

# Opportunities for Geroscience Research: What Can the WHI Contribute?



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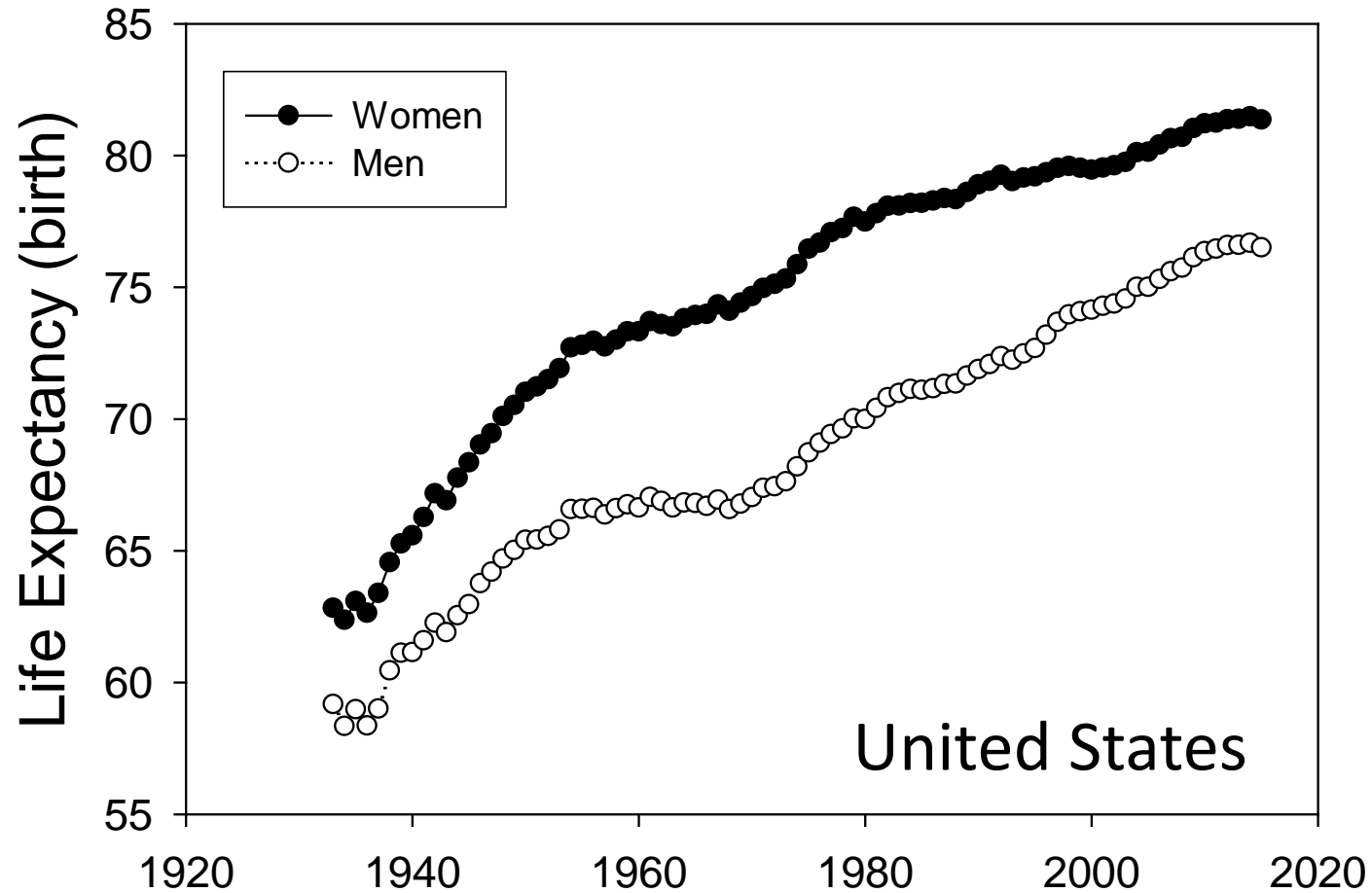
Scientific Director, American Federation for Aging  
Research

What the h\*\*\* is *geroscience*?

**Geroscience** is an interdisciplinary field that aims to understand the relationship between aging and age-related diseases

