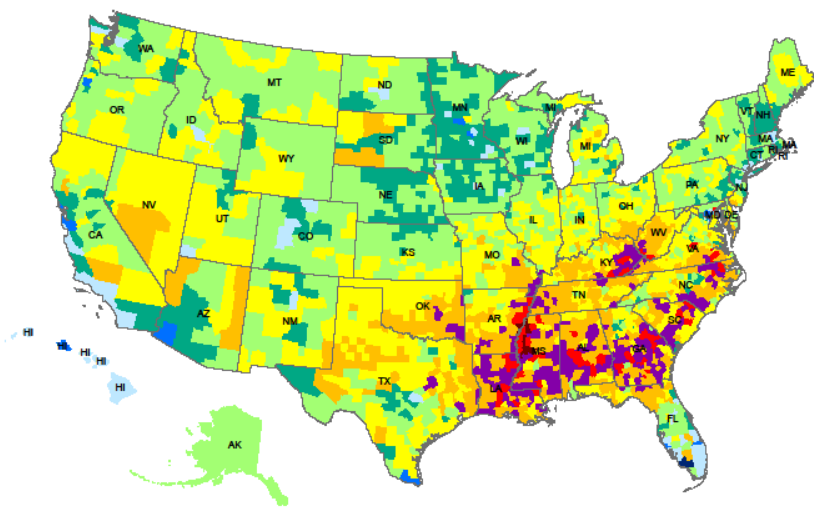
# Inequalities in population health

# Mortality in US counties

# Life expectancy in US counties, 2006

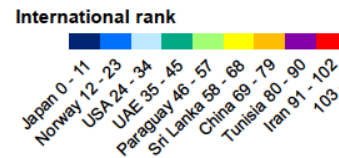
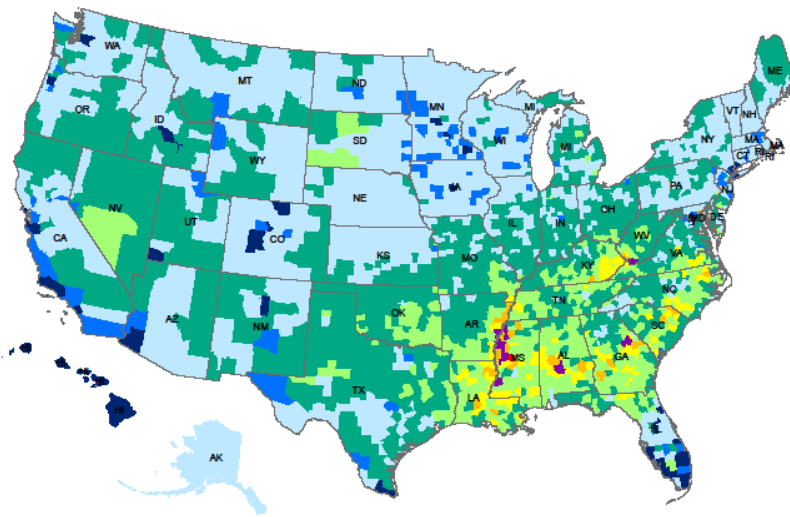
Female

Male

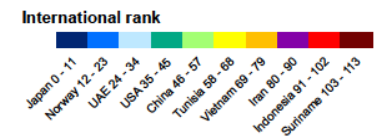
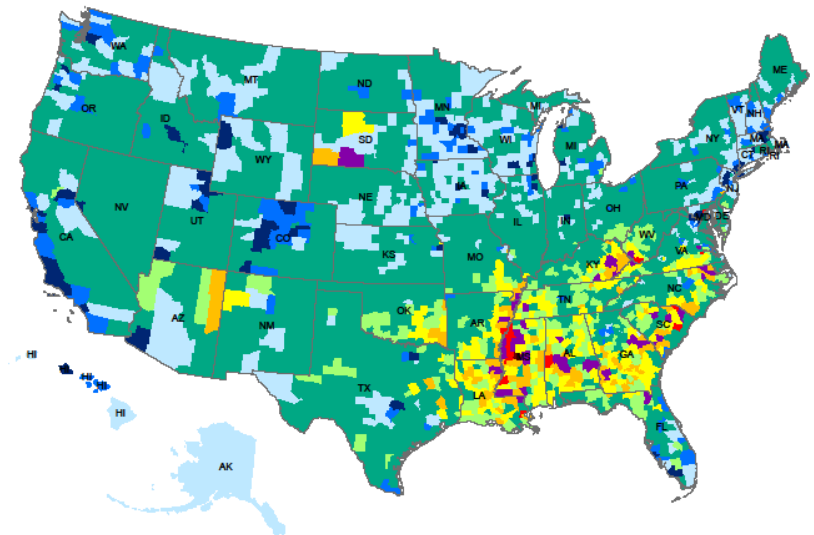


