



# Some animals are more equal than others: *latest insights into longevity inequality*



Douglas Anderson, FIA CERA  
Founder of Club Vita  
September 13<sup>th</sup>, 2019

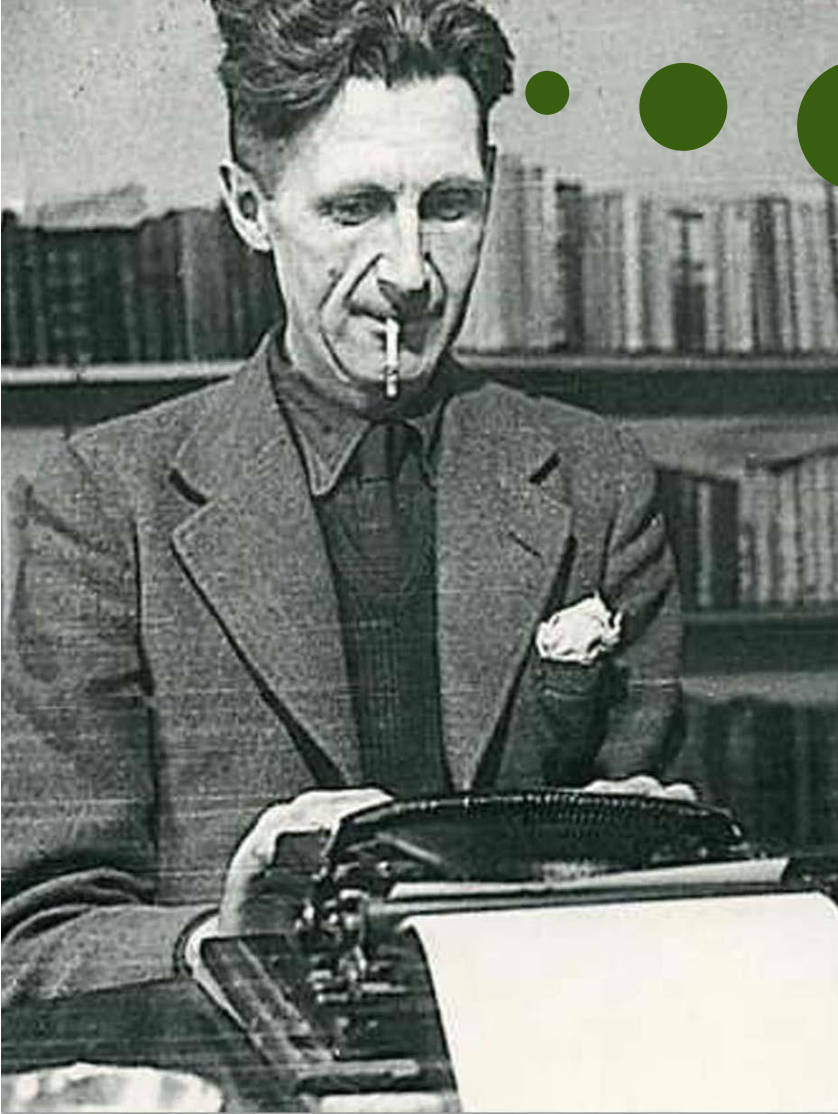


[linkedin.com/company/club-vita](https://www.linkedin.com/company/club-vita)

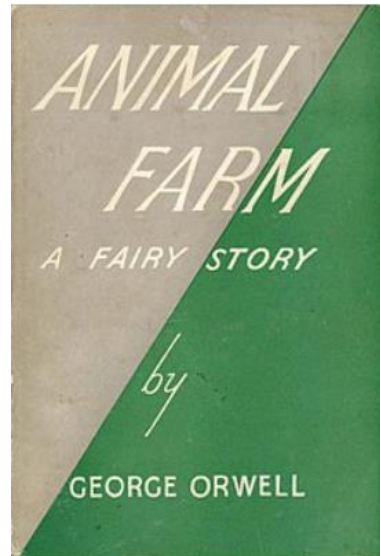


[@ClubVita](https://twitter.com/ClubVita)

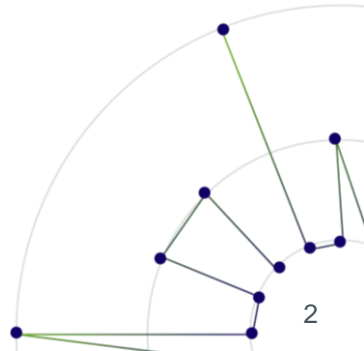
## George Orwell, English writer



*All animals are equal,  
but some animals are  
more equal than others*



- Published in 1945
- George Orwell died in 1950, aged 46, from a burst pulmonary artery

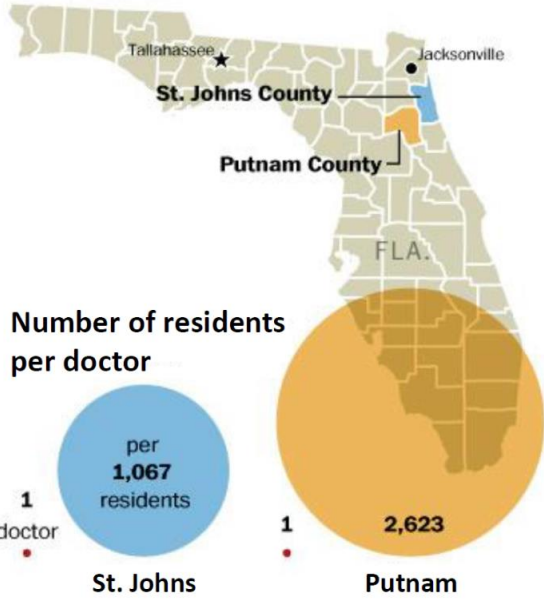
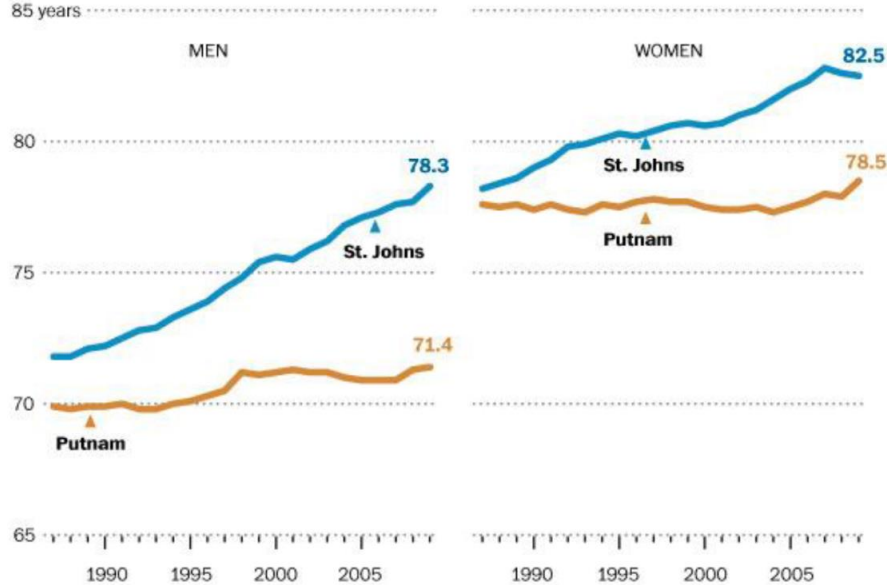


# A tale of two counties ....

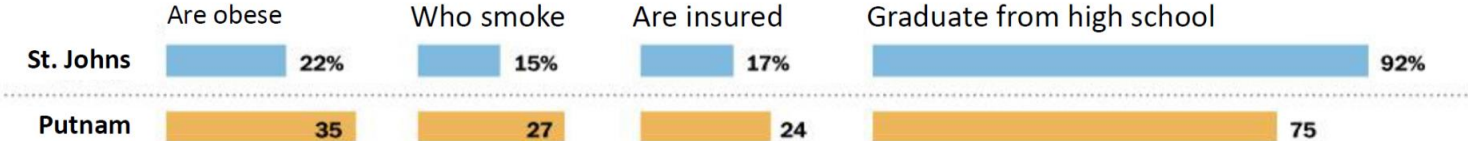


## Differences in LE from health status, education and lifestyle for two neighbouring US counties

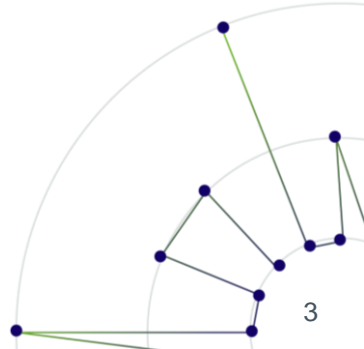
### Life expectancy



### Percentage who:



SOURCE: County Health Rankings and Roadmaps program, Robert Wood Johnson Foundation. The Washington Post. Published on March 10, 2013, 8:07 p.m. [http://www.washingtonpost.com/business/economy/economic-inequality-contributing-to-gap-in-life-expectancy/2013/03/10/54b5d21c-89df-11e2-98d9-3012c1cd8d1e\\_graphic.html](http://www.washingtonpost.com/business/economy/economic-inequality-contributing-to-gap-in-life-expectancy/2013/03/10/54b5d21c-89df-11e2-98d9-3012c1cd8d1e_graphic.html) Slide21