*Wikipedia*

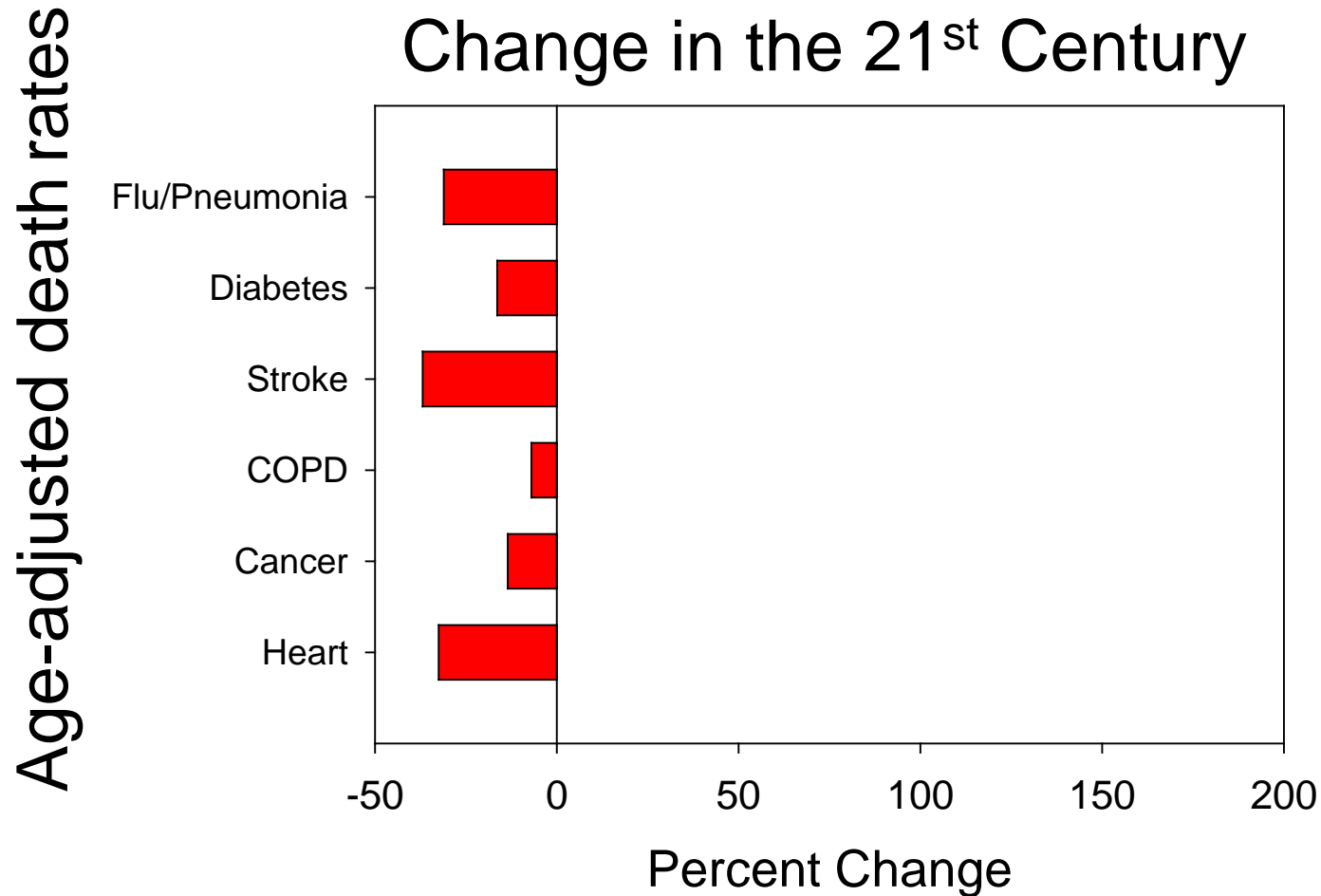
# The Good News



United States

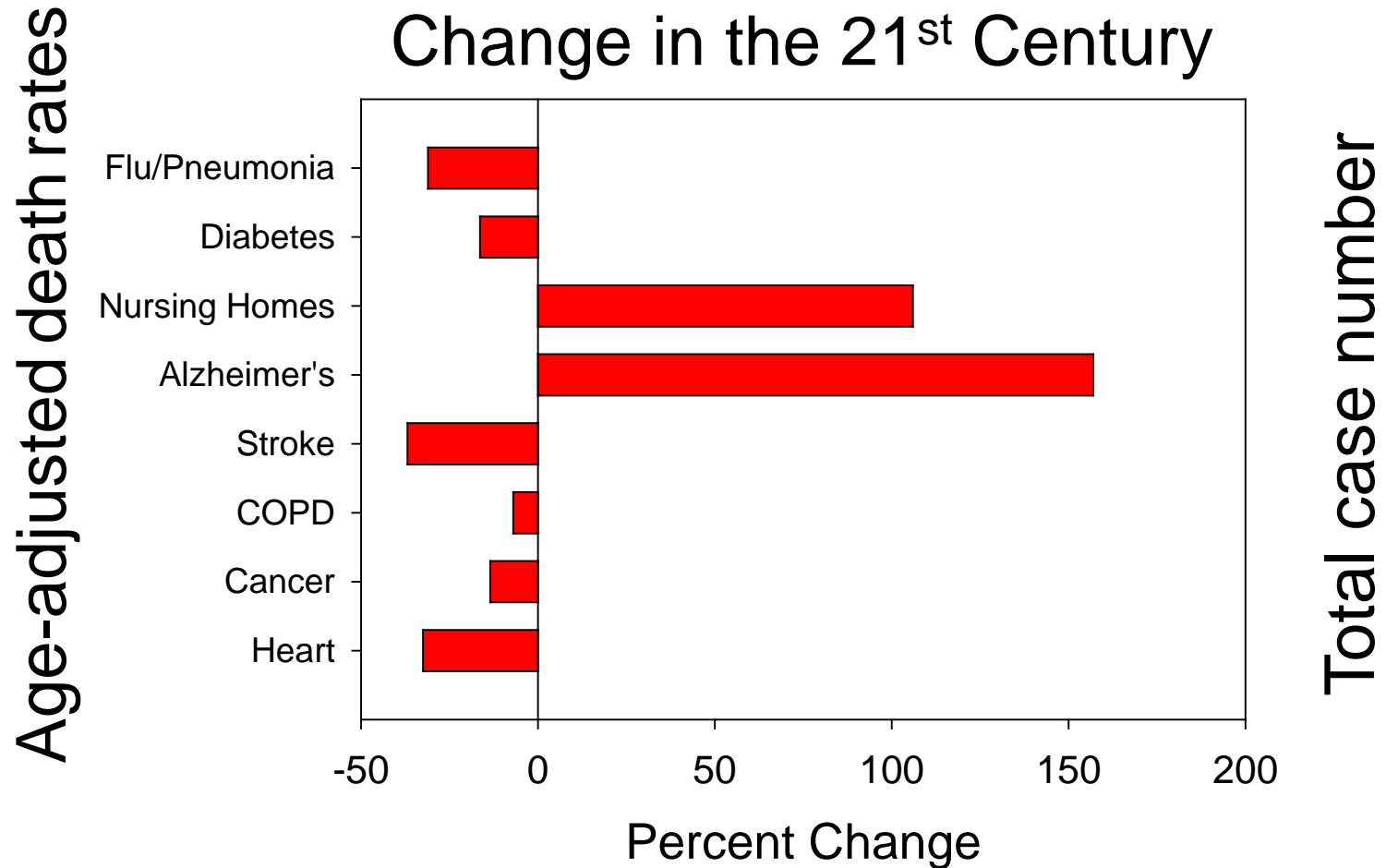
# We know...