# Global rank of life expectancy in US counties, 2006

Female



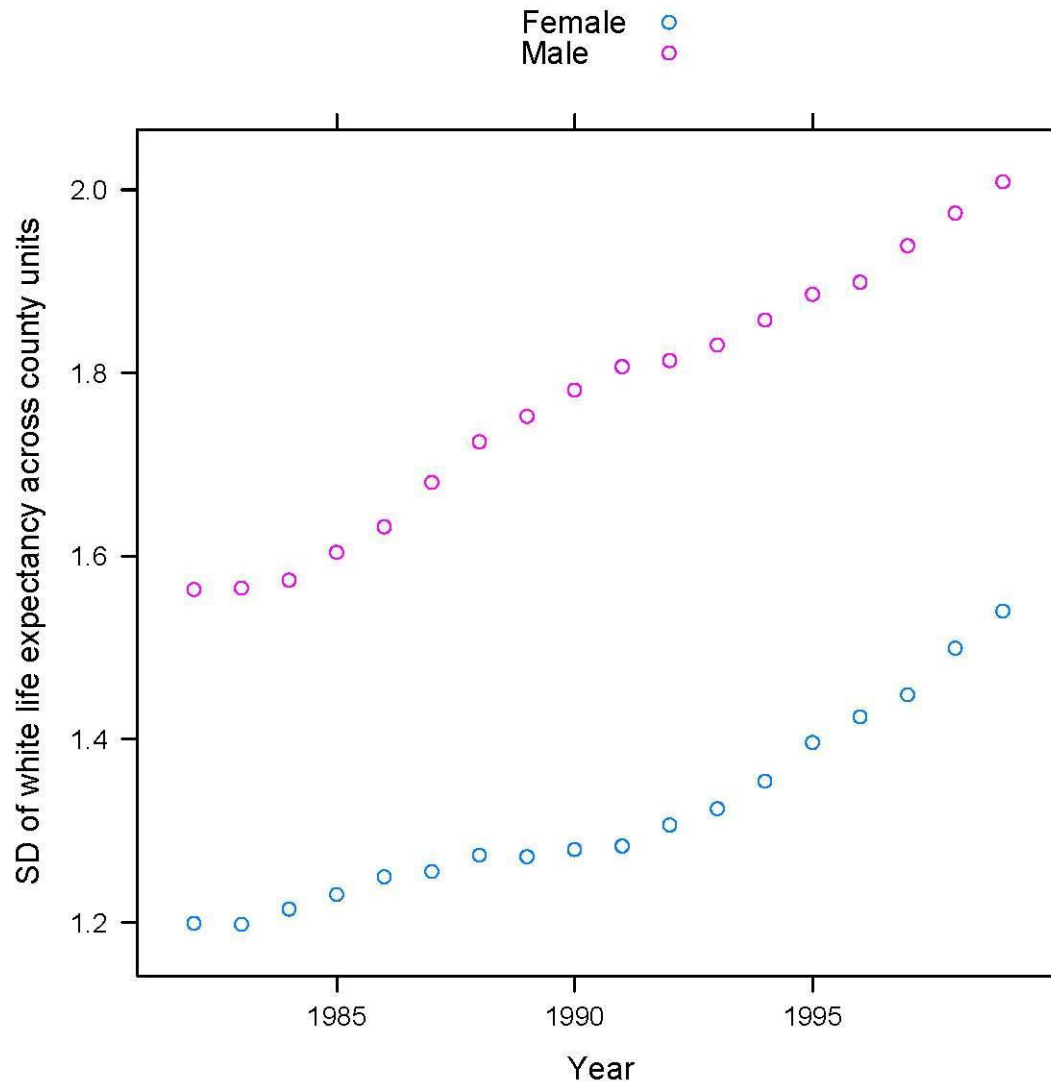
Male



# Standard deviation of county life expectancies over time

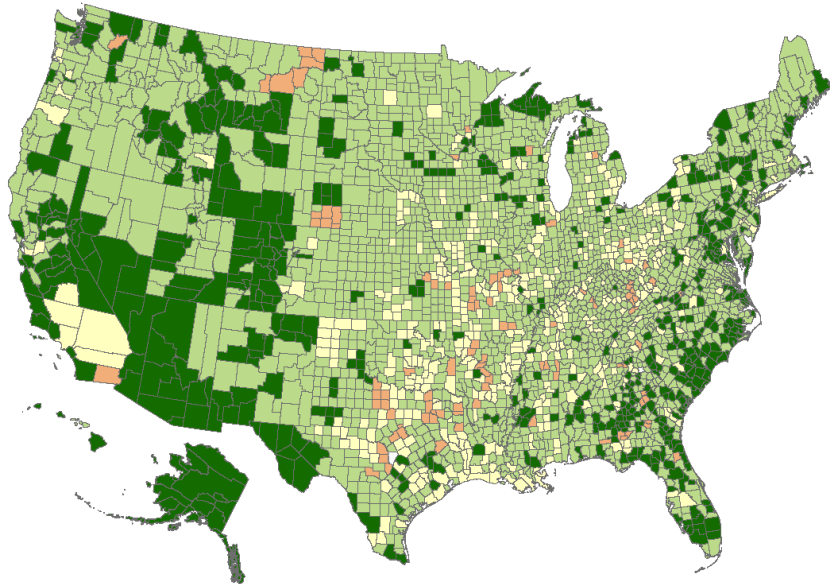


# Standard deviation of county life expectancies over time, whites

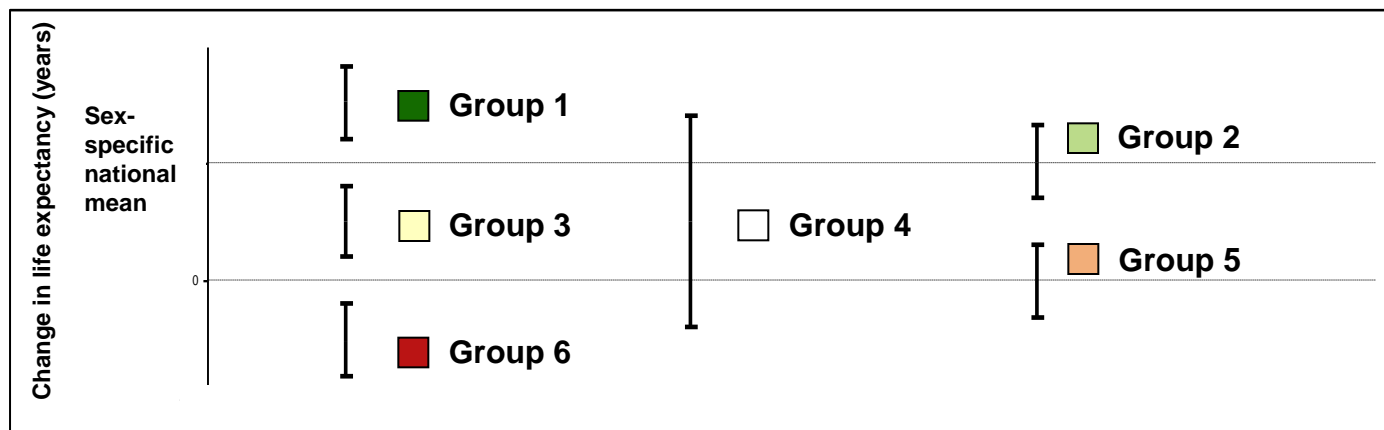
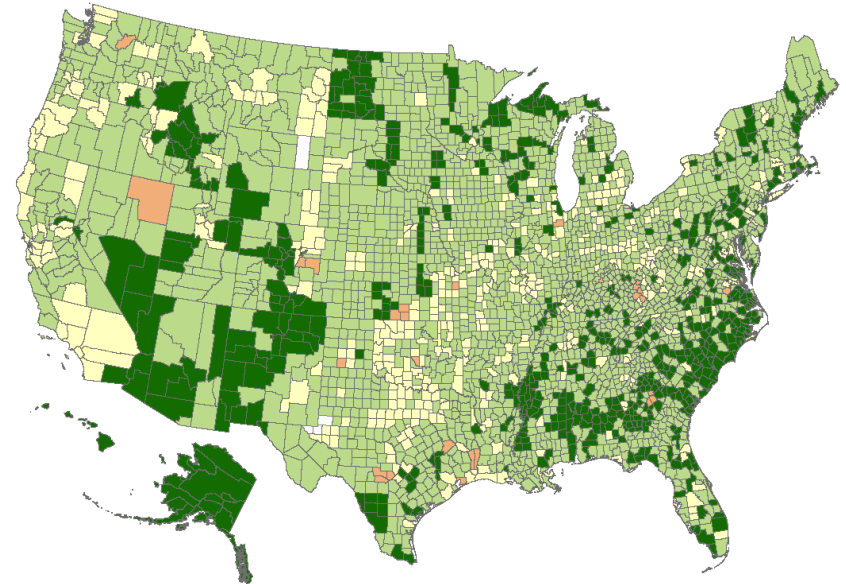


# Change in county life expectancy (1961-83)

Male

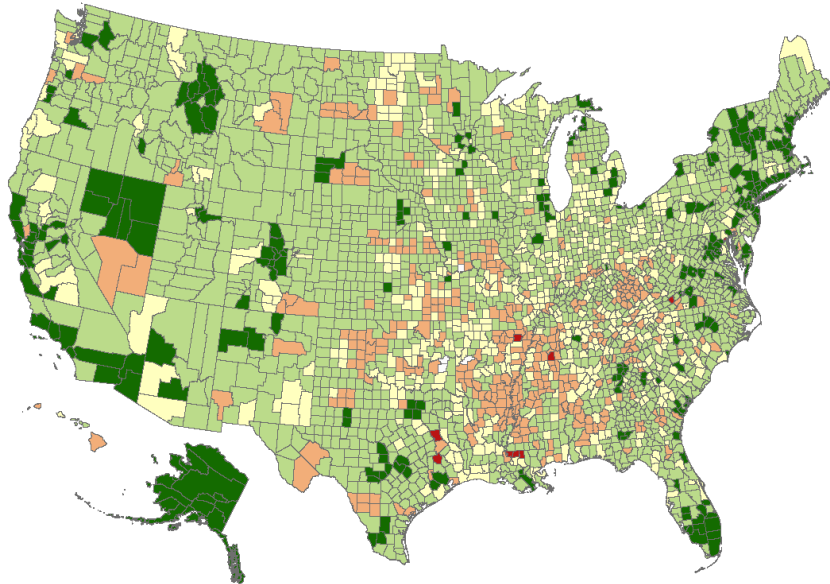


Female

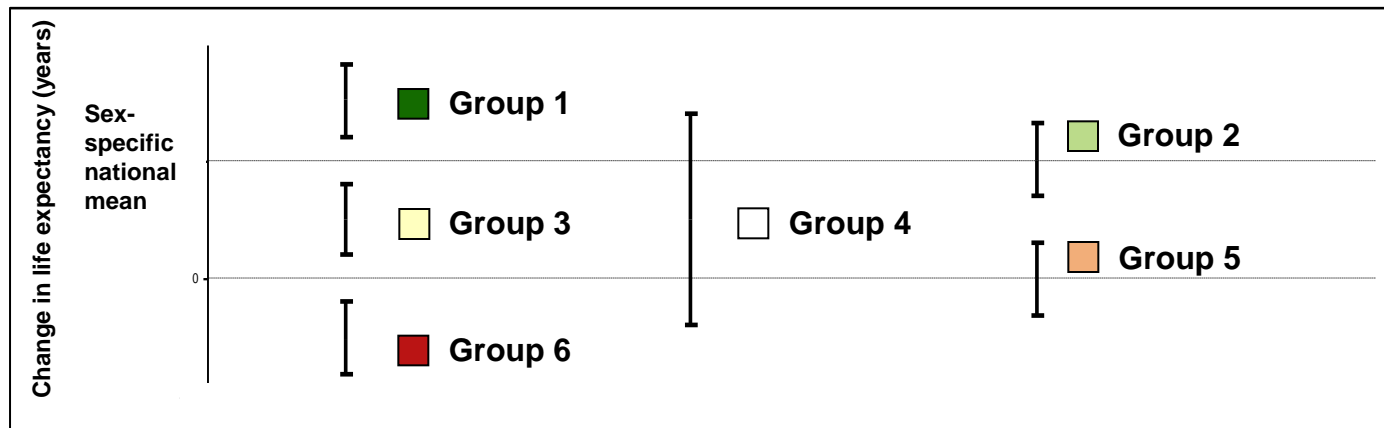
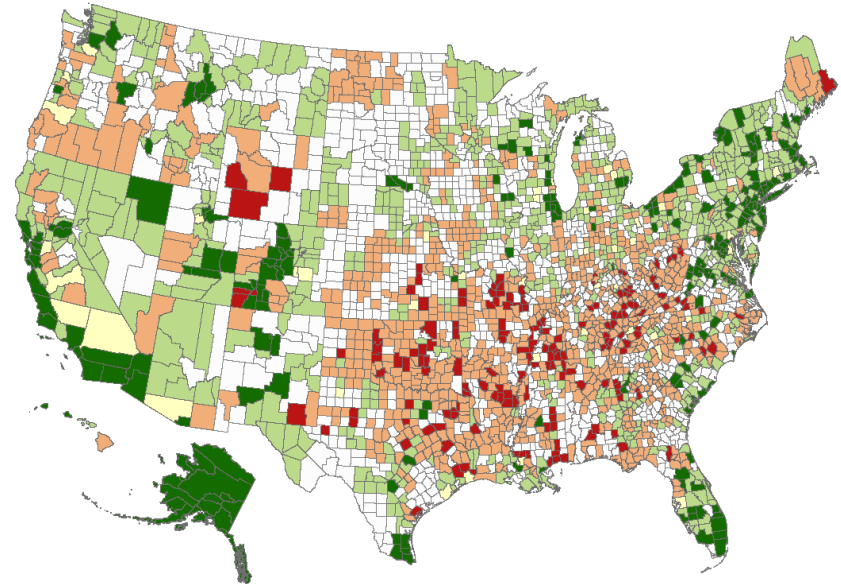