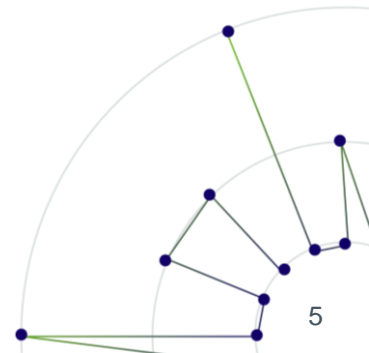
*Are we really born equal?*

*Don't long-lived ancestors  
give some a head start?*

# Not, really. We're born pretty equal ....

	Genetic Bit	The Rest	
Herskind et al., 1996	26%	74%	Danish twins
Ljungquist et al., 1998	33%	67%	Swedish twins
Gavrilova et al., 1998	18%	82%	Royal families
Mitchell et al., 2001	25%	75%	Amish
Skytthe et al, 2003	25%	75%	Danish twins
Joshi et al (in prep)	16%	84%	Scottish nuclear families

- Suggests that only 20% of lifespan variation is explained by our genetic make-up
- Lifespan variation is driven more by nurture than nature



*But do those born  
with a silver spoon  
in their mouths live  
longer?*

# The importance of three healthy habits ....



54% of fall in deaths from heart disease attributable to decline in smoking<sup>1</sup>

1: over 1981-2000, source: Unal et al, 2005



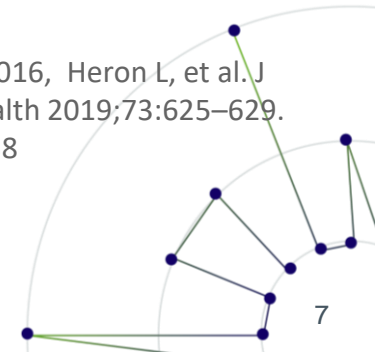
The harmful use of alcohol is a causal factor in more than 200 disease and injury conditions<sup>2</sup>.

2: Alcohol – Key Facts, WHO, Sept 2018



Eradicating prolonged sedentary behaviour might avoid c.10% of UK deaths<sup>3</sup>.

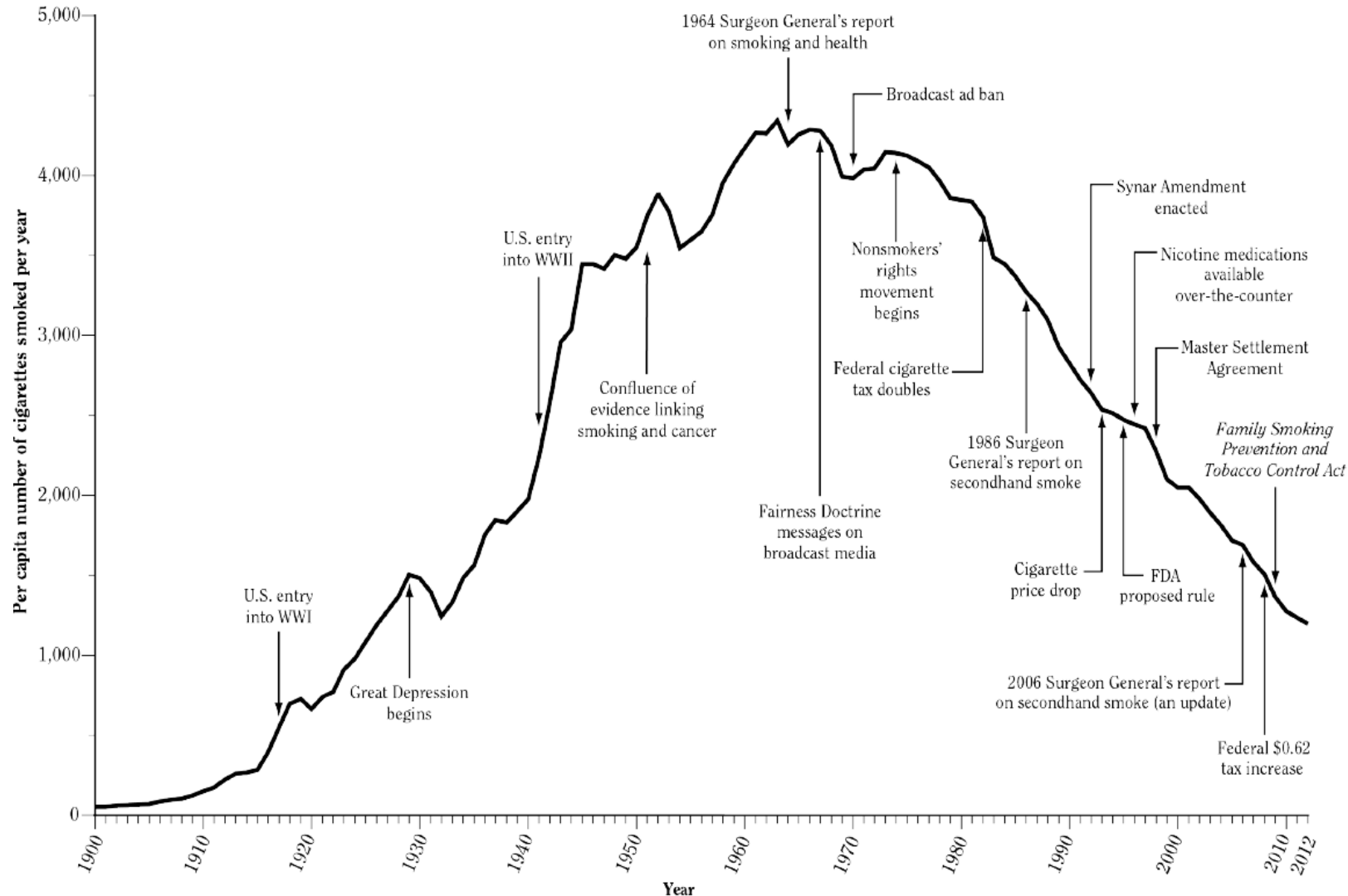
3: 69,276 deaths avoided in 2016, Heron L, et al. J Epidemiology Community Health 2019;73:625–629. doi:10.1136/jech-2018-211758



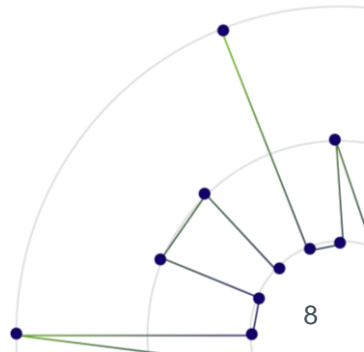
# The rise and fall of smoking: 1900-2010



Figure 2.1 Adult\* per capita cigarette consumption and major smoking and health events, United States, 1900-2012



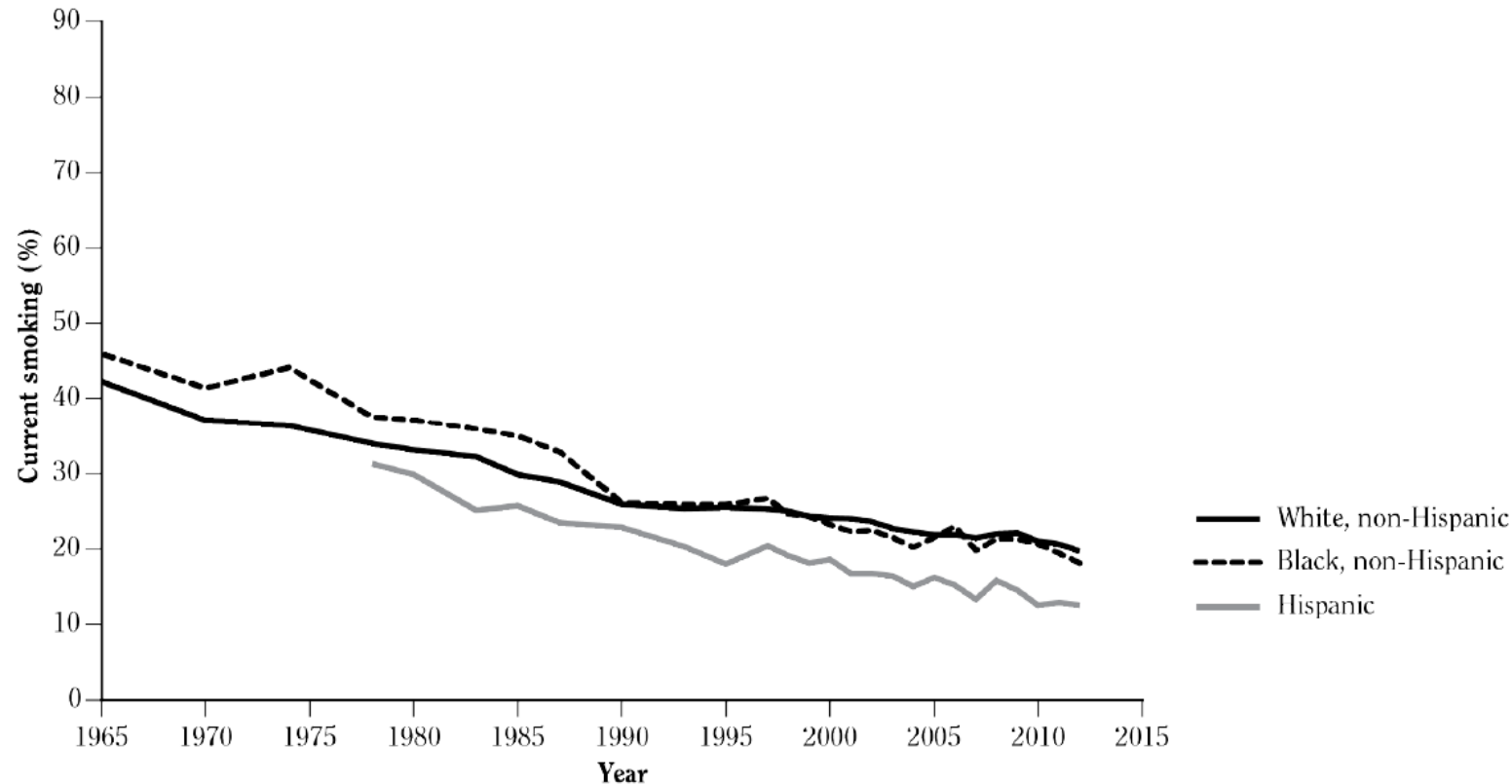
Source: Surgeon General, 2014: [https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf\\_NBK179276.pdf](https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf_NBK179276.pdf)