We are getting *really* better at delaying death

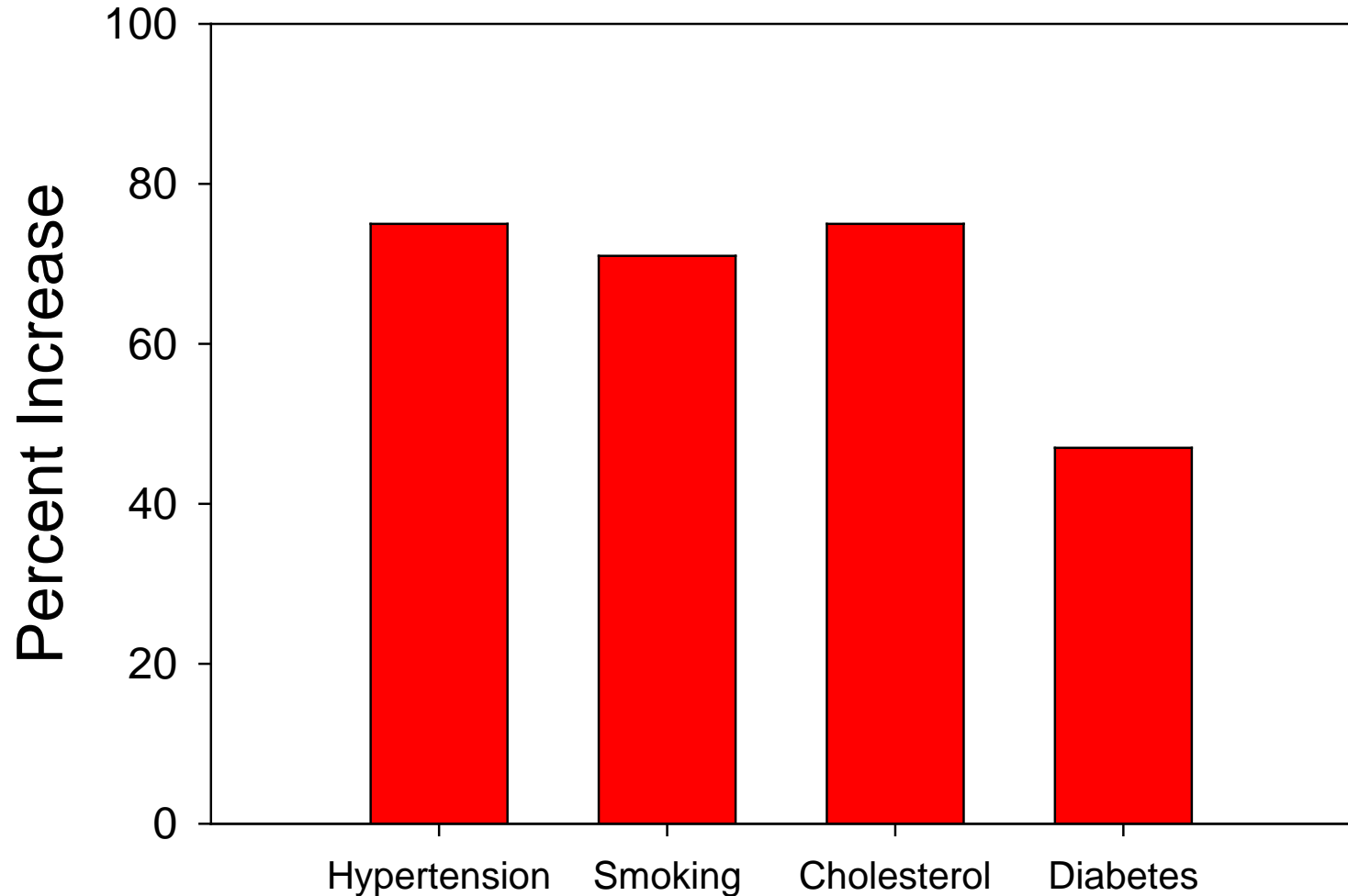


# But we also know...

Delaying death leads to other disabling maladies

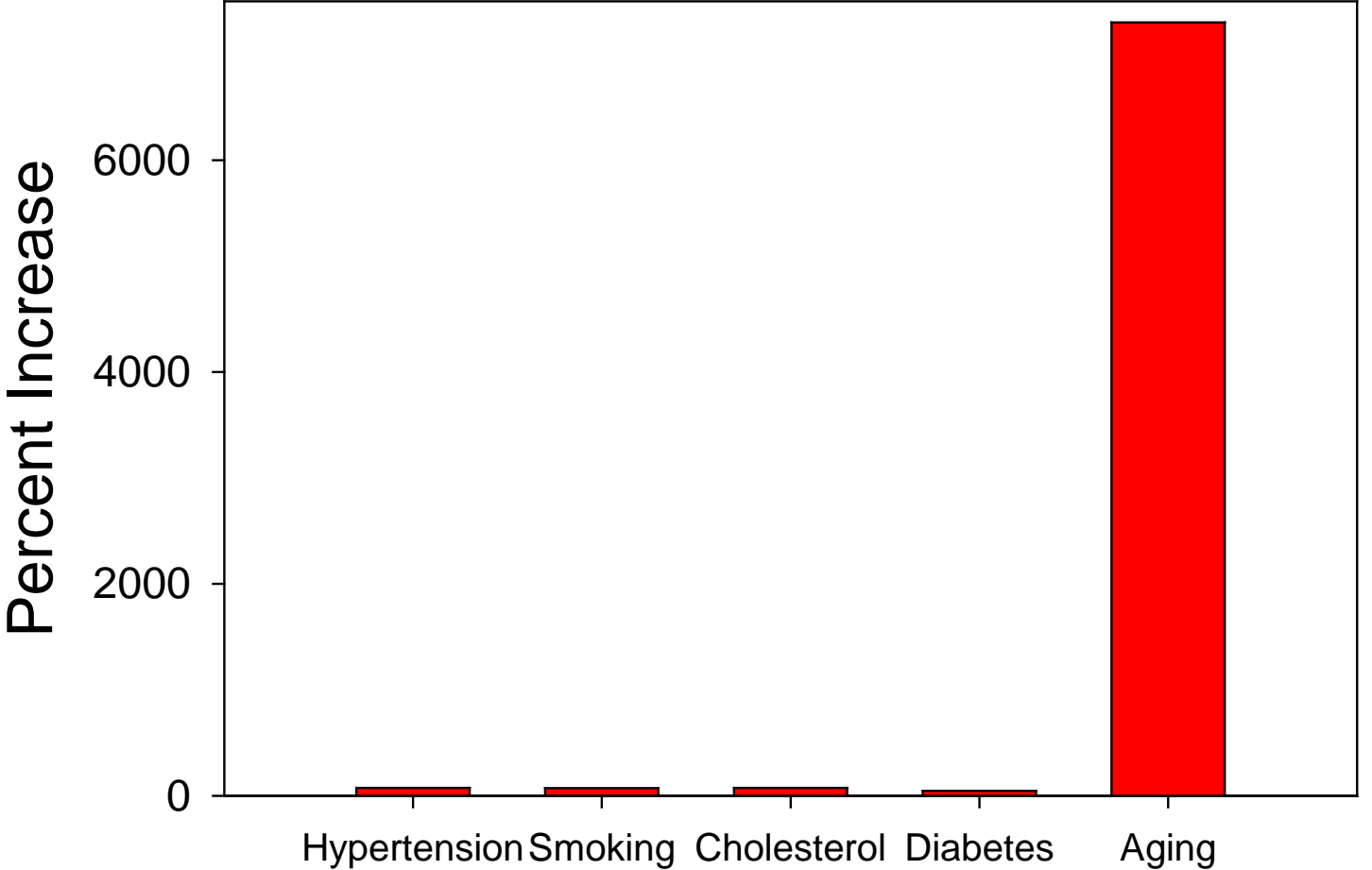


# Risk Factors for Heart Disease



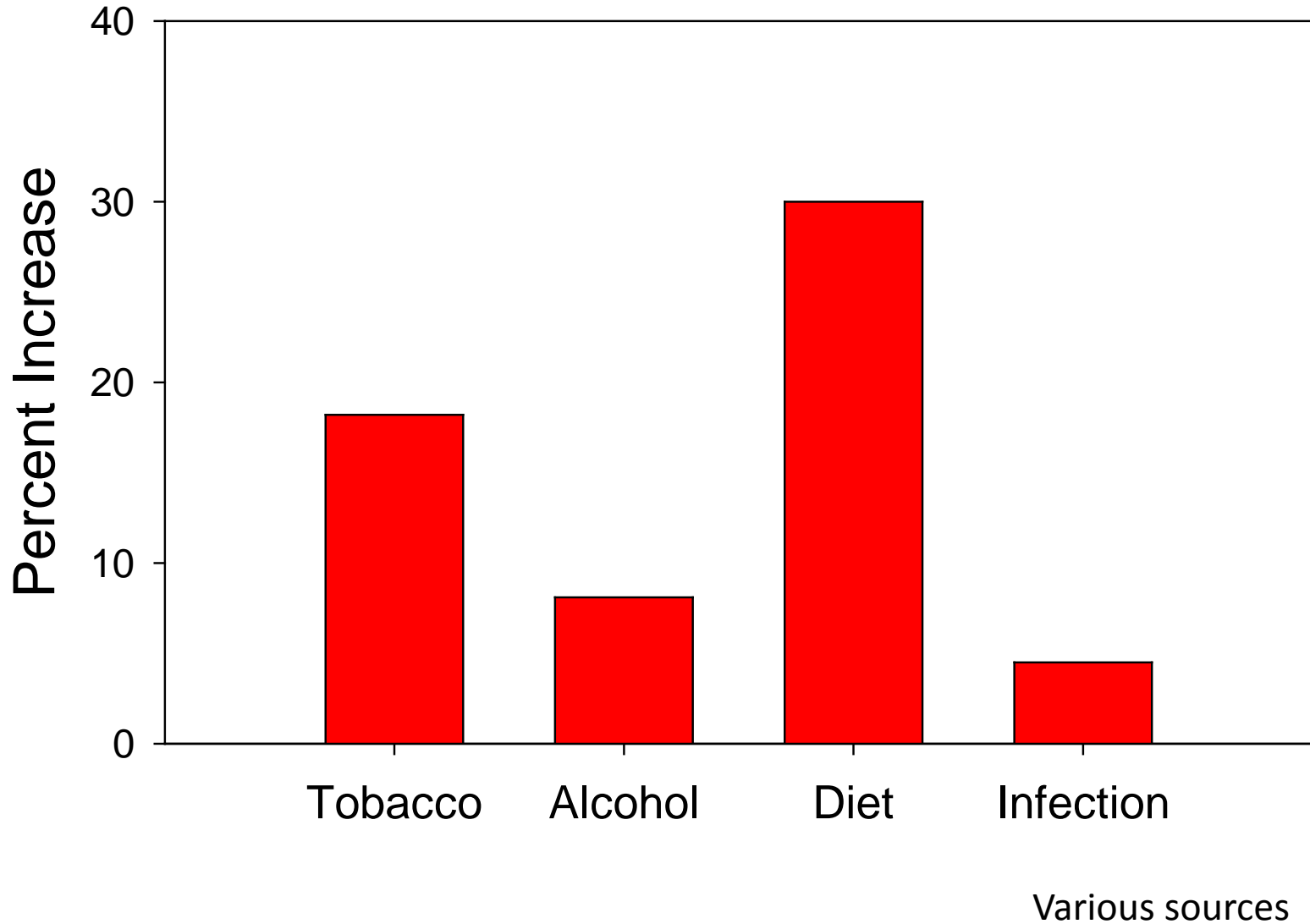