# Change in county life expectancy (1983-99)

Male



Female





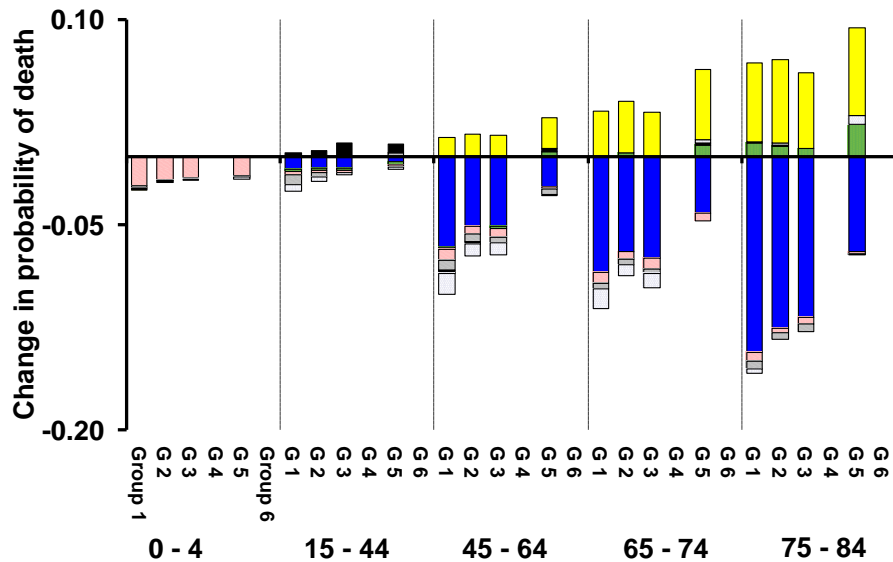
# US county life expectancy summary

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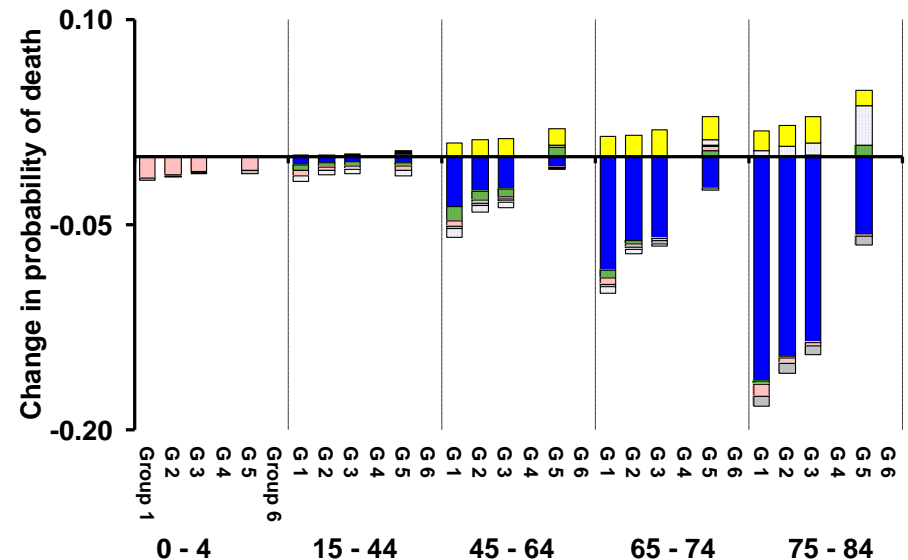
- Rise in cross-county life expectancy disparity since the early 1980s
- Continued rise in life expectancy of better-off counties but stagnation or decline in some of the worse-off ones
- The patterns are unlikely to be due to migration

# Change in probabilities of death in county groups, by cause (1961-83)

Male

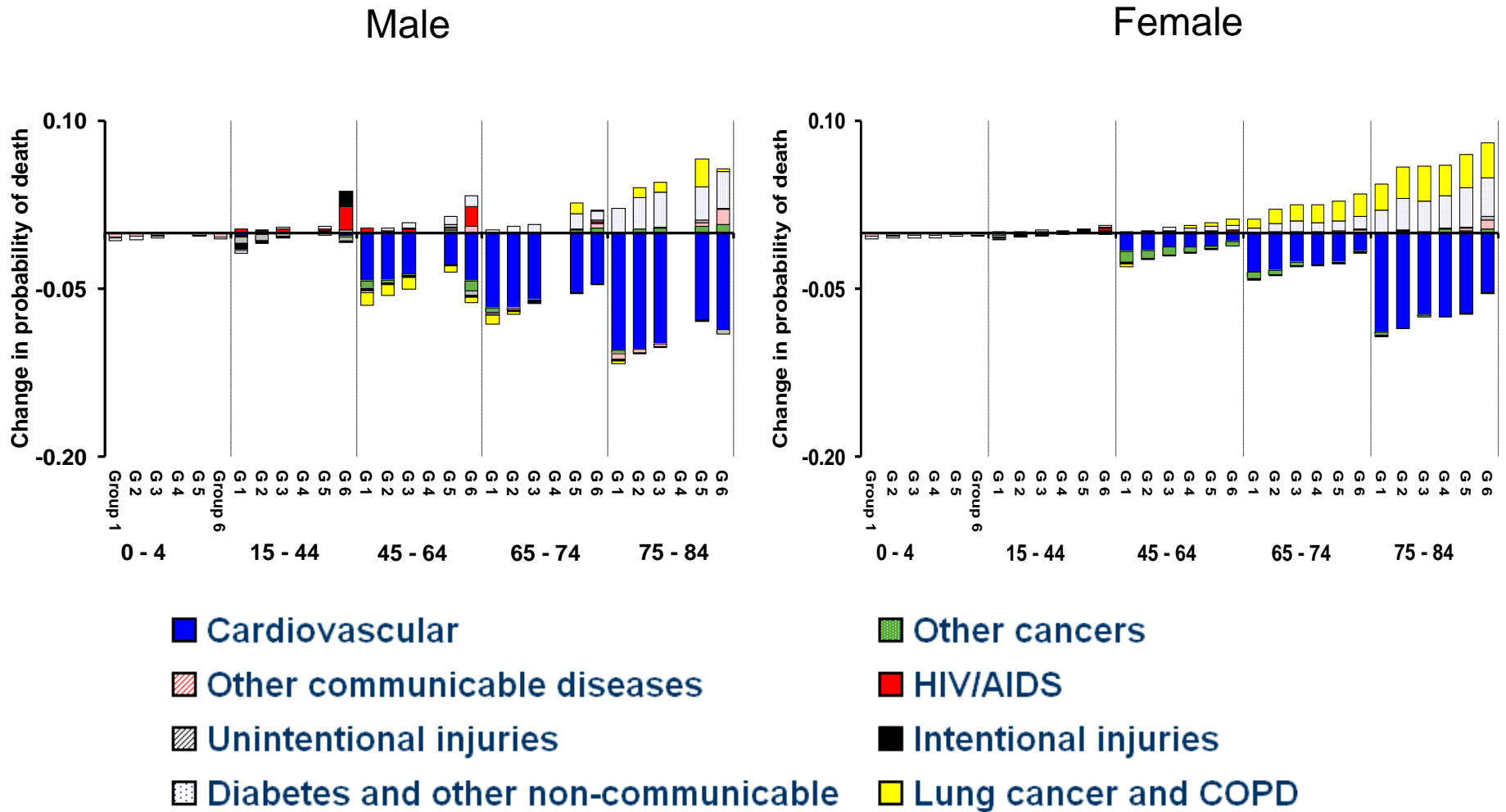


Female



- Cardiovascular
- Other communicable diseases
- Unintentional injuries
- Diabetes and other non-communicable
- Other cancers
- HIV/AIDS
- Intentional injuries
- Lung cancer and COPD

# Change in probabilities of death in county groups, by cause (1983-89)



# US county life expectancy summary

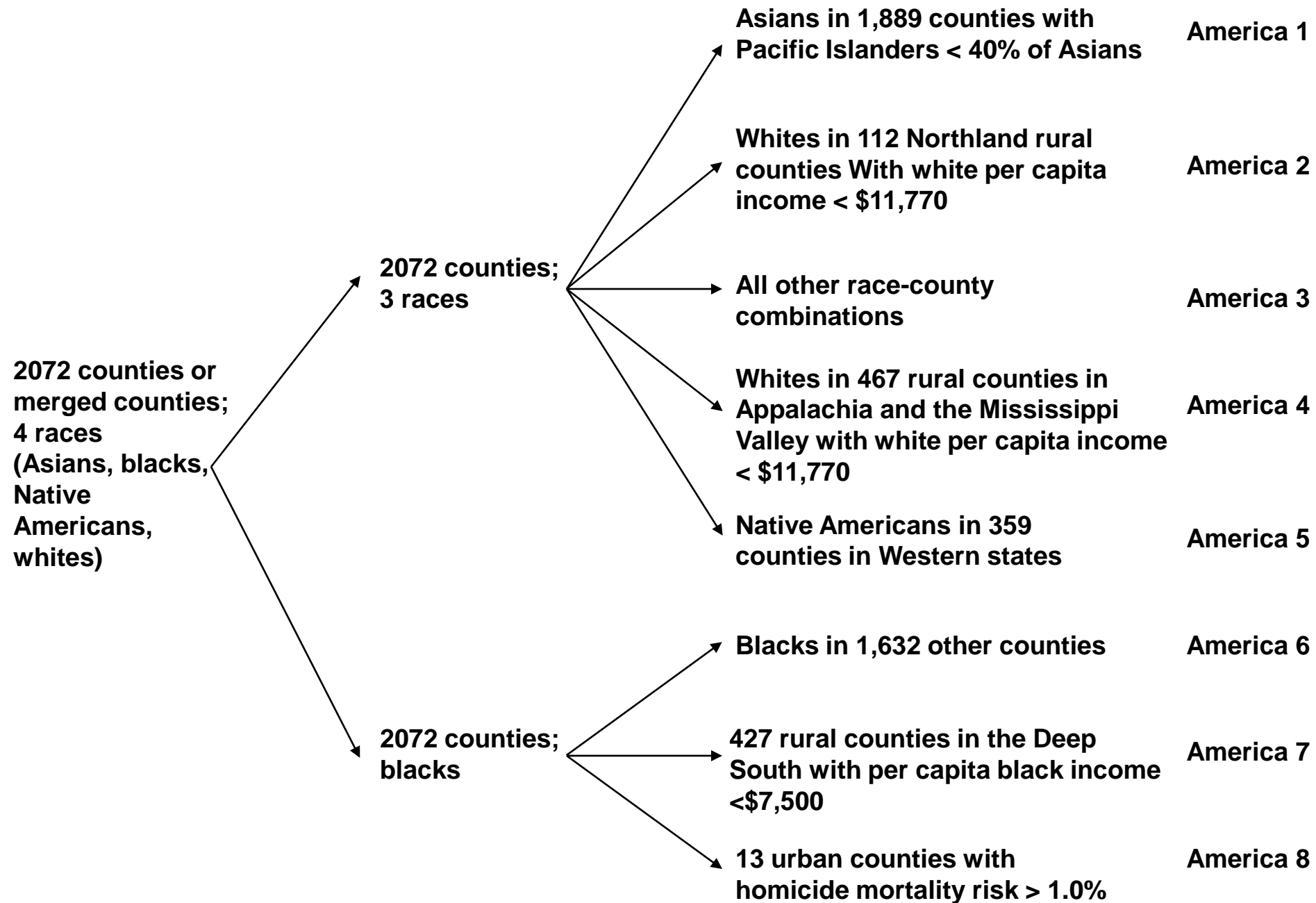
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- Rise in cross-county life expectancy disparity since the early 1980s
- Continued rise in life expectancy of better-off counties but stagnation or decline in some of the worse-off ones
- The patterns are unlikely to be due to migration
  