# Smoking levels have halved over a generation....



Figure 13.10 Trends in prevalence (%) of current cigarette smoking among adults 18 years of age and older, by race/ethnicity; National Health Interview Survey (NHIS) 1965–2012; United States

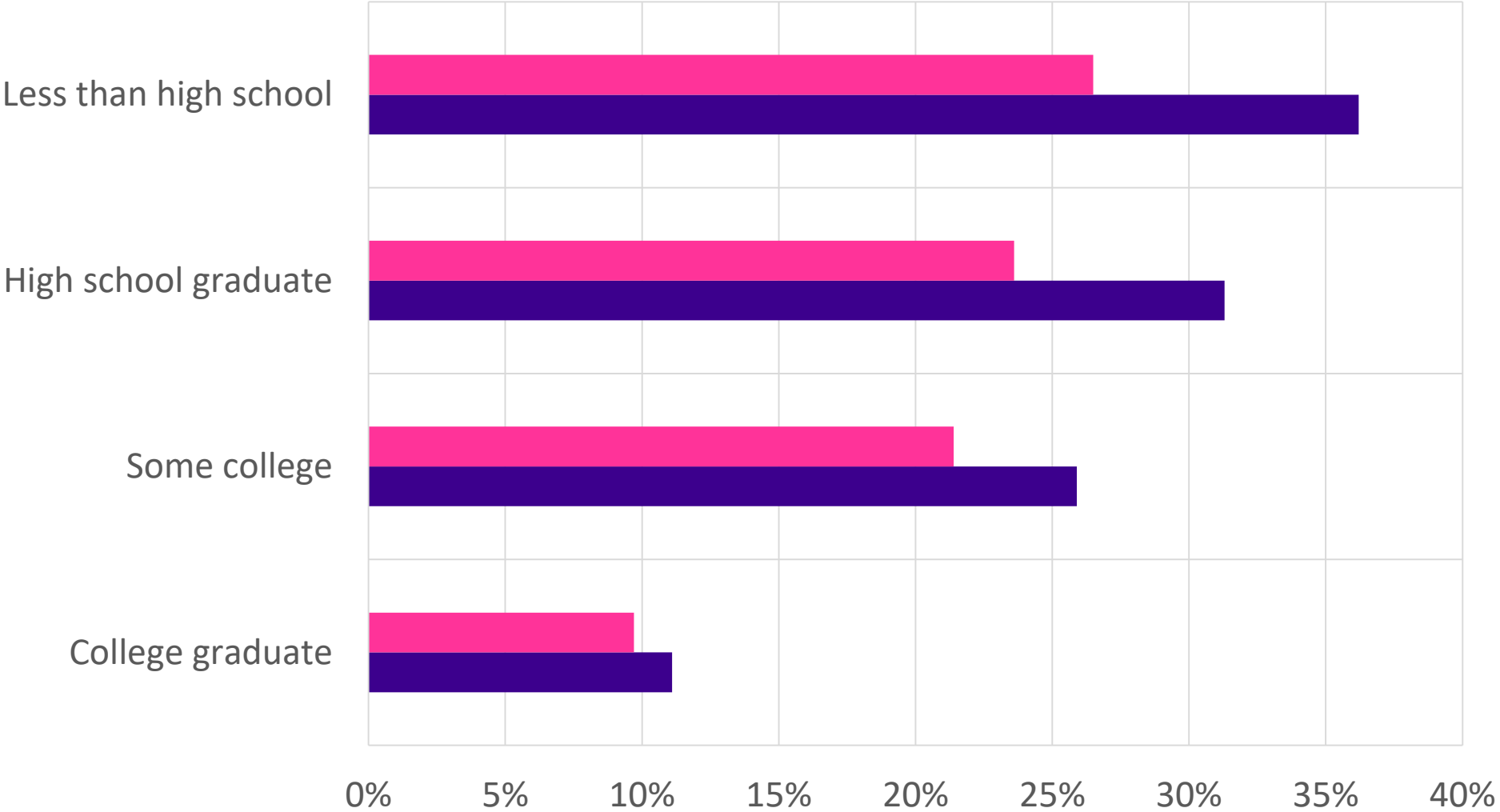


.... very little difference in smoking rates between ethnic groups

Source: 1965–2012 NHIS, National Center for Health Statistics, public use data tapes.

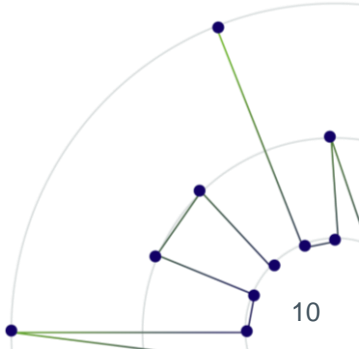


# But, smoking declines sharply with education

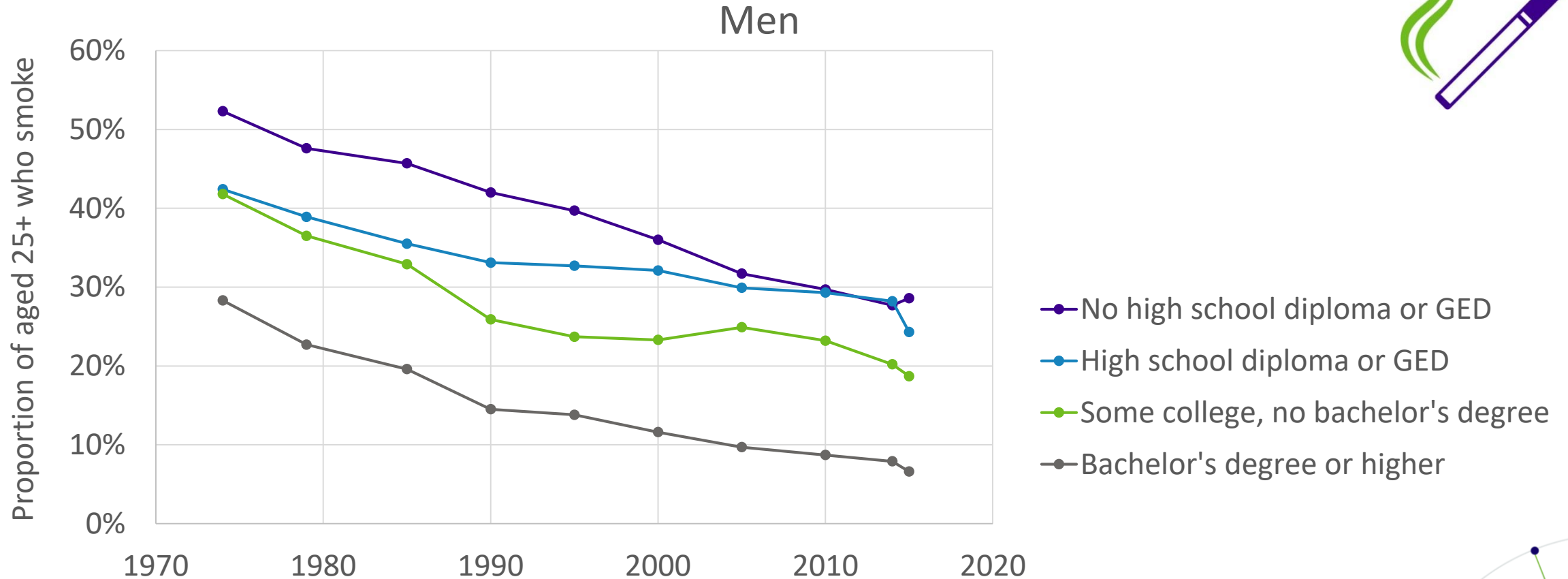


Female  
Male

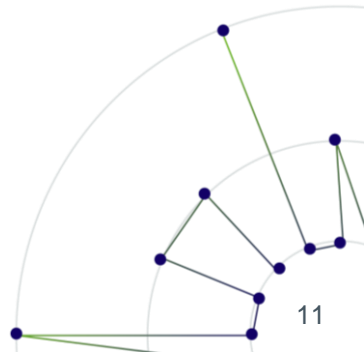
Source: <https://www.datafiles.samhsa.gov/study/national-survey-drug-use-and-health-nsduh-2012-nid13601>