Various sources

# Risk Factors for Heart Disease



Various sources

# Risk Factors for Cancer



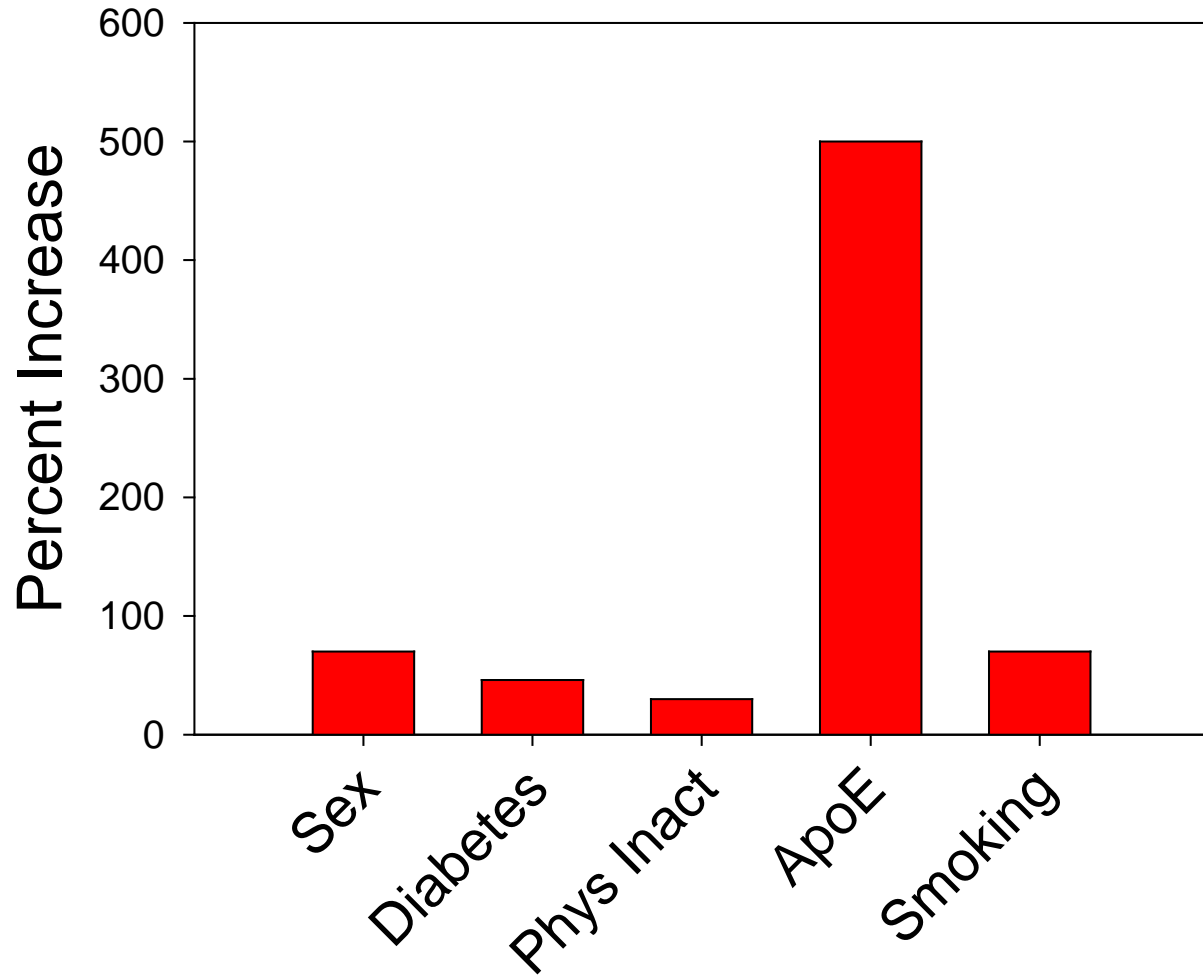


# Risk Factors for Cancer



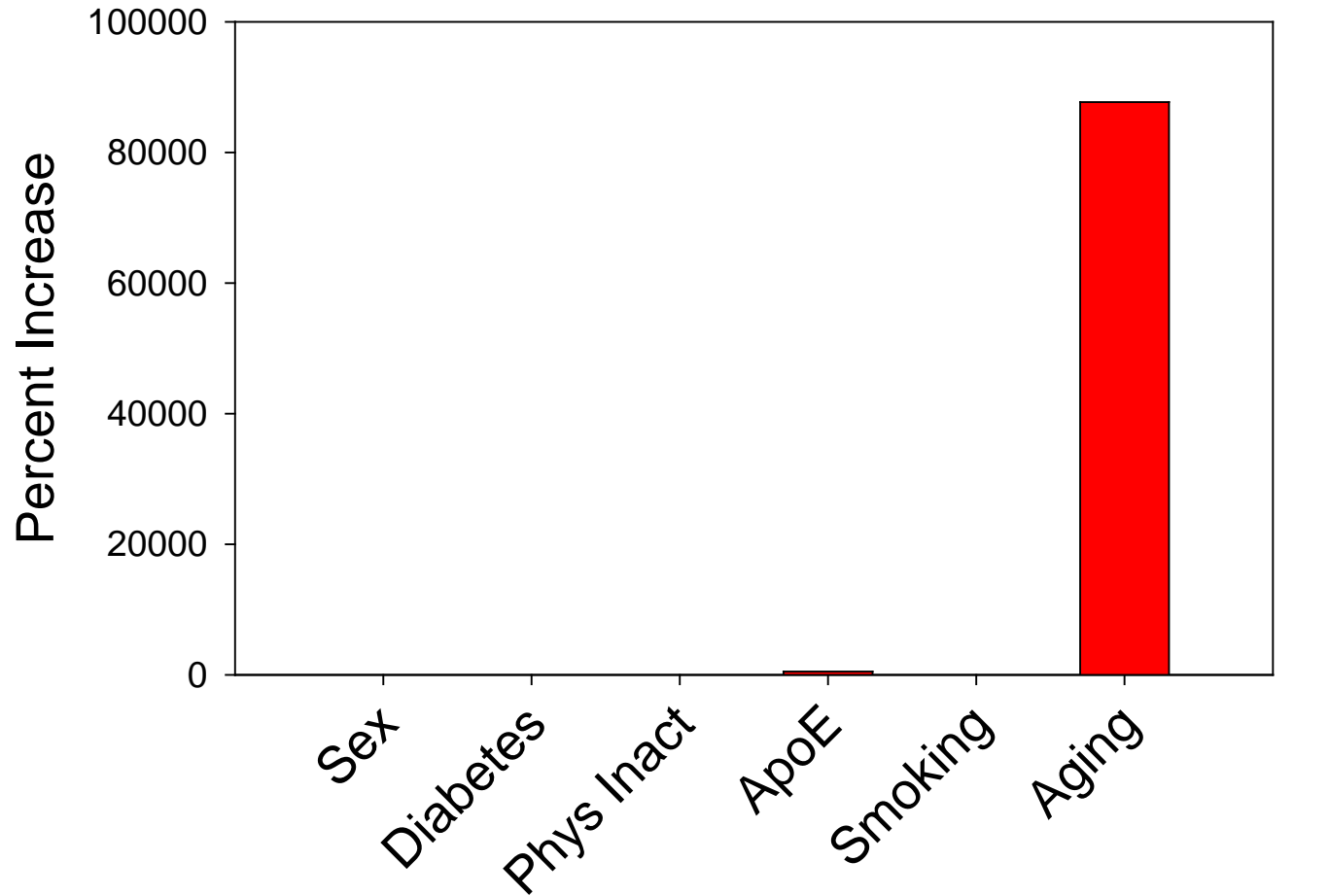
Various sources

# Risk Factors for Alzheimer's Disease



Various sources

# Risk Factors for Alzheimer's Disease



Various sources

# Many interventions that delay death (and improve health) in laboratory animals

*C. elegans*  
“The worm”

*Drosophila melanogaster*  
“The fly”

*Mus musculus*  
“The mouse”