- Rise in mortality disparities driven primarily by differential change in chronic diseases like lung cancer, COPD, diabetes, and cardiovascular diseases (plus HIV/AIDS and homicide for men)
- Likely roles of smoking, blood pressure, and obesity should be explored

# The “Eight Americas”

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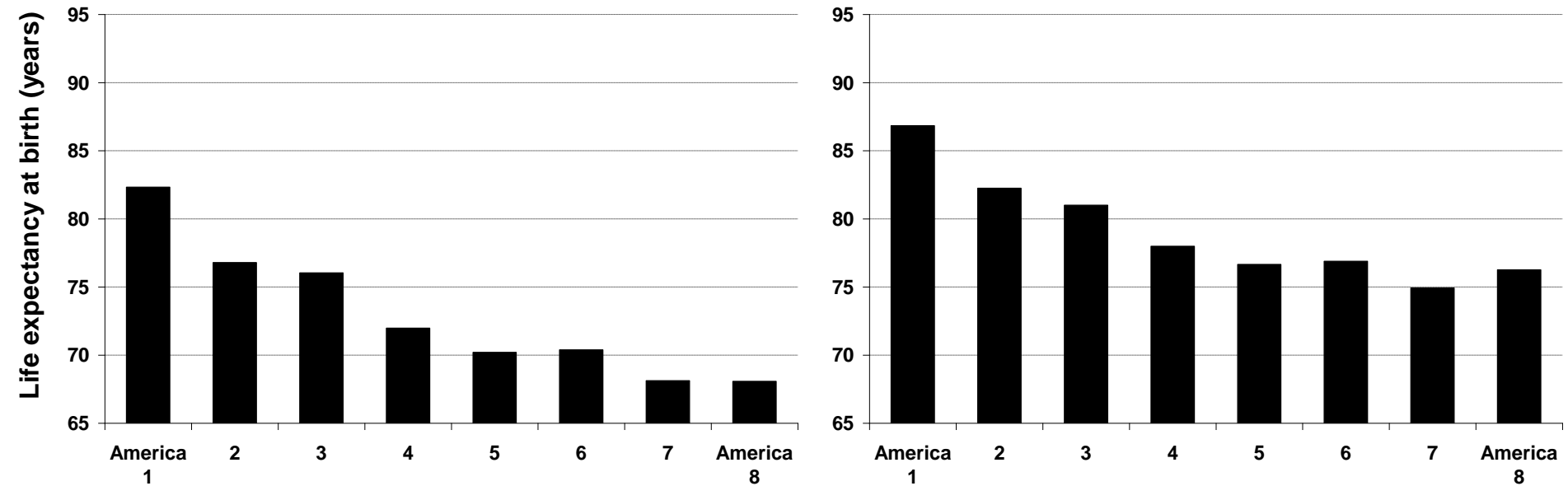
- Identify sub-populations making up the US population with distinct socio-demographic and geographical characteristics that capture the range of mortality experiences across counties and races



# Life expectancy at birth in the Eight Americas in 2005

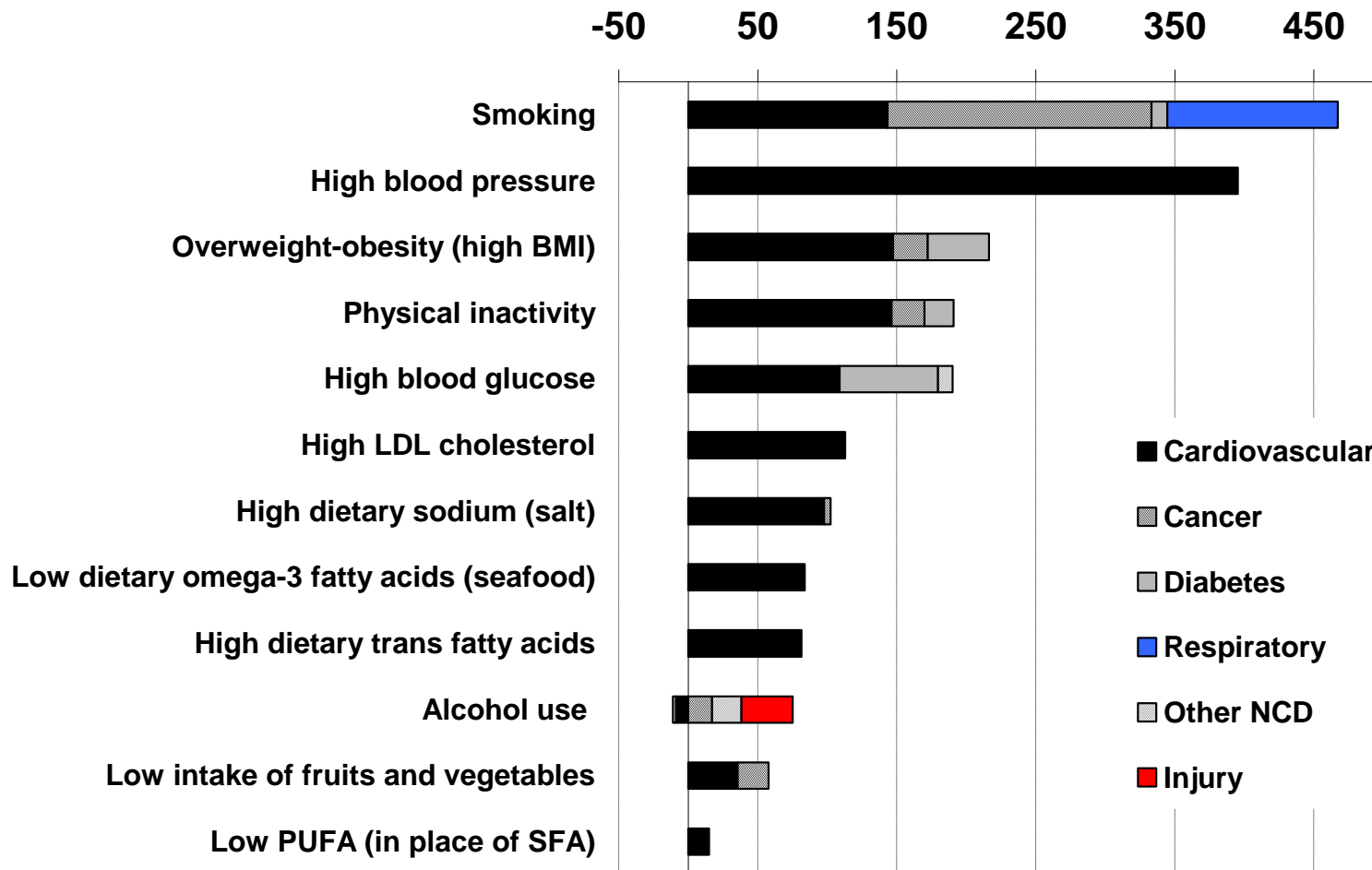
Male

Female



# Deaths attributable to individual risk factors by disease

Deaths attributable to individual risks (thousands) in both sexes





# Risk factors in the Eight Americas: men $\geq$ 60 years (age-standardized)

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)

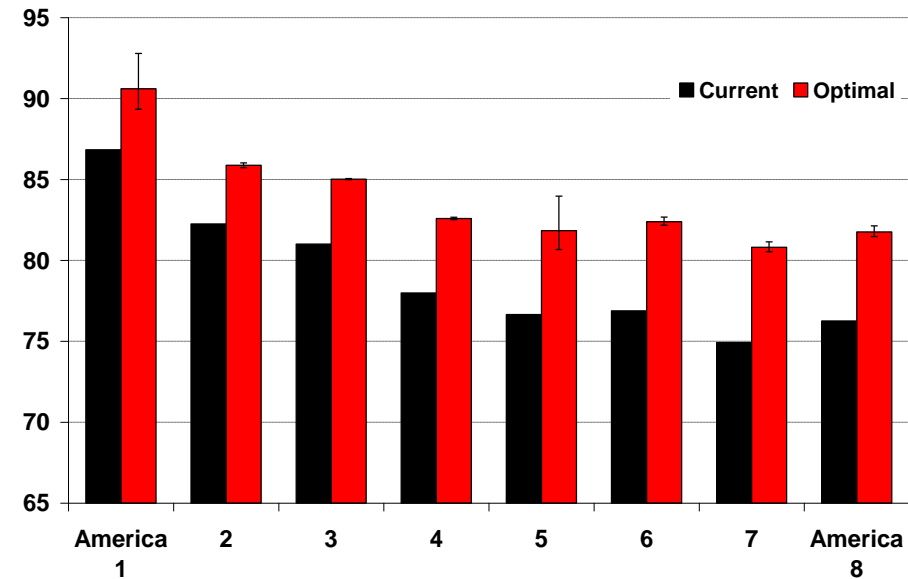
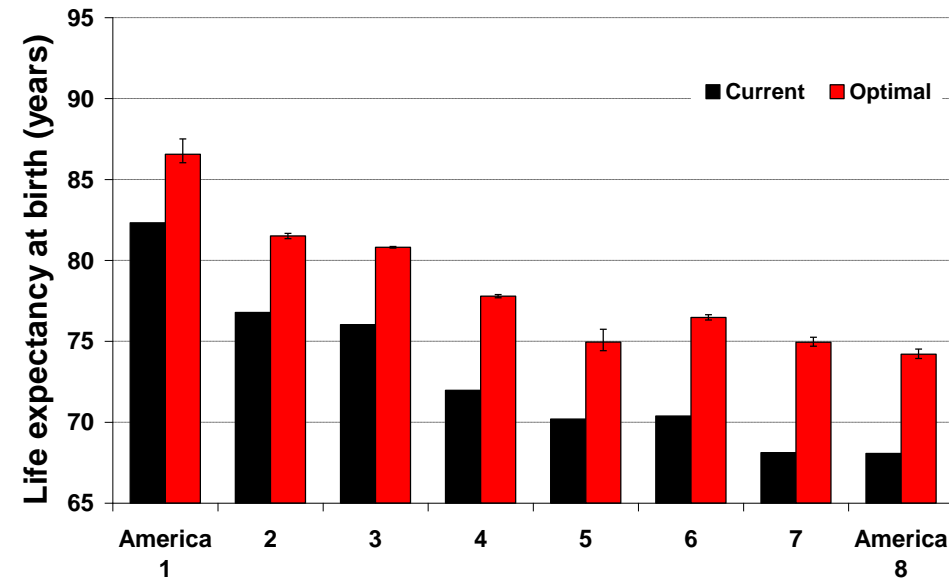
# Risk factors in the Eight Americas: women $\geq$ 60 years (age-standardized)