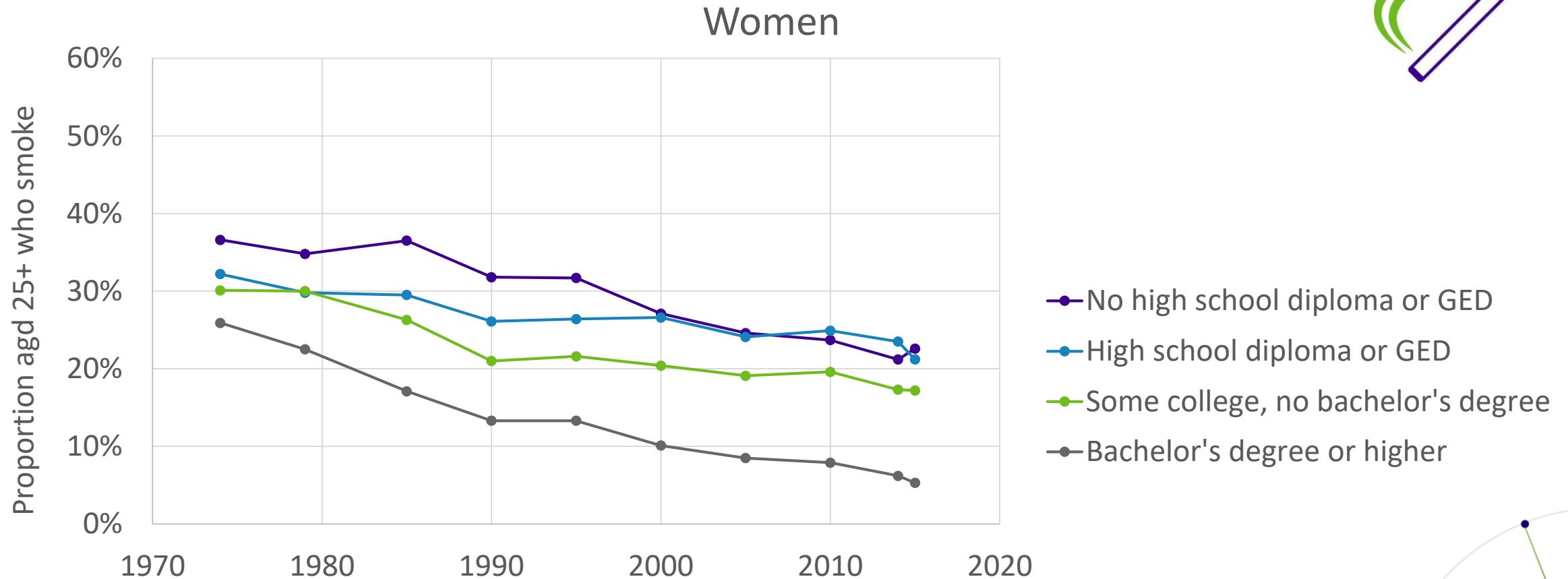
# Decline in men smoking since 1970



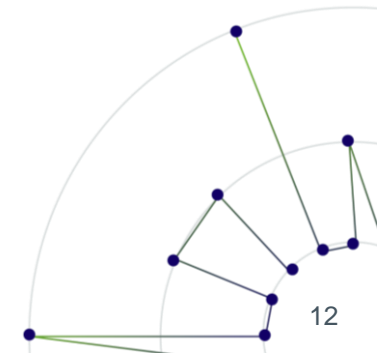
Age-adjusted prevalence of current cigarette smoking among adults aged 25 and over, by sex, race, and education level: United States, selected years 1974–2015 (CDC)



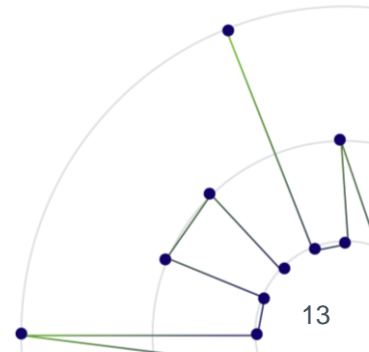
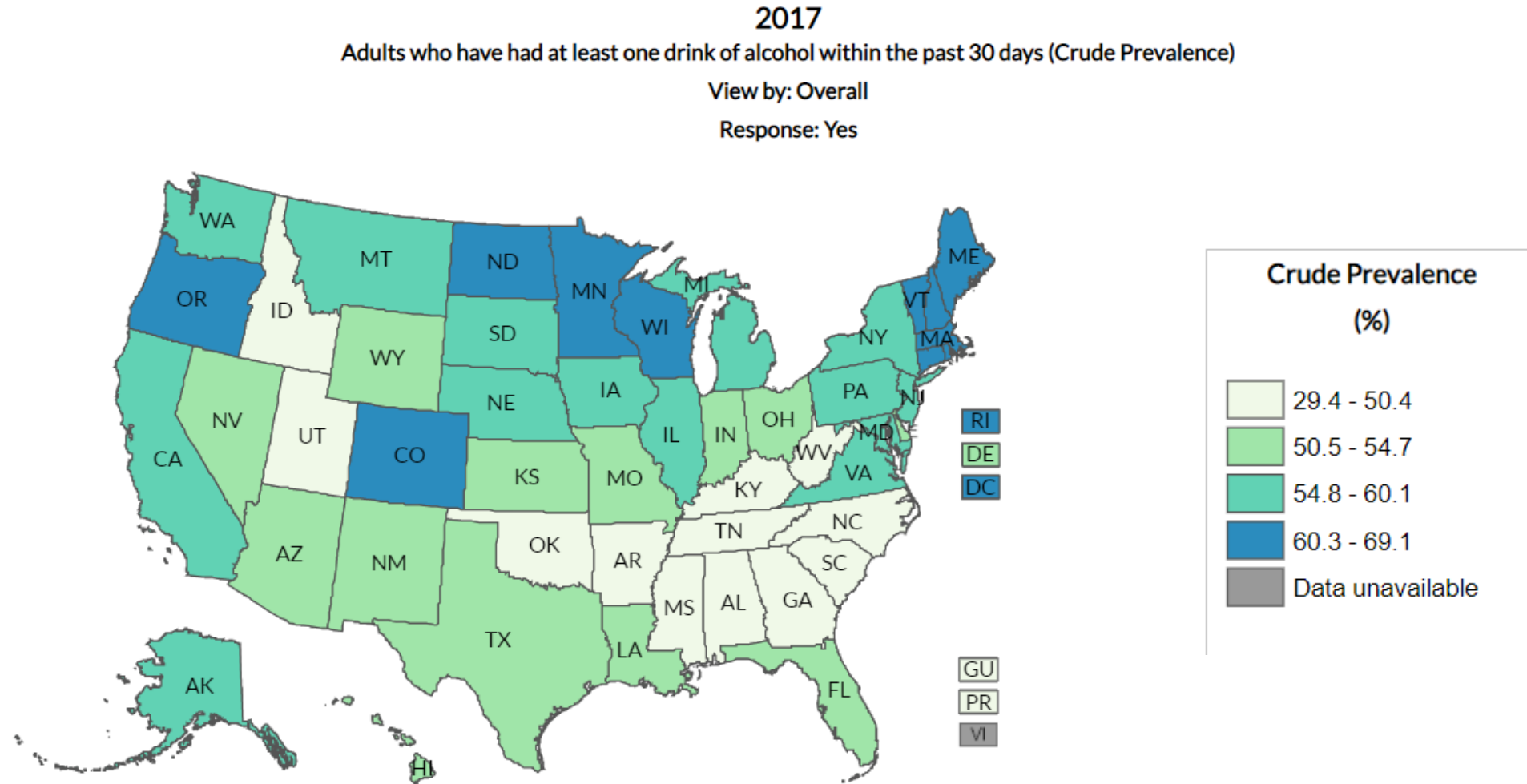
# Decline in women smoking since 1970



Age-adjusted prevalence of current cigarette smoking among adults aged 25 and over, by sex, race, and education level: United States, selected years 1974–2015 (CDC)



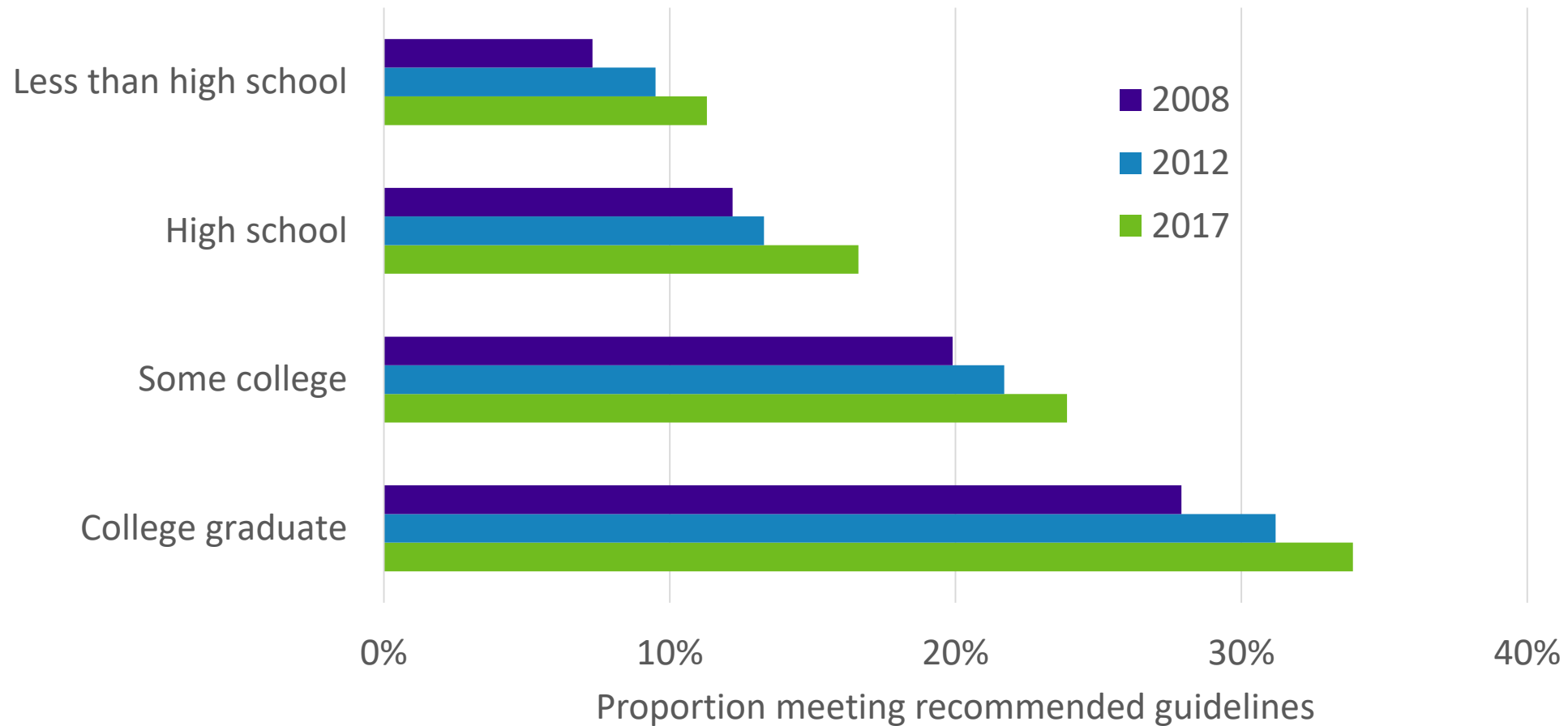
# Lots of regional variation in drinking habits