10x Increase

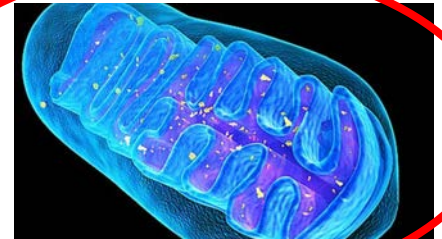
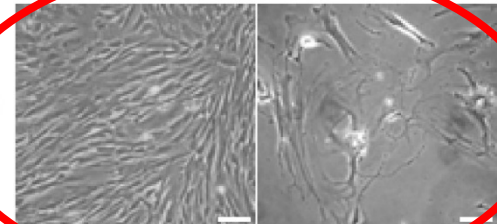
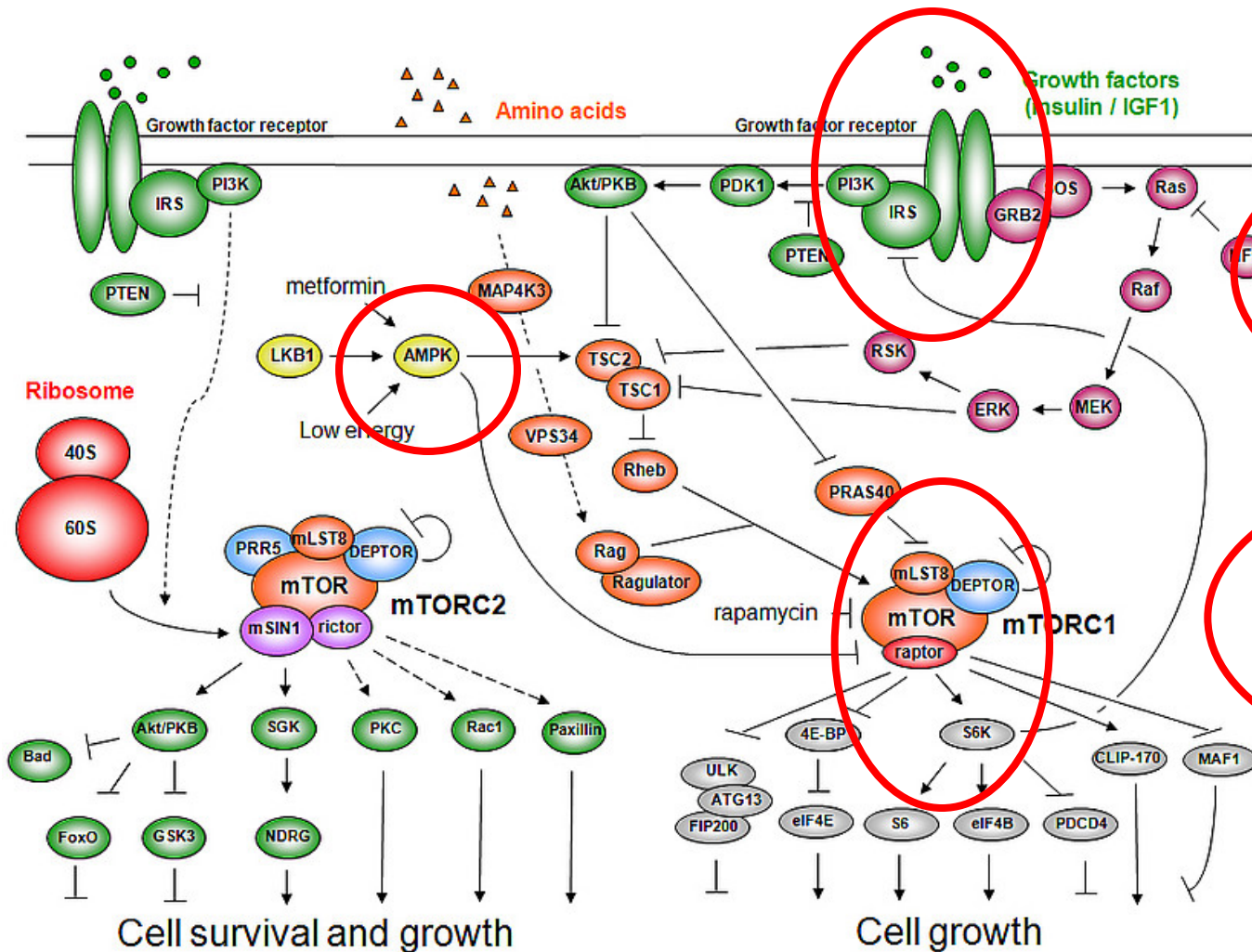