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)

# Life expectancy at birth in the Eight Americas in 2005 without the effects of four leading risks

Male

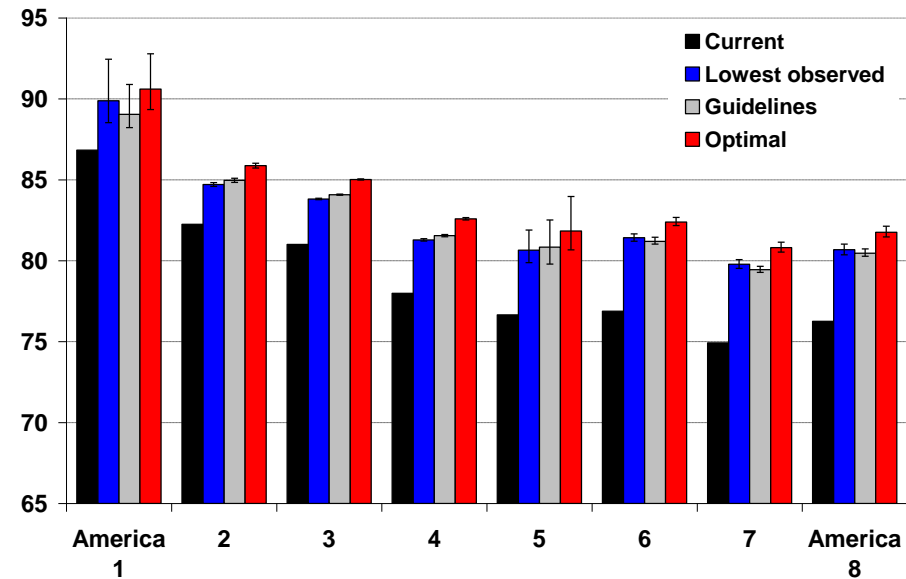
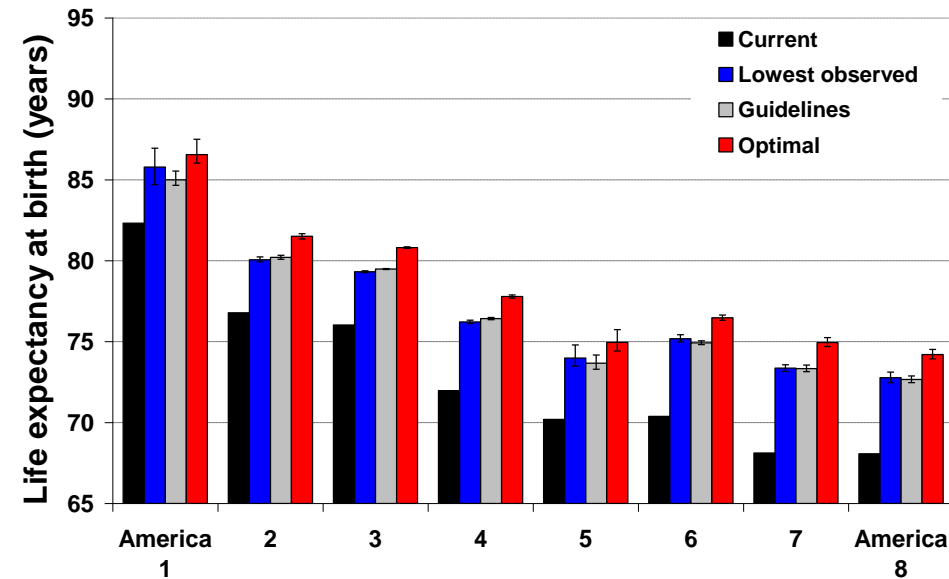
Female



# Life expectancy at birth in the Eight Americas in 2005 with other baseline values

Male

Female



# Child mortality in Mexico

# Background: Mexico health reform priority setting and evaluation

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- Landmark effort to provide health coverage to the uninsured (2003)
- The Ministry of Health commissioned evaluation of the reform by the National Institute of Public Health and Harvard University
- The evaluation included a national and state level comparative risk assessment (CRA)
  - Effort to quantify the relative contribution of risk factors using comparable methods

# Risk factors in Mexican CRA

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**Child & maternal under-nutrition**