# Whilst exercise rises with education....

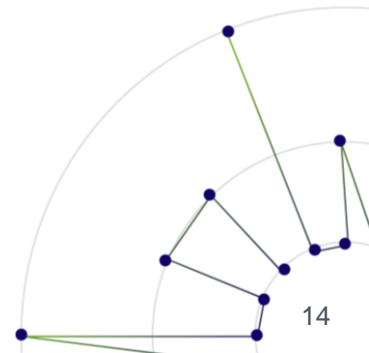


## Physical activity by educational attainment



Prevalence of meeting the combined aerobic and muscle-strengthening physical activity guidelines, and prevalence trends among adults — National Health Interview Survey, United States, 2008, 2012, and 2017

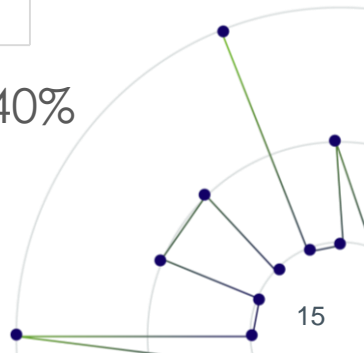
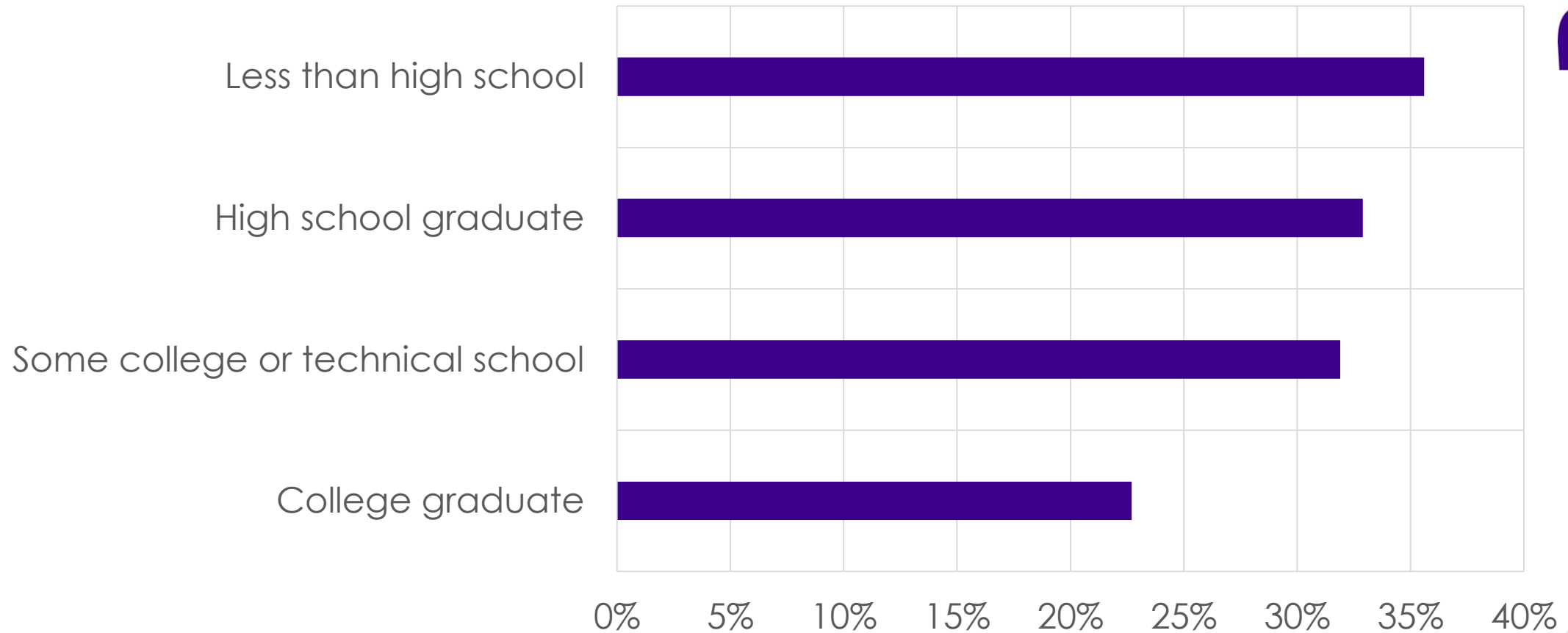
[https://www.cdc.gov/mmwr/volumes/68/wr/mm6823a1.htm#F1\\_down](https://www.cdc.gov/mmwr/volumes/68/wr/mm6823a1.htm#F1_down)



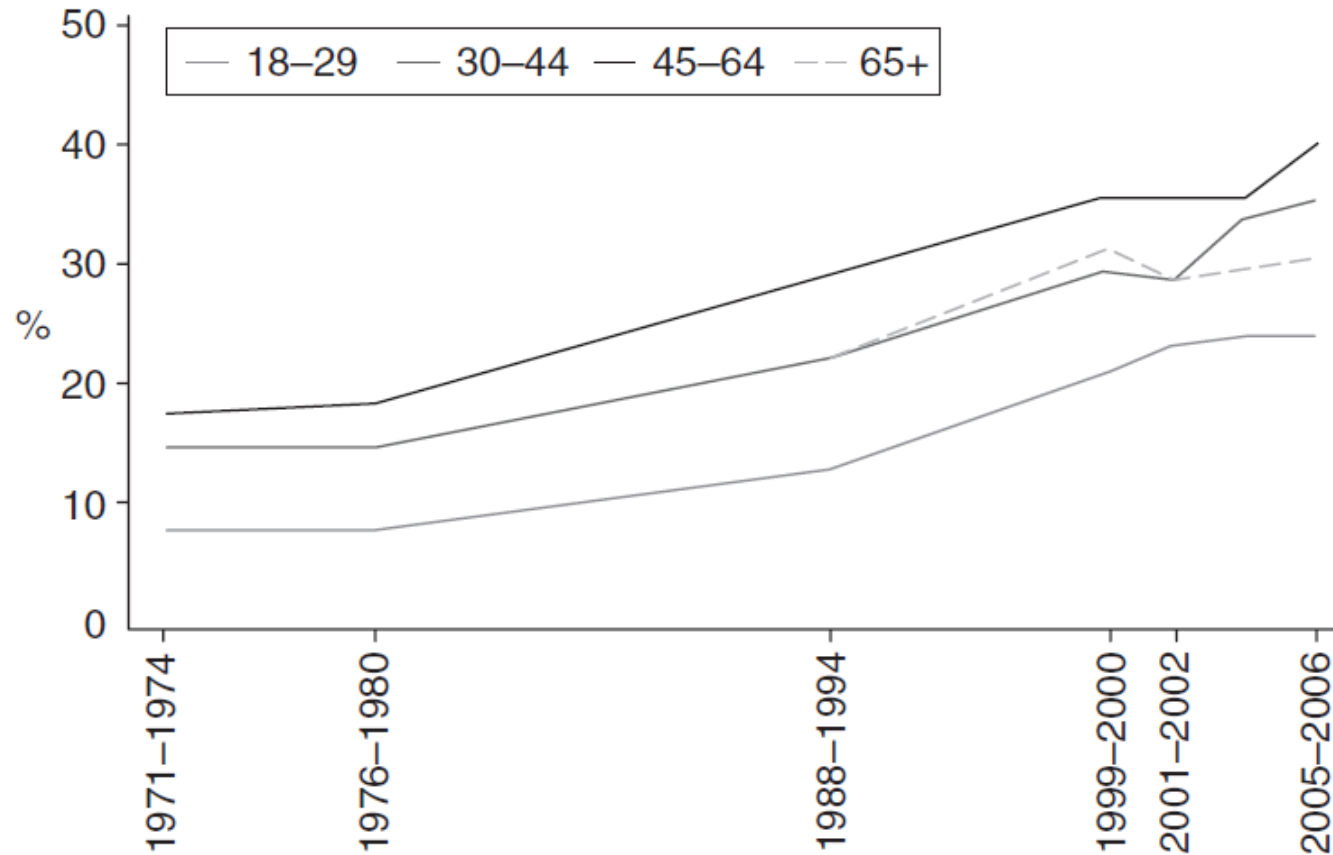
# Obesity declines sharply with education



Percentage of Adults classed as Obese, 2017



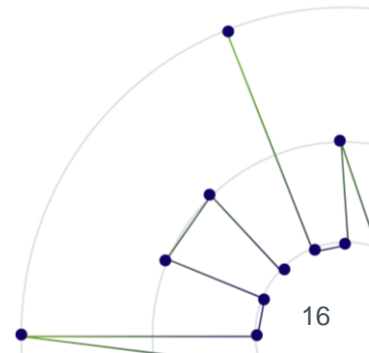
# Growing obesity over time



*Notes:* we must consider cumulative effects: increasing duration of obesity for the aged in the future.