2x Increase



~75% Increase

# Known molecular *networks* contributing to aging

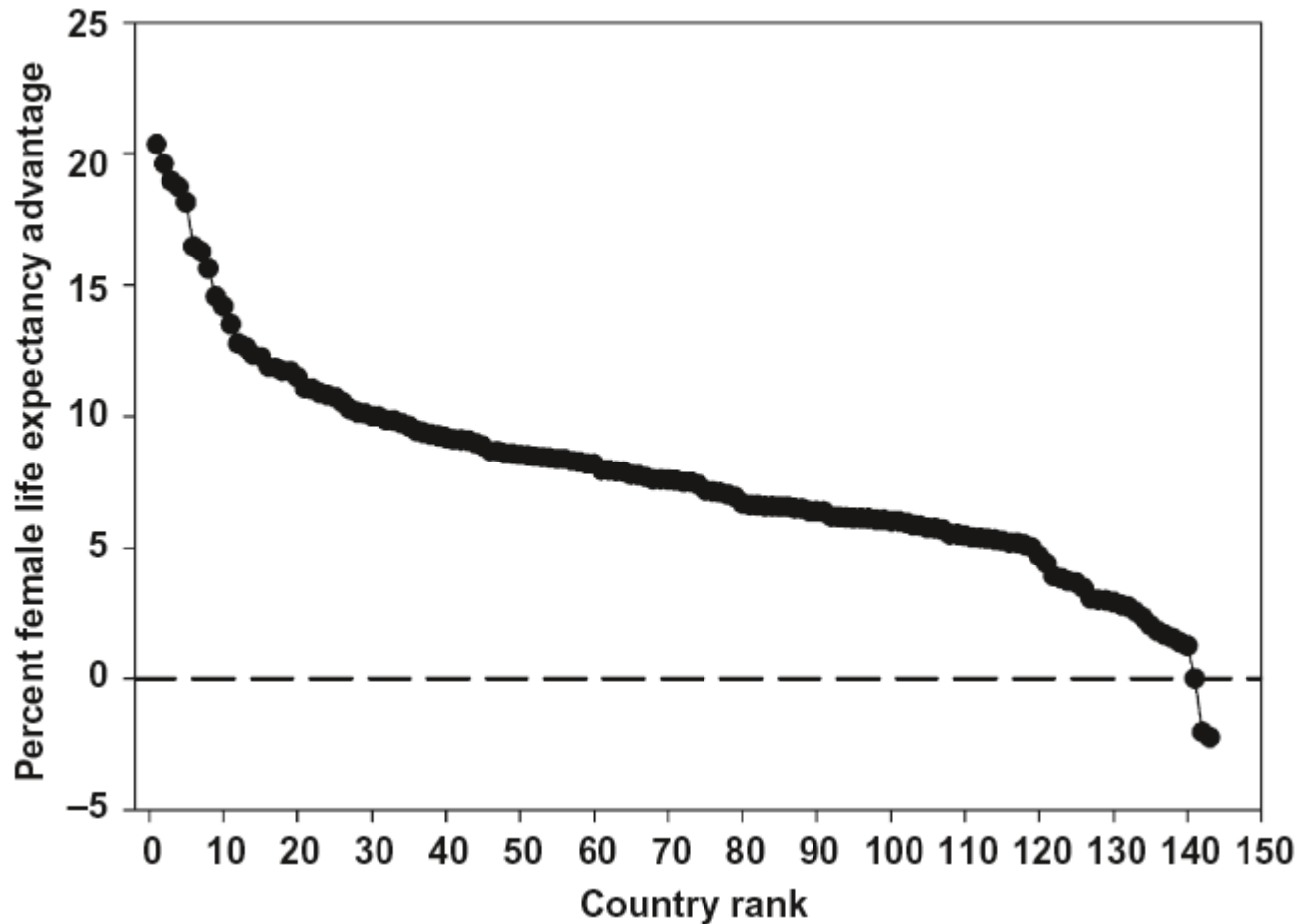


# Interventions Testing Program: drugs that might extend life in mice

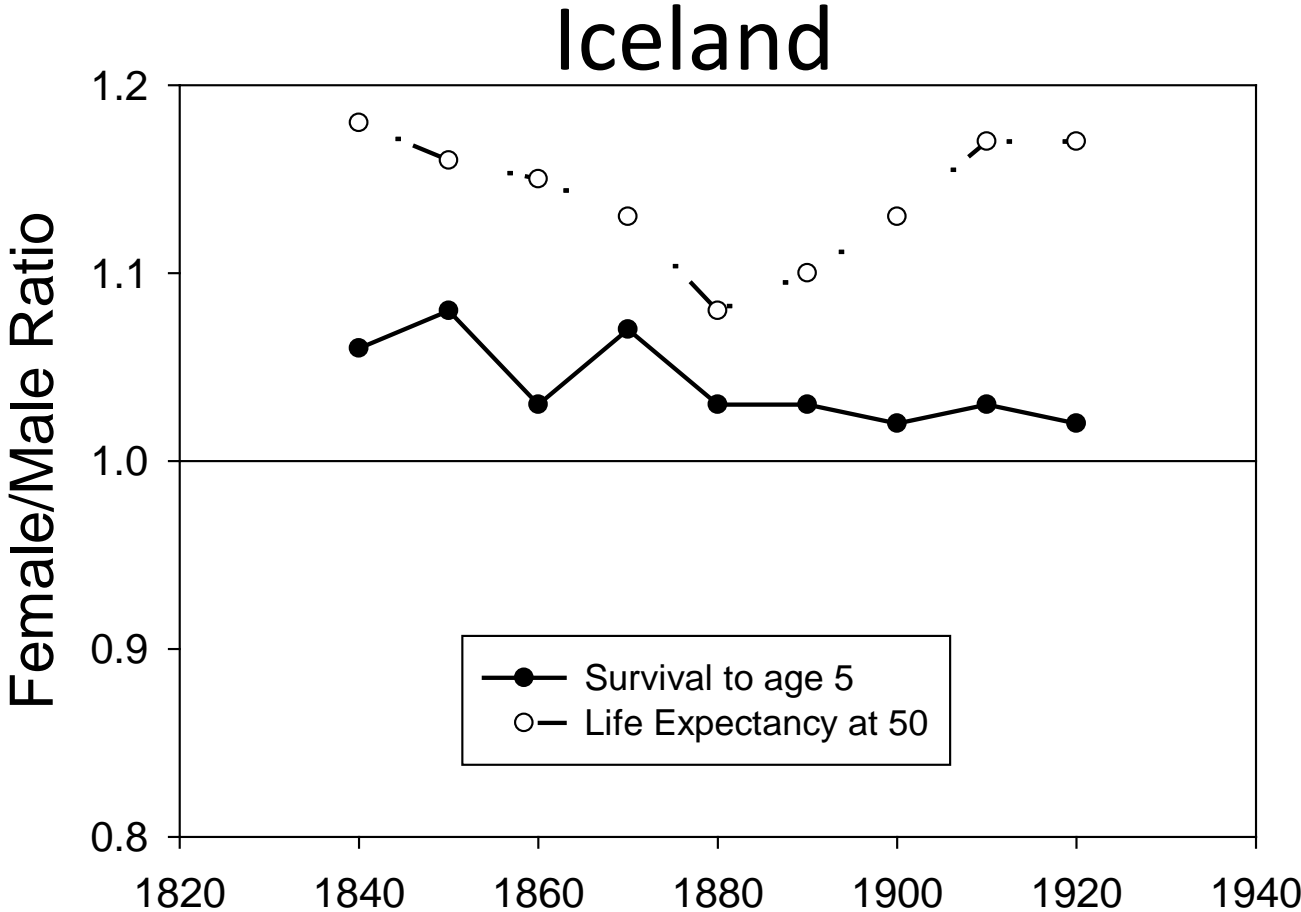
Extends	Does not
Aspirin ( <u>males</u> only)	NFP
NDGA ( <u>males</u> only)	CAPE
Rapamycin	4-OH-PBN
17 $\alpha$ -estradiol ( <u>males</u> only)	Enalapril maleate
Acarbose ( <u>males</u> only)	Simvastin
Protandim ( <u>males</u> only)	Resveratrol
Rapamycin + metformin	Oxaloacetic acid
	Green tea extract
	Curcumin
	Medium chain triglyceride oil
	Fish oil
	UCDA
	Metformin

# What about humans???

## A robust feature of human biology



# Female babies survive better too

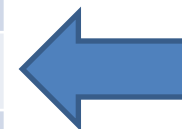


Austad & Fischer, *Cell Metabolism* (2016)