**Child and maternal underweight**

**Iron deficiency**

**Vitamin A deficiency**

**Zinc deficiency**

**Other nutrition-related risks & inactivity**

**High blood glucose**

**High blood pressure**

**High cholesterol**

**Overweight and obesity**

**Inadequate fruit and vegetable intake**

**Physical inactivity**

**Addictive substances**

**Tobacco smoking**

**Alcohol use**

**Sexual and reproductive health risks**

**Unsafe sex**

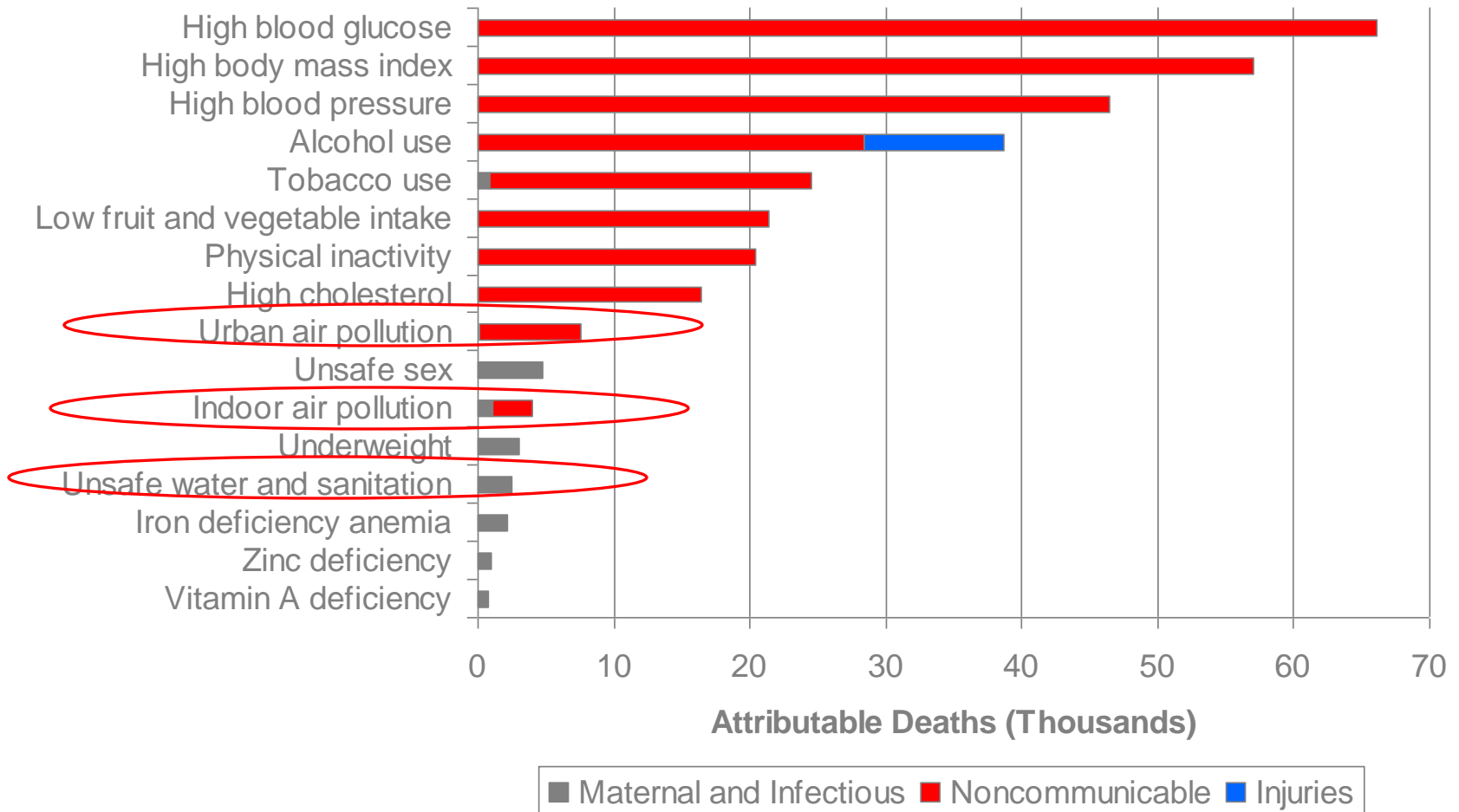
**Environmental risks**

**Unsafe water and sanitation**

**Indoor air pollution from solid fuels**

**Urban ambient air pollution**

# Mortality attributable to risk factors (national)





# Quantification of the distribution of mortality burden

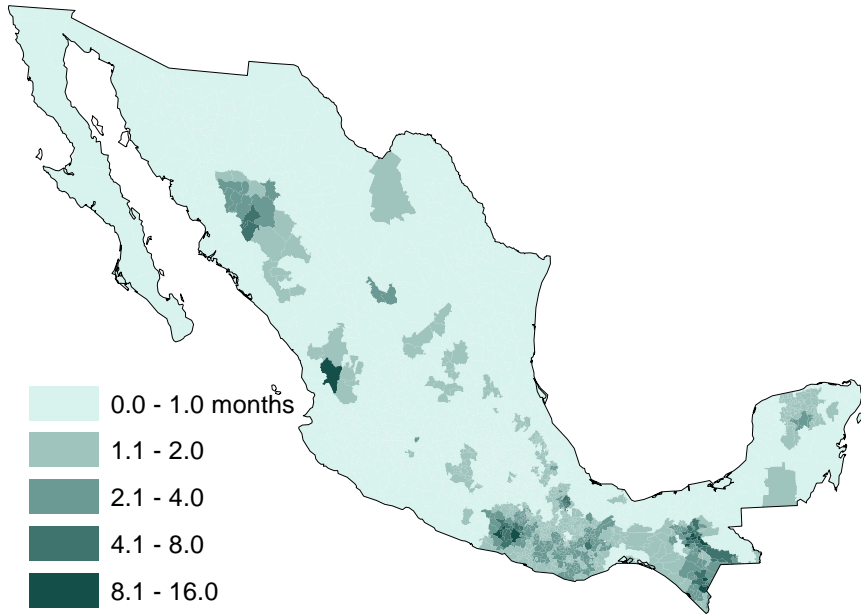
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- Analyses at the national level conceal inequalities in mortality burden of environmental exposures
- Interventions should focus on areas where mortality burden (i.e. absolute risk), not exposure, is the largest
- Subsequent analyses of the mortality effects of 3 environmental risks in finer resolution (e.g. *municipio*)
  - Effects on child and adult mortality
  - Calculate risk-factor-deleted life expectancy to account for competing causes

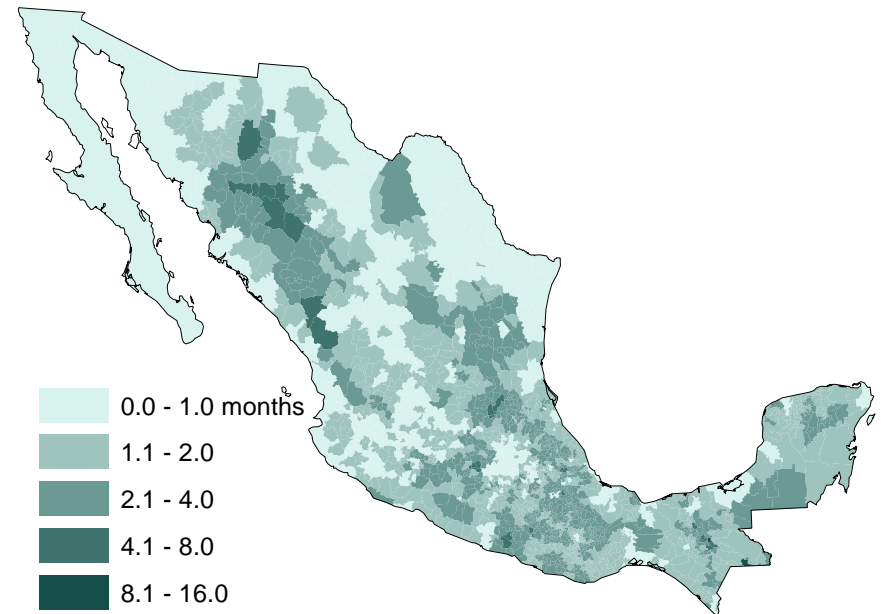
# Mortality effects of unsafe water and sanitation and indoor air pollution

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## Unsafe water and sanitation



## Indoor air pollution



# Effects in the worst-off communities

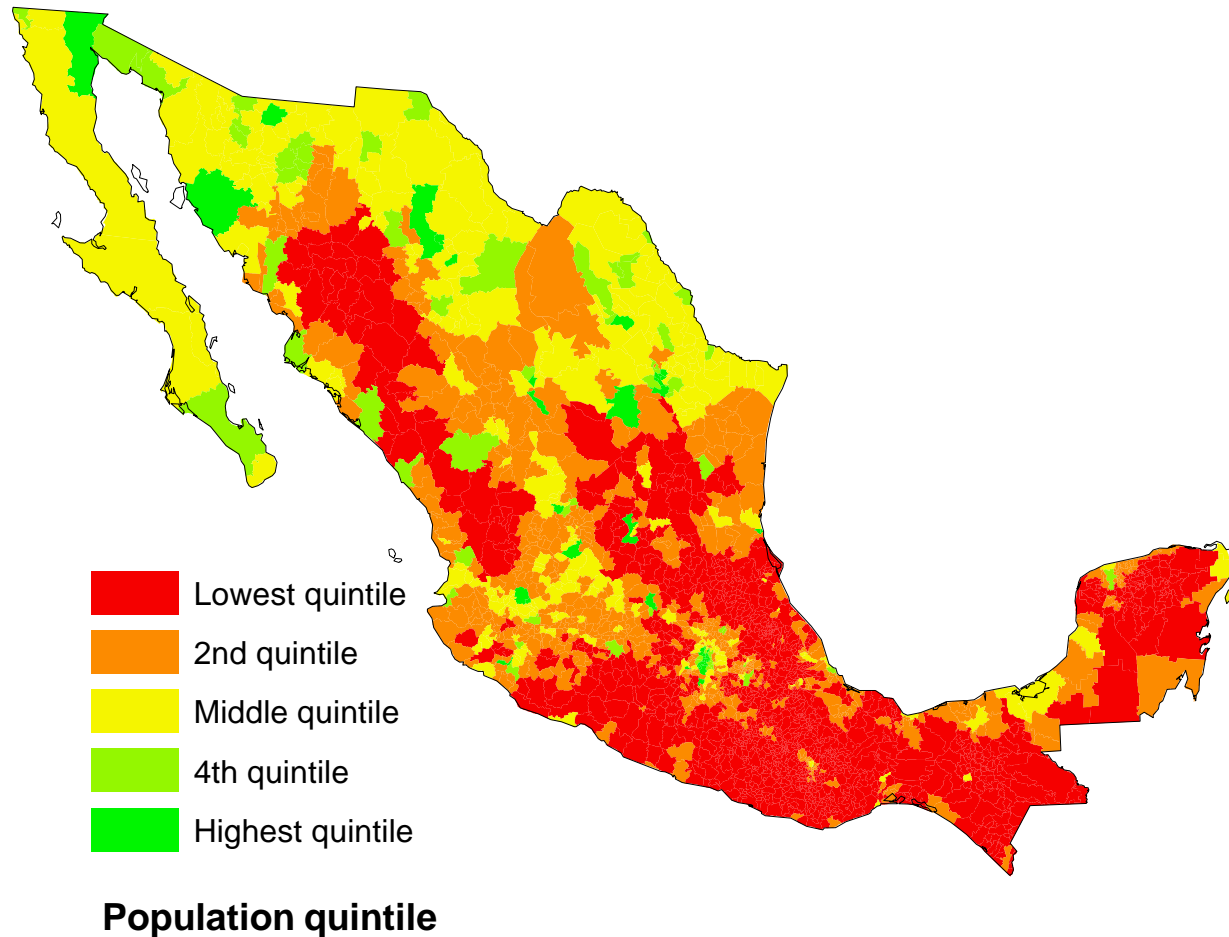
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In the 50 *municipios* with the highest child mortality effects:

- 1.5% of total population
- 5.8% of *all* deaths attributable to the 3 environmental exposures
- 16.2% of *child* deaths attributable to the 3 environmental exposures
- 10 month reduction in average life expectancy (versus 4.6 months nationally)
- Primarily communities in Chiapas, Guerrero, Oaxaca and Puebla (over 64% of population over age 5 speaks an indigenous language)

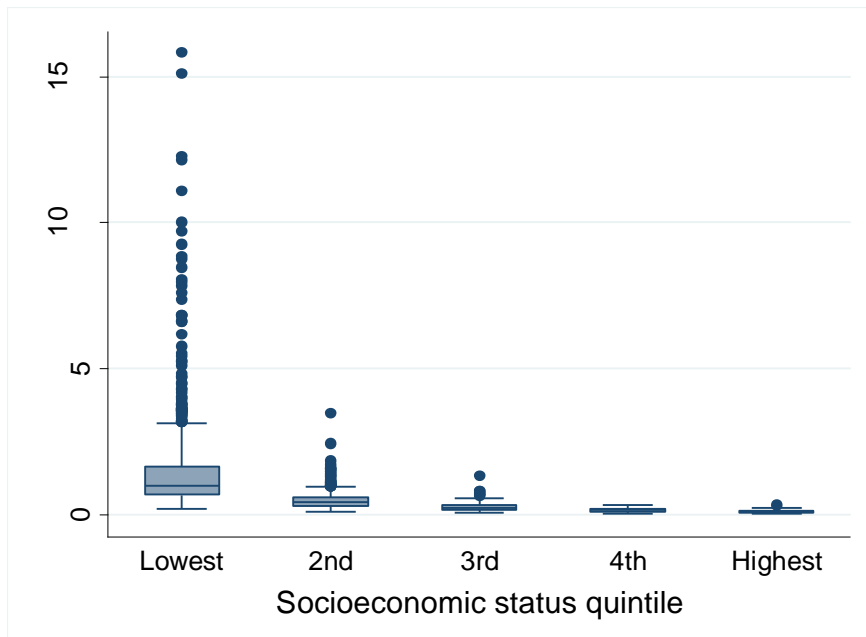
# *Municipio socio-economic status in Mexico*