*Source:* National Center For Health Statistics (2008, pp. 33, 117-118).

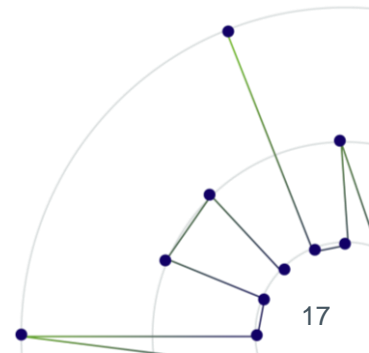
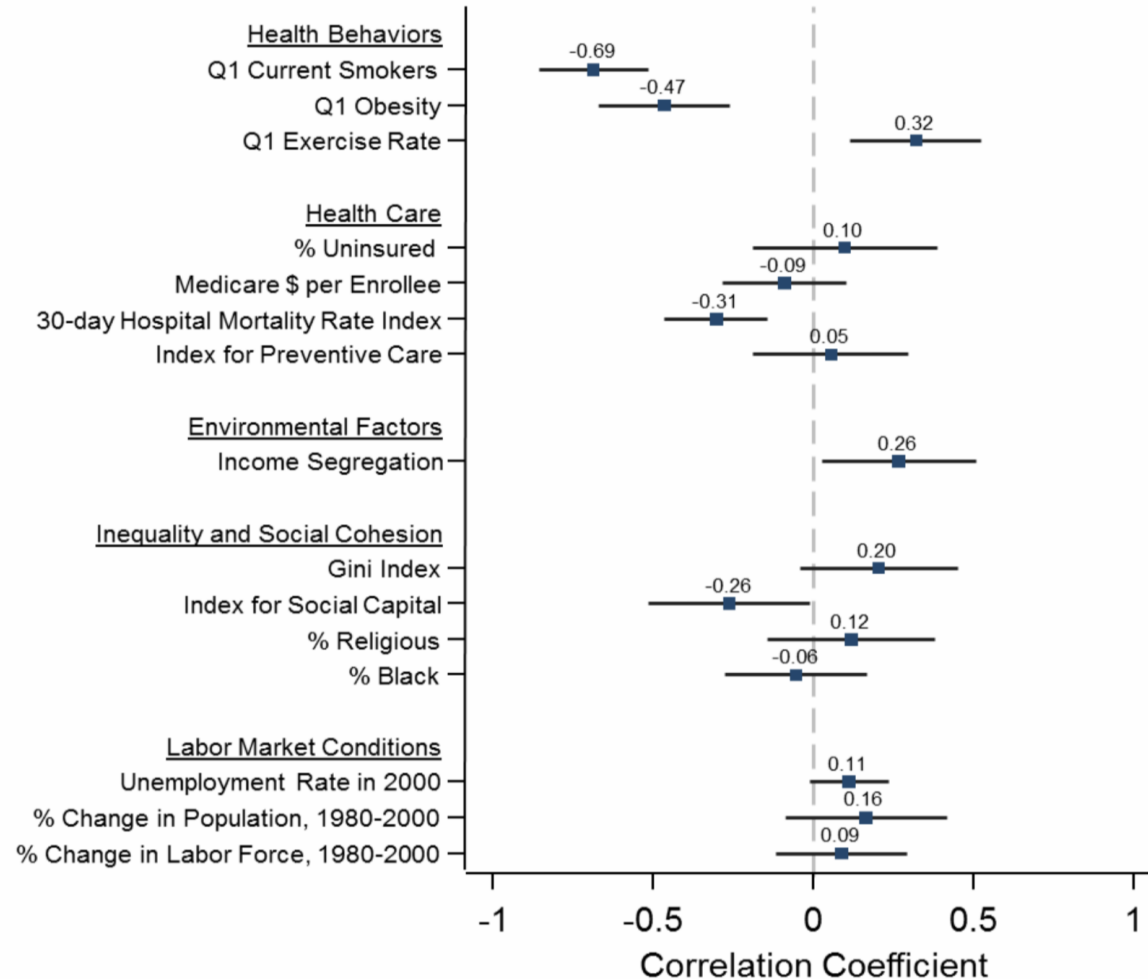
**Source:** Longevity Risk, published by RiskBooks, Chapter 17 (Fig 17.15): Pensions and Longevity in the US: Amy R. Kessler; Karen P. Glenn, Stephen C. Goss (Prudential Financial, Inc. (PFI); US Social Security Administration, Office of the Chief Actuary)



# Bringing it all together ....



## Correlations of Expected Age at Death with Health and Social Factors For Individuals in Bottom Quartile of Income Distribution

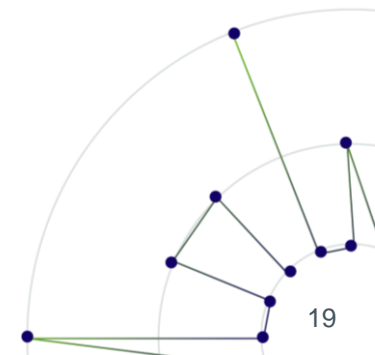
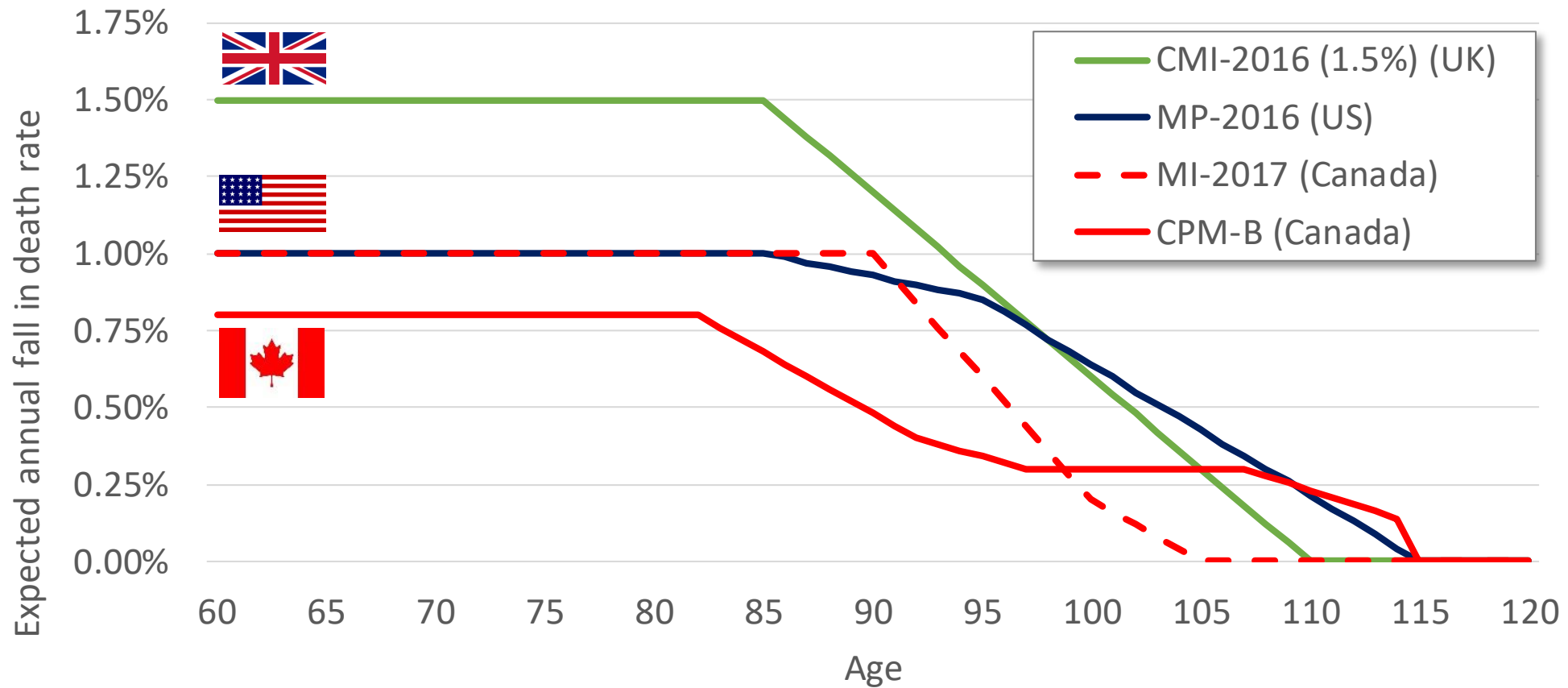


*So, if the  
healthiness of our  
lifestyles drives  
longevity variation,  
how does this  
change over time?*