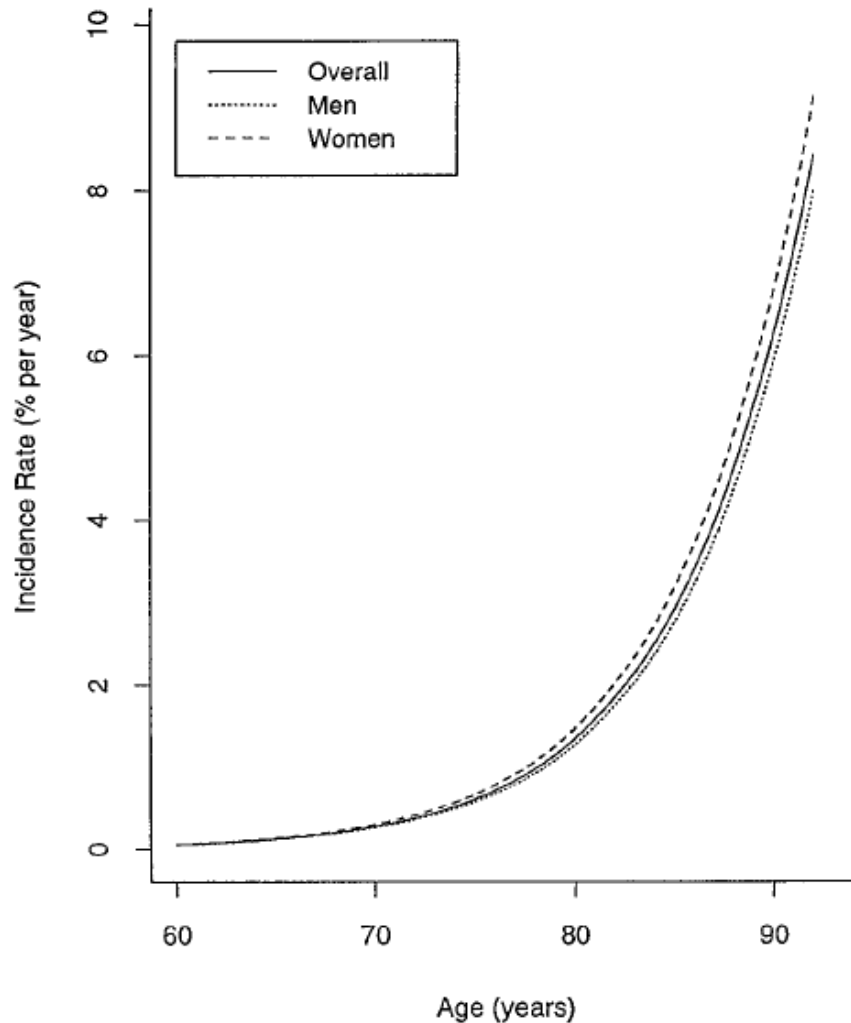


# Top Causes of Death (United States 2014)

Disease	Percent Deaths	M/F Age-adjusted rate
Heart	23.4	1.6
Cancer	22.5	1.4
COPD	5.6	1.2
Accidents	5.2	2.0
Cerebrovascular	5.1	1.0
Alzheimer's	3.6	0.7
Diabetes	2.9	1.5
Pneumo/Influ	2.1	1.3
Chronic Kidney	1.8	1.5
Suicide	1.6	3.6



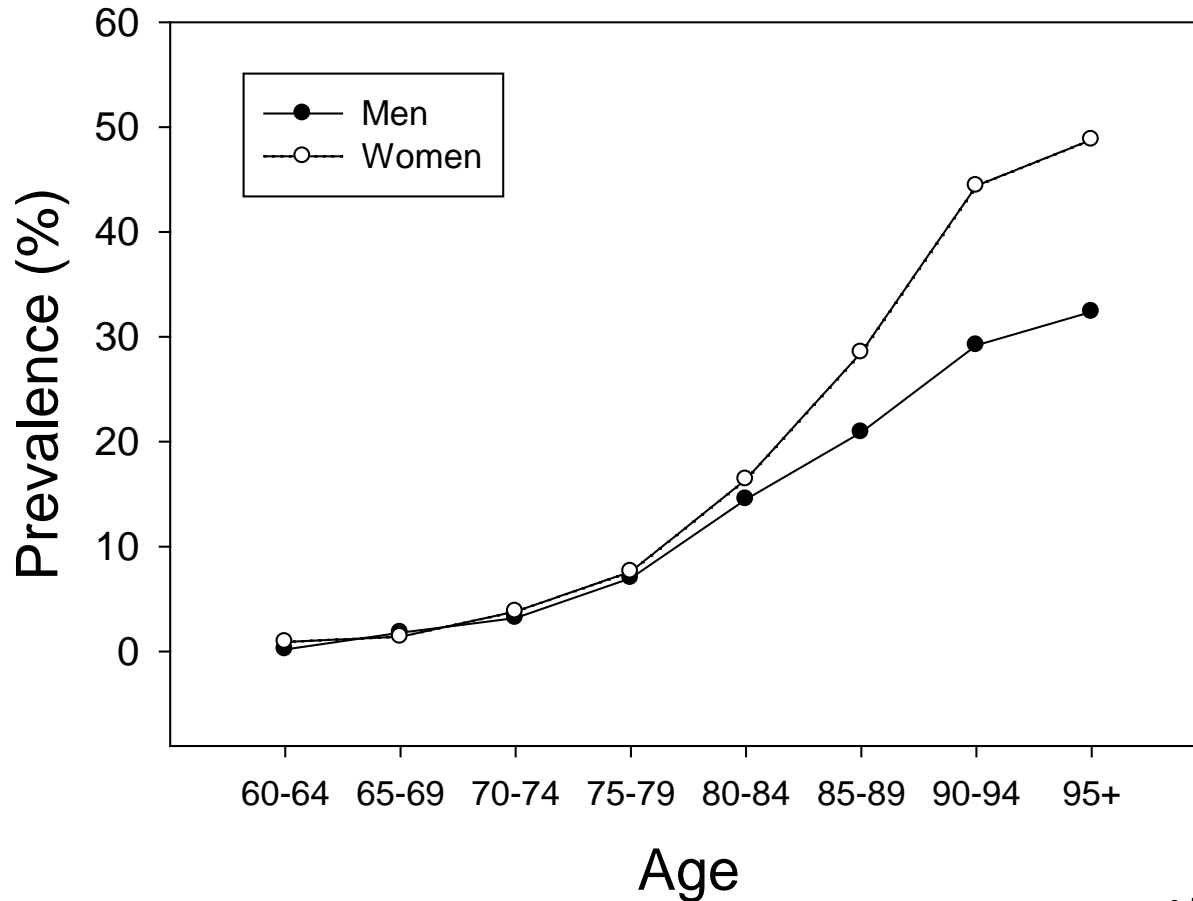
# Baltimore Longitudinal Study of Aging (AD incidence, no signif. sex diff.)



Kawas, et al., 2000

# Sex differences in prevalence of Alzheimer's disease

(Summary 31 studies across Europe)



source: Alzheimer's Europe

# M/F age-adjusted death rates for dementia

Country	Year	M/F Ratio	F/M Ratio	Source
United States	2014	0.70	1.43	Centers for Disease Control
Japan	2014	0.75	1.33	Ministry of Health, Labor, & Welfare
United Kingdom	2010	0.73	1.37	Office for Nat'l Statistics

# Opportunities in Geroscience

- Does the mouse work inform us about mechanisms in people?
- Geriatric assessment by questionnaire??
- Resilience (recovery from adverse medical event)
- In vivo molecular pathway markers from stored plasma/serum (epigenomic, telomere length)
- Postmortem markers (e.g. organ markers of aging)
- Mechanisms, do they differ between the (human) sexes?
- Alzheimer's paradox