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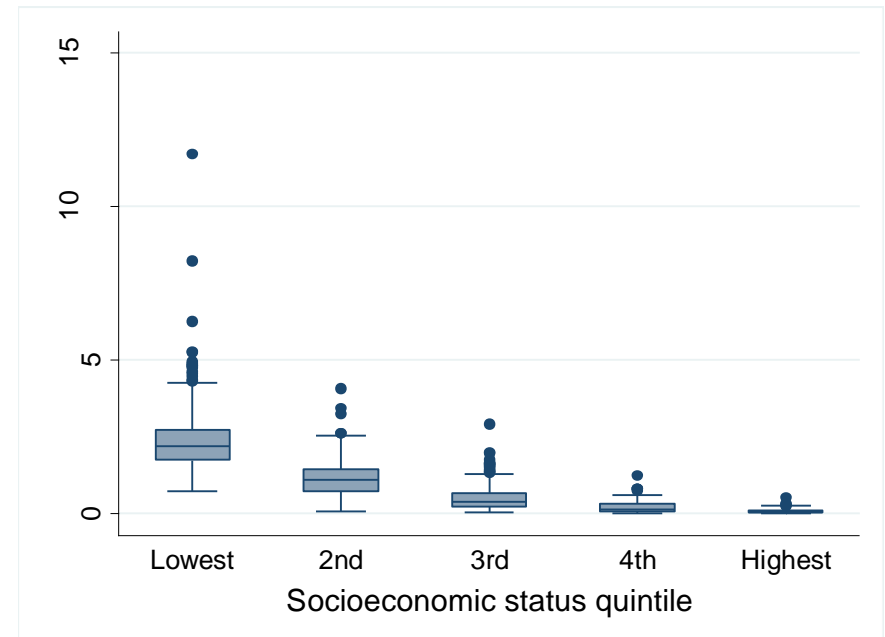


# Mortality effects of unsafe water and sanitation and indoor air pollution by *municipio* SES

Unsafe water and sanitation



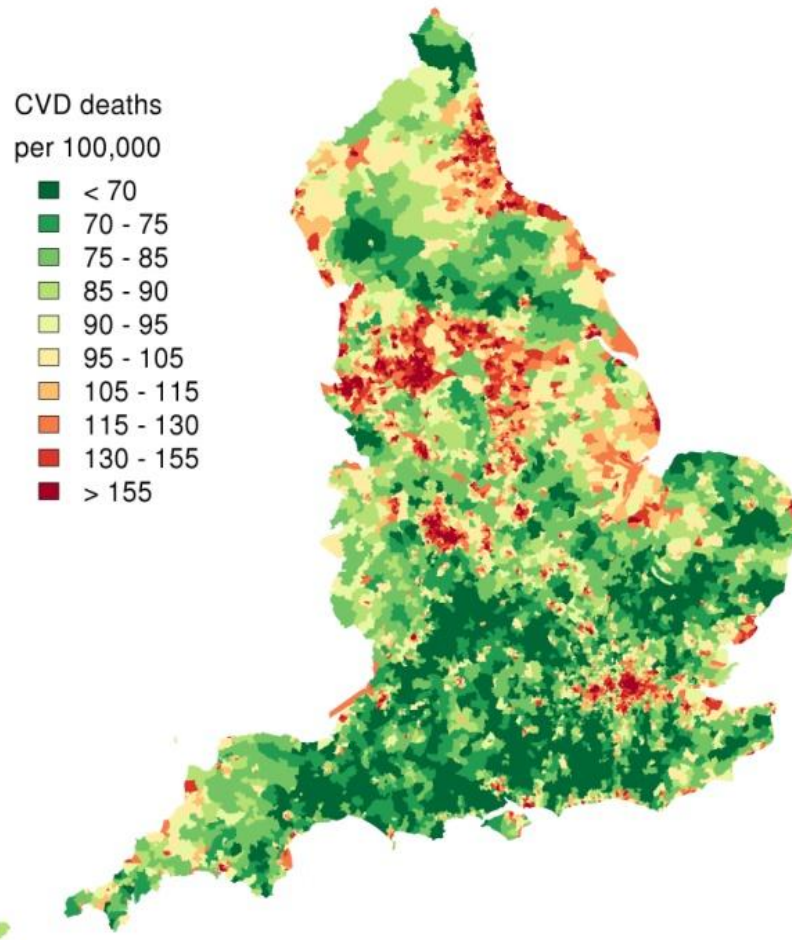
Indoor air pollution



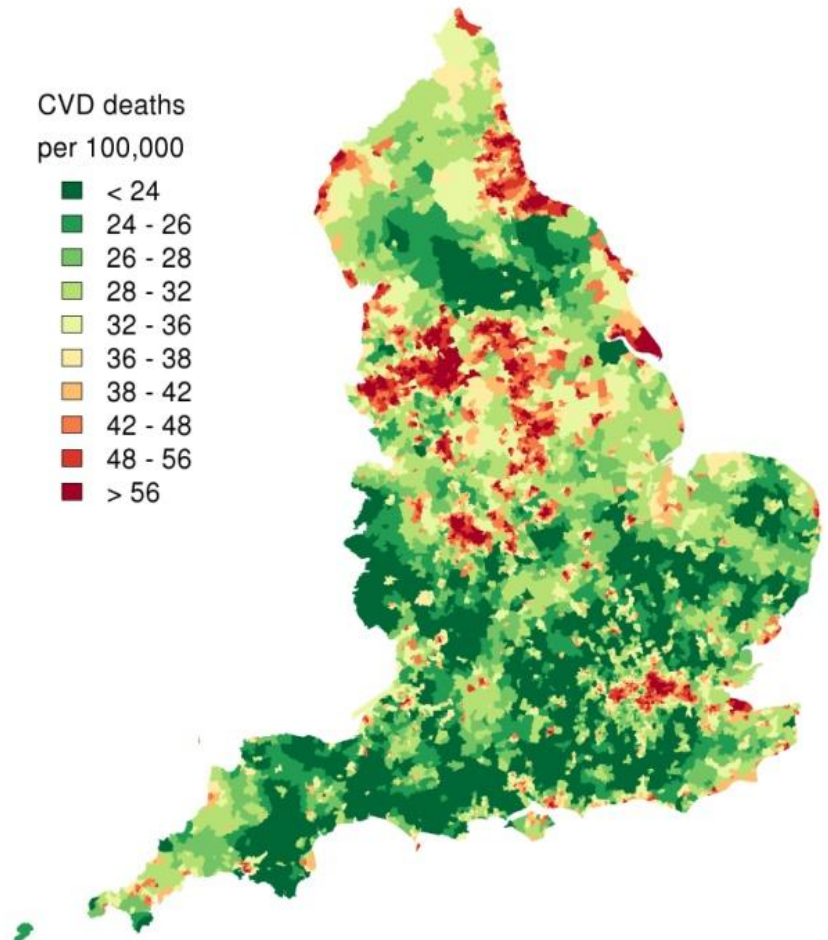
# Cardiovascular mortality in English wards

# Cardiovascular mortality in England's wards

Men 30-64 years



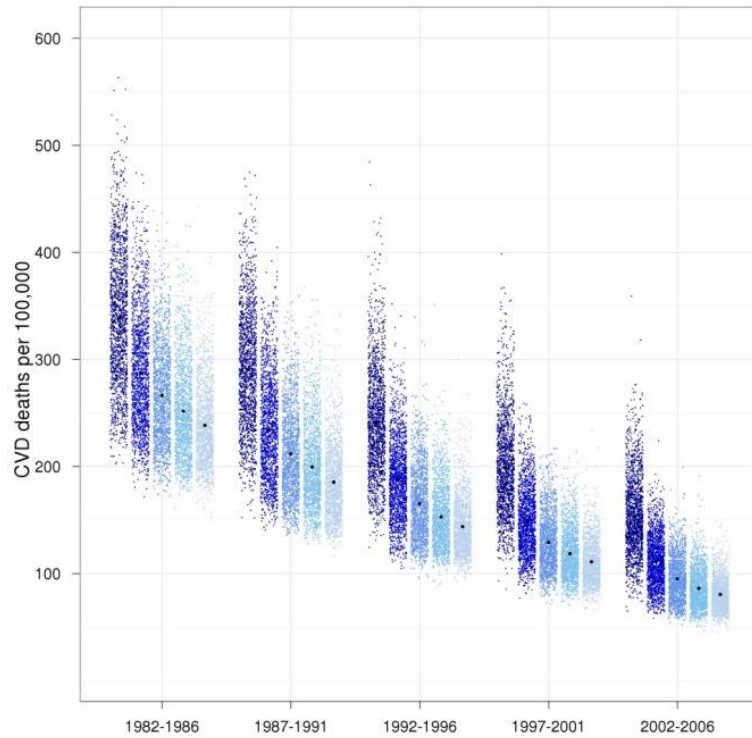
Women 30-64 years



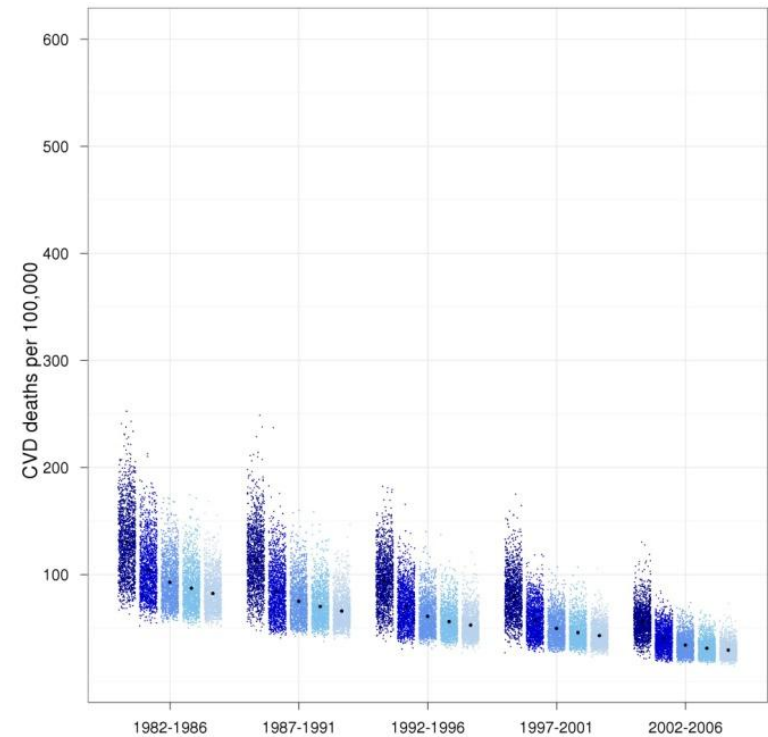
# CVD mortality by community deprivation