# Where will it all end?

## *Actuaries' typical assumptions*

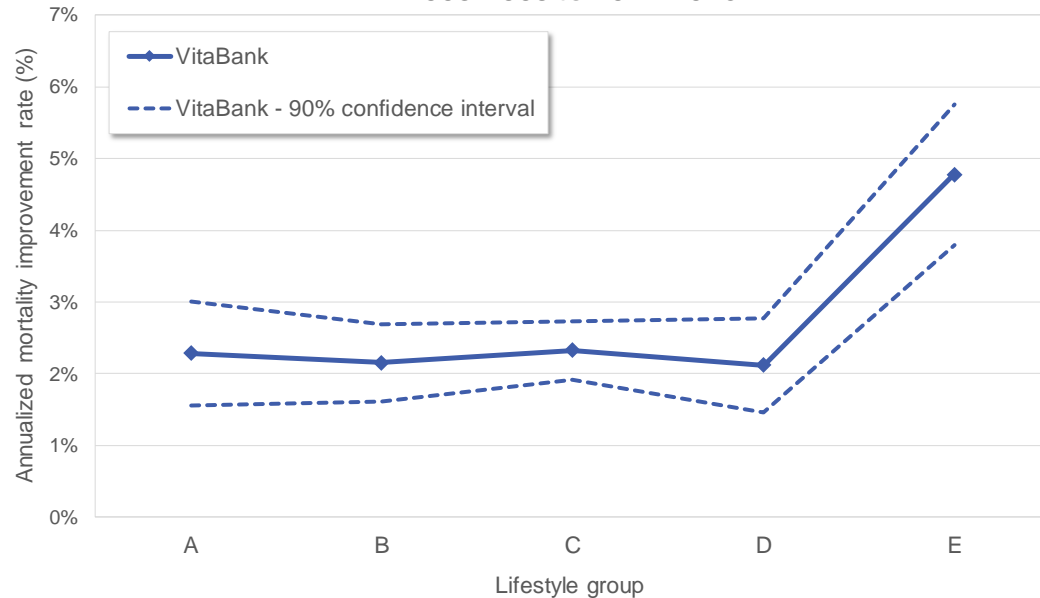
### Long-Term Improvement Rates



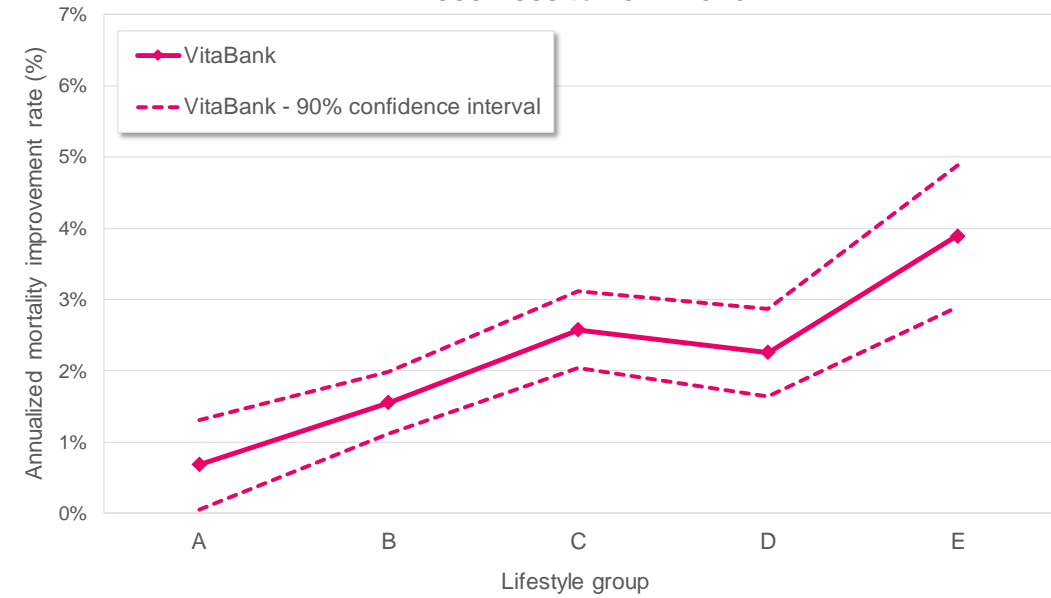
# Much higher improvements for wealthiest and healthiest Canadians



VitaBank male mortality improvements by lifestyle group  
2005-2009 to 2012-2016



VitaBank female mortality improvements by lifestyle group  
2005-2009 to 2012-2016

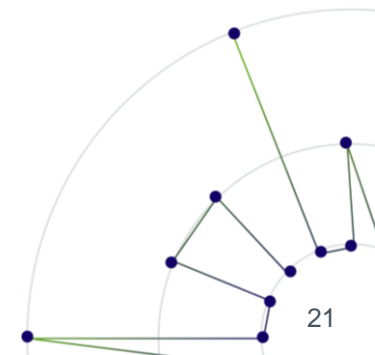
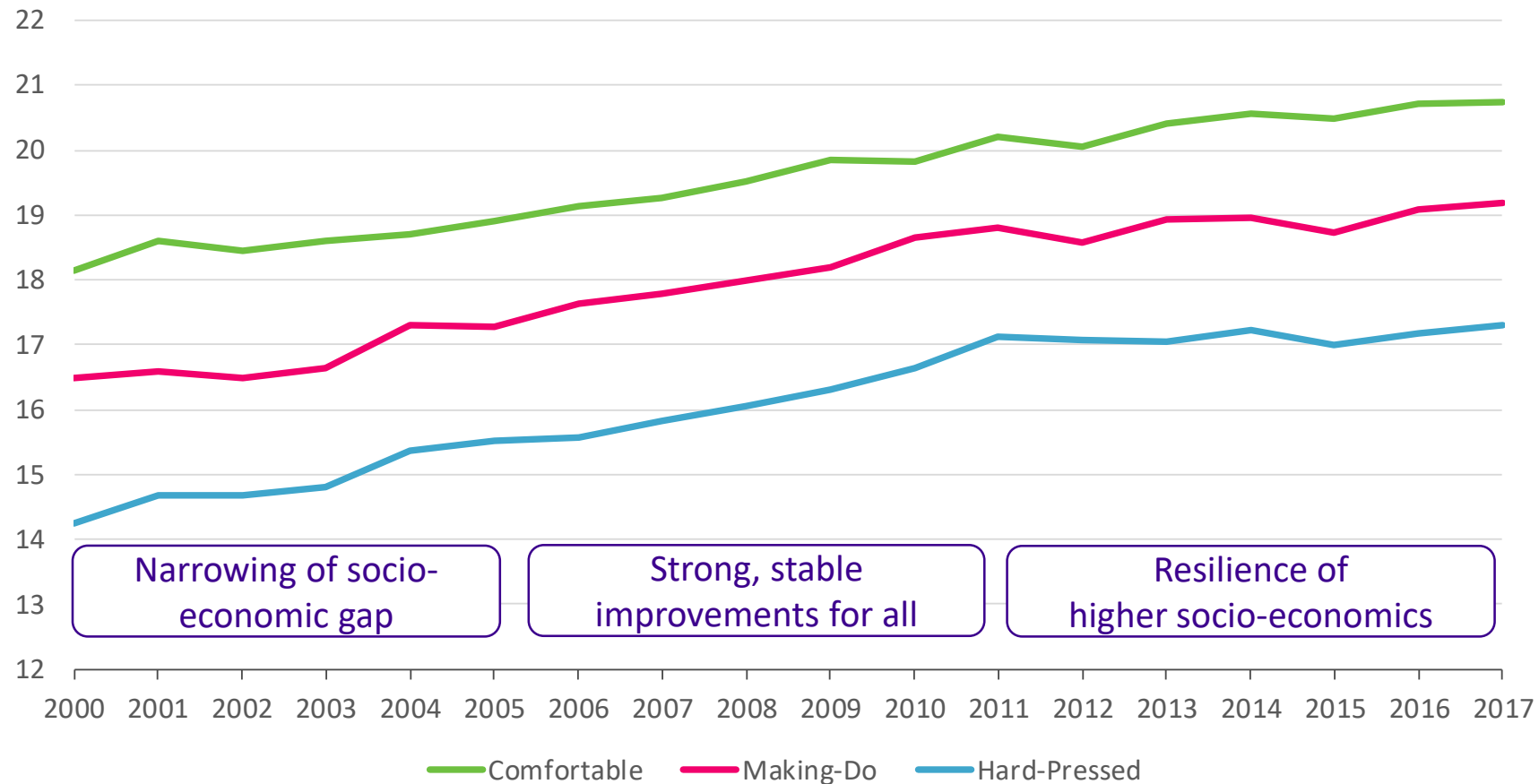


Source: Club Vita Canada, 2019. The VitaBank data used is that for pensioners and survivors where complete and reliable mortality experience and postal code data was available from 2005 to 2016 for the underlying plans. The annualized mortality improvement rates shown are those for ages 65 to 94 after age-standardizing for the Canadian population in 2016.