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**Men 30-64 years**

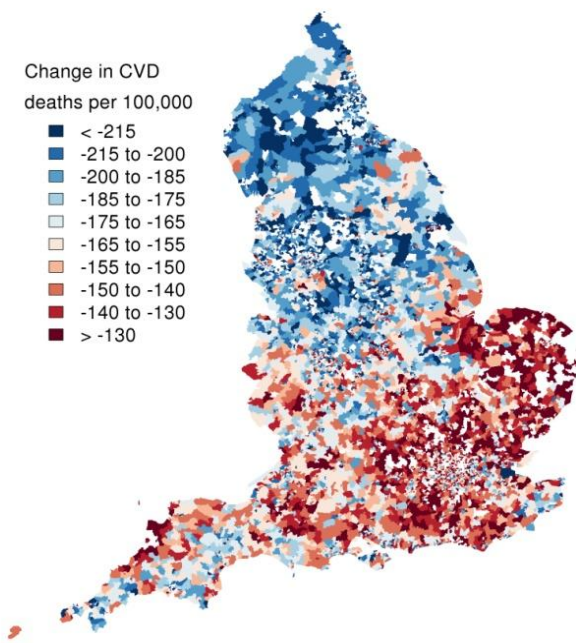
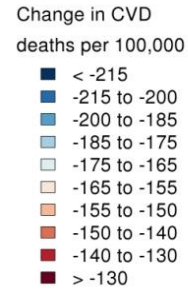
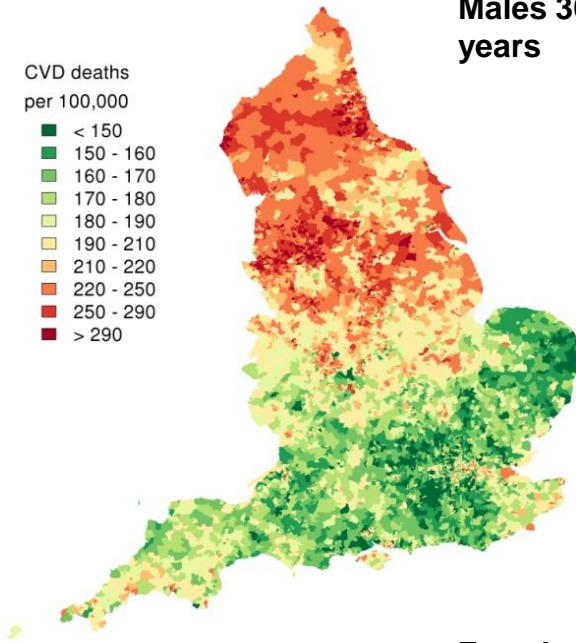


**Women 30-64 years**

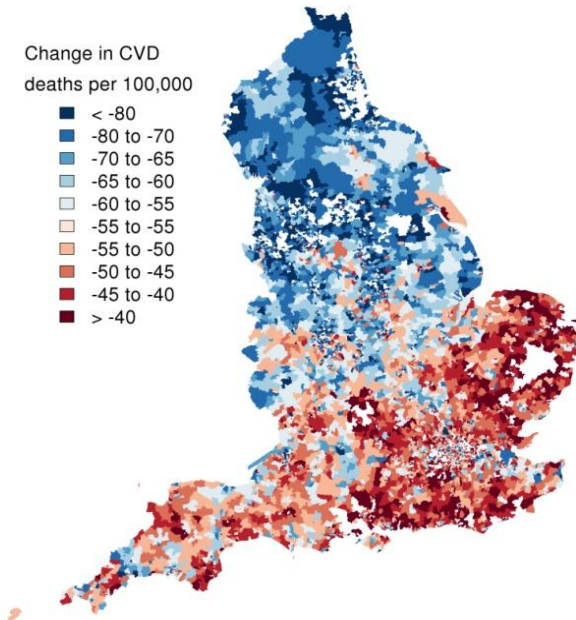
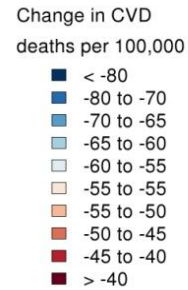
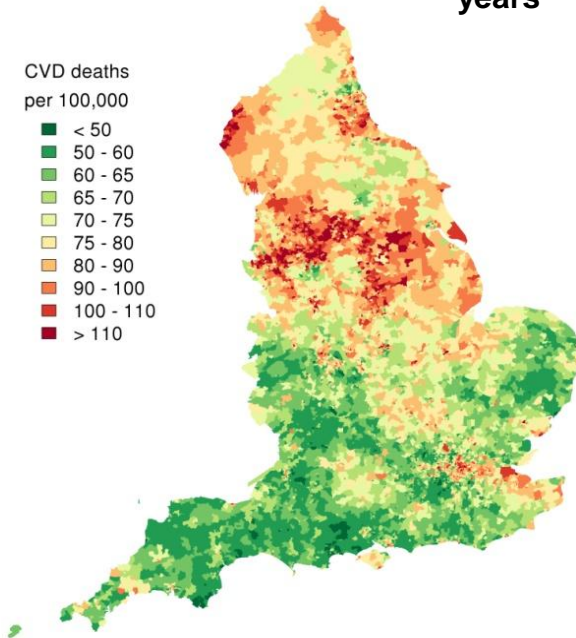
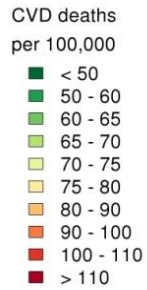




### Males 30-64 years



### Females 30-64 years



Deprivation Quintile	1982-1986	1987-1991	1992-1996	1997-2001	2002-2006	Absolute reduction between 1982-86 and 2002-06	Percentage reduction between 1982-86 and 2002-06
<b>Males 30-64 years</b>							
Least deprived	222	170	129	98	75	147	66%
Q2	245	199	147	111	85	160	65%
Q3	270	210	165	128	102	168	62%
Q4	297	244	193	156	126	171	58%
Most deprived	362	314	264	220	184	178	49%
<b>Q1-Q5 difference</b>	<b>140</b>	<b>144</b>	<b>136</b>	<b>122</b>	<b>109</b>	<b>31</b>	
<b>Q1-Q5 ratio</b>	<b>1.63</b>	<b>1.85</b>	<b>2.05</b>	<b>2.25</b>	<b>2.45</b>		
<b>Females 30-64 years</b>							
Least deprived	69.0	55.4	42.6	34.6	26.2	42.8	62%
Q2	81.0	64.8	51.4	41.3	30.6	50.5	62%
Q3	88.4	72.3	58.6	47.5	37.1	51.3	58%
Q4	106.2	86.6	71.6	58.1	47.2	59.1	56%
Most deprived	140.7	122.4	104.3	91.4	72.3	68.4	49%
<b>Q1-Q5 difference</b>	<b>71.8</b>	<b>67.1</b>	<b>61.7</b>	<b>56.9</b>	<b>46.2</b>	<b>25.6</b>	
<b>Q1-Q5 ratio</b>	<b>2.04</b>	<b>2.21</b>	<b>2.45</b>	<b>2.64</b>	<b>2.76</b>		
<b>Males 65 and over</b>							
Least deprived	3821	3405	3014	2654	2044	1776	46%
Q2	4015	3623	3145	2669	2157	1858	46%
Q3	4157	3711	3289	2790	2268	1890	45%
Q4	4309	3830	3414	2901	2382	1927	45%
Most deprived	4360	3934	3562	3130	2635	1725	40%
<b>Q1-Q5 difference</b>	<b>539</b>	<b>529</b>	<b>547</b>	<b>476</b>	<b>591</b>	<b>-51</b>	
<b>Q1-Q5 ratio</b>	<b>1.14</b>	<b>1.16</b>	<b>1.18</b>	<b>1.18</b>	<b>1.29</b>		
<b>Females 65 and over</b>							
Least deprived	2554	2273	2012	1714	1417	1137	45%
Q2	2684	2401	2131	1782	1516	1168	44%
Q3	2760	2470	2190	1855	1566	1194	43%
Q4	2893	2559	2258	1936	1628	1265	44%
Most deprived	2939	2640	2380	2078	1800	1140	39%
<b>Q1-Q5 difference</b>	<b>385</b>	<b>367</b>	<b>368</b>	<b>364</b>	<b>383</b>	<b>3</b>	
<b>Q1-Q5 ratio</b>	<b>1.15</b>	<b>1.16</b>	<b>1.18</b>	<b>1.21</b>	<b>1.27</b>		

# Reducing health inequalities

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- Strategies to improve population health and reduce health inequalities
  - Address fundamental social and economic inequalities and their institutional determinants
  - Increase financial, physical, and behavioral access to health care
  - Reduce inequality in the quality of health care
  - Reduce risk factors through interventions acting on communities
  - Reduce risk factors through interventions acting on individuals and groups not in the same community