# Possible evidence of “eras”: *linked to economic policies and/or flu epidemics?*

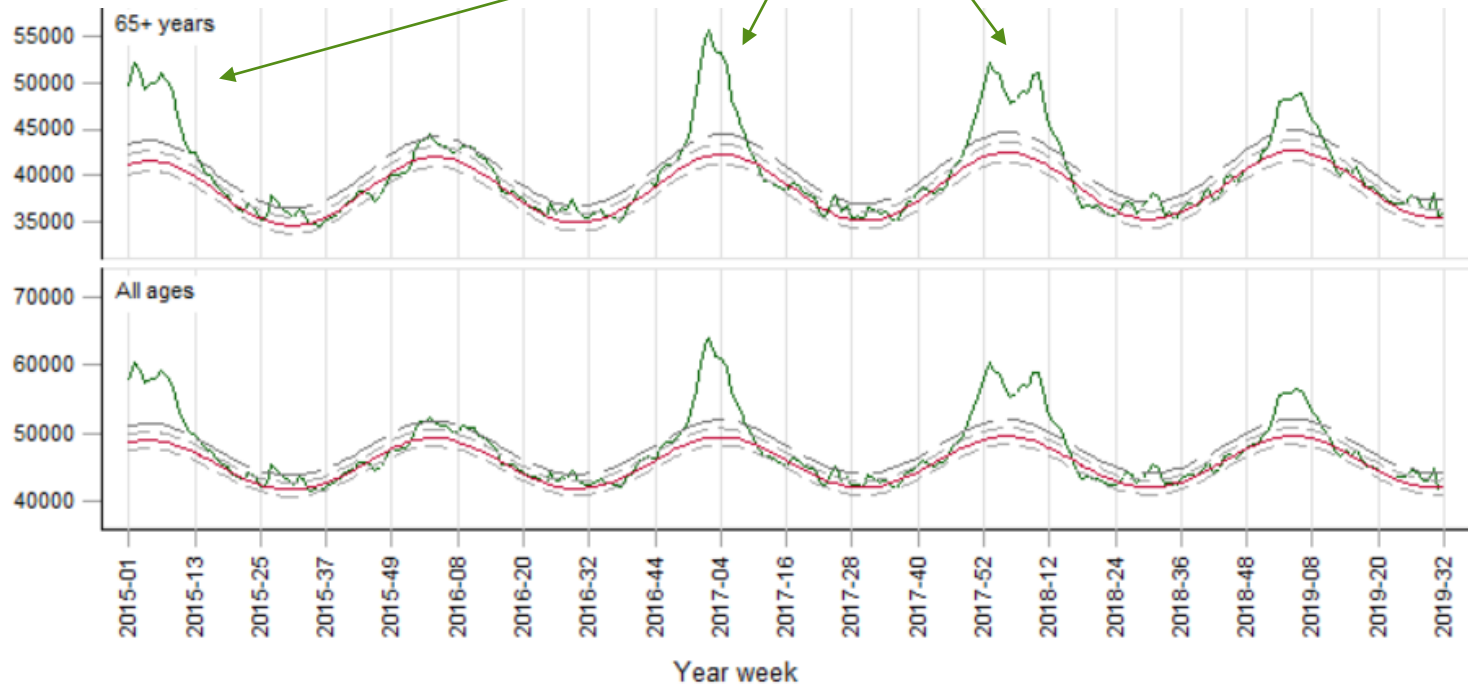
Life Expectancy at age 65 (men)



# The short-term volatility of winter flu epidemics

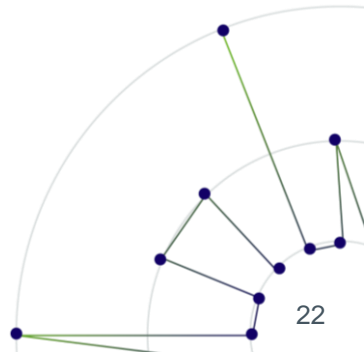


Winter flu epidemics in 2014/15, 2016/17 and 2017/18

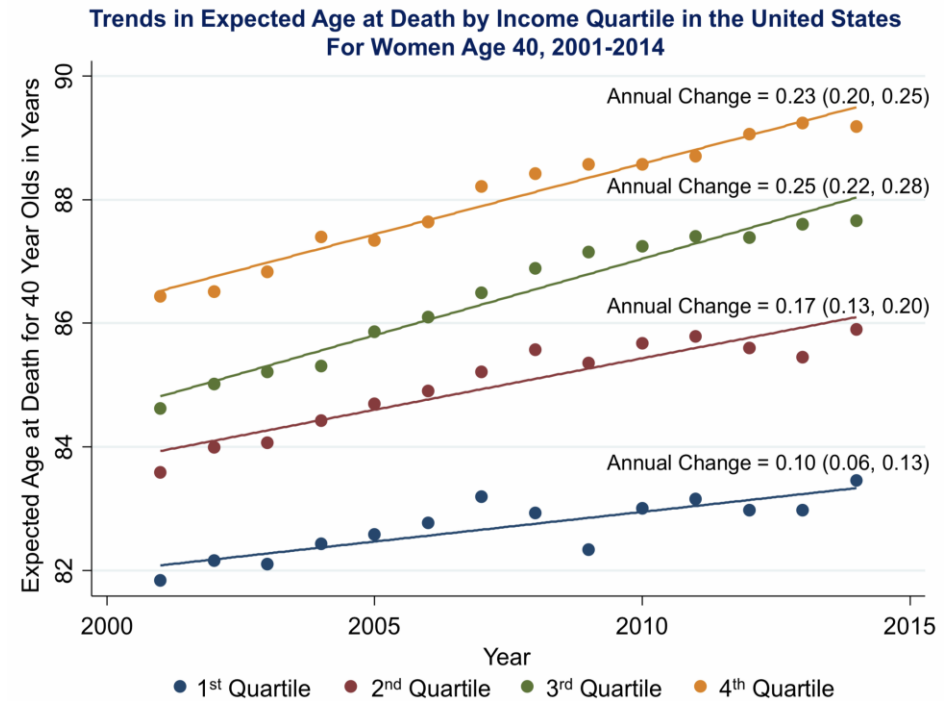
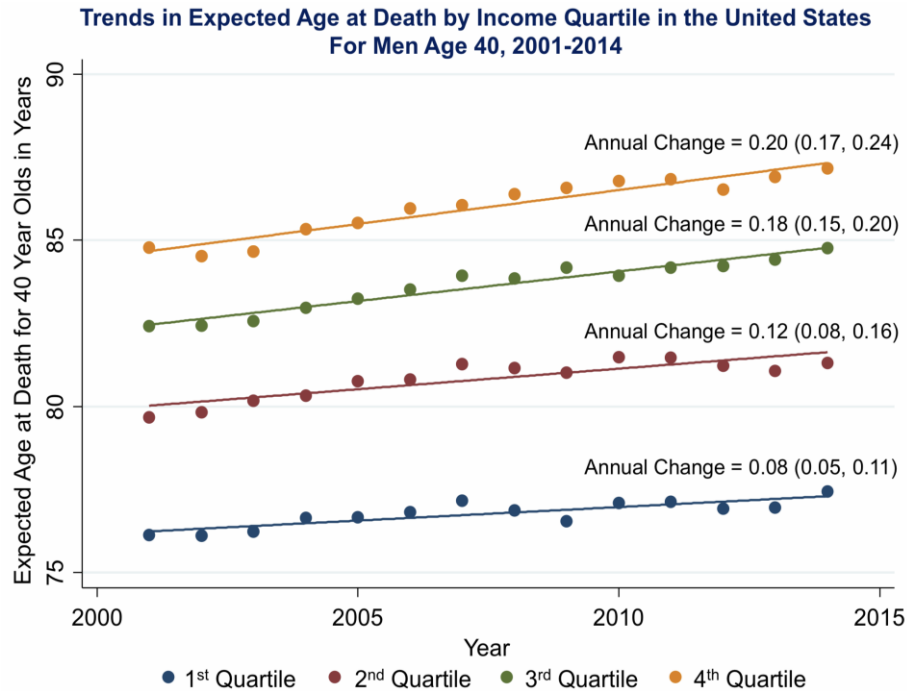


— Stratified baseline      — Delay-adjusted number of deaths  
- - - Normal range (+ 2 z-scores)      - - - Substantial increase (4 z-scores)

**Participating countries:**  
 Denmark, Finland, France, Germany (Berlin), Germany (Hesse), Greece, Hungary, Ireland, Italy, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK (England), UK (Northern Ireland), UK (Scotland), UK (Wales)

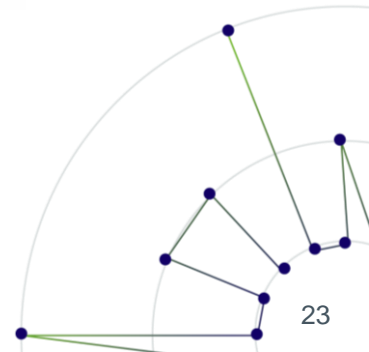


# Gap between top and bottom quartiles widening by around 1 year a decade



Source: Chetty et al, "The association between income and life expectancy in the United States, 2001-2014"  
[https://healthinequality.org/documents/paper/healthineq\\_slides.pdf](https://healthinequality.org/documents/paper/healthineq_slides.pdf)

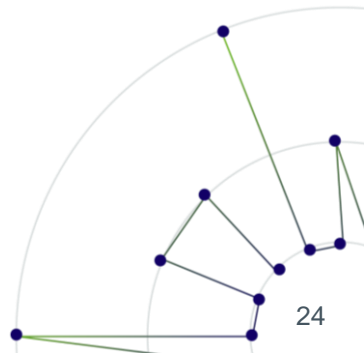
What's happened since 2014?



# So, what can we infer about improvement rates for US pension sponsors?



- The national population is not improving uniformly
- Top quarter, are gaining roughly one year a decade more than bottom quarter (and vice versa)
- Assuming that these differences are sustained, over the remaining lifetime of a typical 50 yr old DB participant a 4 year gap will open up
- Using national population leads to over/under valuation of order valuation of +/-5% relative to the central best estimate.
- Sobering thought for sponsors of white collar plans. Good news for blue collar plans. Keep a close eye on emerging trends instead.





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*Lang may yer lums reek*