2A – Living to 100 Call for Essays

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2020 Living to 100 Symposium

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ALCOHOL AND MORTALITY

Call for Essays

January 13, 2020

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ALCOHOL AND MORTALITY
What I'll cover

- Size of the problem
- Consequences
- The moderate drinking issue
- Conclusions

Size of the problem

- Alcohol consumption is either the 2nd or 3rd leading global behavioral-related cause of death – 3.0 million deaths
  - 7.7% for males and 2.6% for females
  - Compares with more than 7 million annually due to smoking and between 2.8 and 4.0 million due to being obesity/overweight
  - 132.6 million disability-adjusted life years (5.1% of all DALYs)
- 2.3 billion people are current drinkers (43% of the population)
  - 44.8% - spirits
  - 34.3% - beer
  - 11.7% - wine
- Men drink more often and drink more when drinking than females
- Can be a serious addiction

Size of the problem - 2

- Per capita consumption
  - 5.9 liters in 1990 to 6.5 liters in 2017, projected to be 7.6 liters in 2030
  - Consumption in low and medium-income countries is expected to increase, while consumption in higher-income countries will be stable
  - Selected countries (1990 to 2017)
    - United States – 9.3 to 9.8 liters
    - China – 7.1 to 7.4 liters
    - India – 4.3 to 5.9 liters
- Reported consumptions tend to underestimate consumption
  - Most data gathered by survey techniques
  - Source of some alcohol is self-produced

Binge drinking

- U.S. adults between 2001-2002 and 2012-2013
  - 12-month alcohol use – from 65.4% to 72.7%
  - High-risk drinking (exceeding daily drinking guidelines in the past 12 months) – from 9.7% to 12.6%
  - DSM-IV AUD (Alcohol Use Disorder) increased from 8.5% to 12.7%
  - Largest increases were among females, older adults, racial/ethnic minorities, those with lower educational attainment and those with lower family income
    - These reduced prior differences between categories
- U.S. over age 65 during 2015-2017 – 10.6%
- U.S. high school students who drank who were binge drinkers (having 5 or more alcoholic drinks in a row on ≥1 day in the previous 30 days)*
  - 57.8%
  - 43.8% of binge drinkers consumed eight or more drinks in a row
  - Between 2006 and 2010 on average, 4,300 high schoolers died annually from alcohol-attributed causes

*Esser et al. (May 12, 2017) *Morbidity and Mortality Weekly Reports*

U.S. drinking prevalence

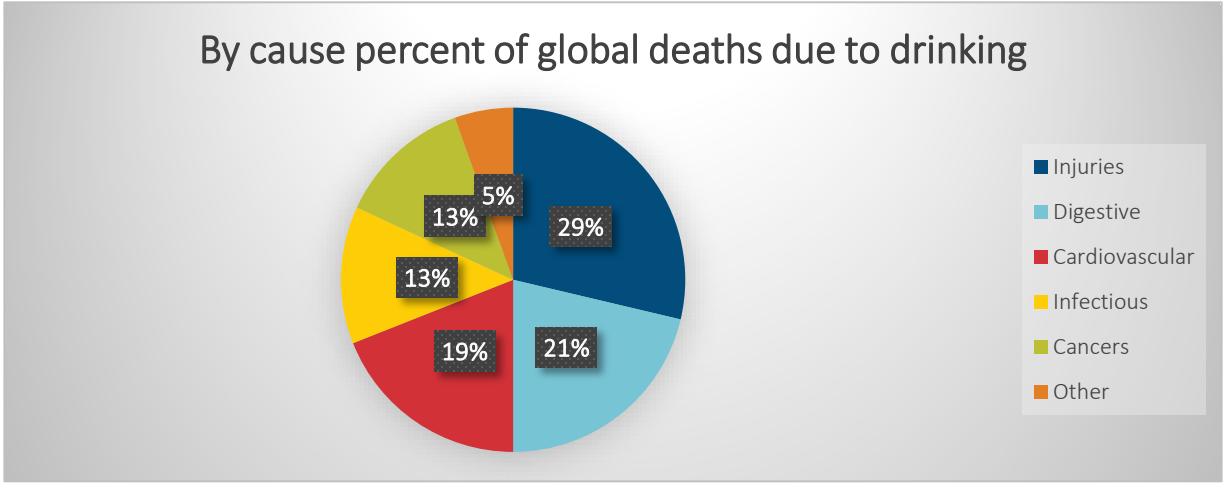
Ages	Current use		Binge use 2016	Heavy use 2016
	2002	2016		
12-13	4.3%	1.3%	0.3%	0.0%
14-15	16.6	7.4	3.7	0.5
16-17	32.6	19.7	10.2	1.7
18-25	60.5	53.3	38.4	10.1
26-34	61.4	65.0	37.2	9.4
35 +	52.1	53.5	21.3	5.2
Total	51.0%	51.7%	24.2%	6.0%
Males	57.4	56.2	28.9	8.3
Females	44.9	47.4	19.8	3.9
Total 12-17	17.6	9.2	4.9	0.8
Males	17.4	8.8	4.4	0.9
Females	17.9	9.6	5.4	0.6

Source: *Health US 2017;* Binge drinking: through 2014 5 drinks in a short period at least once in the past month, beginning in 2015 – 5 drinks in a short period for males, 4 drinks for females. Heavy drinking: binge drinking at least 5 times during the past month

Consequences

- High-risk drinking and alcoholism can cause
  - Fetal alcohol spectrum disorders
  - Hypertension
  - Cardiovascular diseases
  - Stroke
  - Liver cirrhosis (significant increase in age-adjusted mortality between 2009 and 2016)
  - Several types of cancer and infections
  - Pancreatitis
  - Type 2 diabetes
  - Various injuries (e.g., motor vehicle crashes, violence, and property crime)
- Drunk driving
  - In 2017, almost 11,000 deaths in the United States were due to alcohol-impaired driving, representing a 63% reduction from 1982
- Can be disabling, is associated with numerous psychiatric effects and impaired work and personal productivity, as well as interpersonal dysfunctions
  - Through dependence, places psychological and financial burdens on society, as well as families, friends, and coworkers

Consequences



- Global: 0.9 million injury deaths
  - 370,000 due to road injuries (about half were not drivers), 150,000 to self-harm, and 90,000 to interpersonal violence
- 17.6% of all deaths due to injury has been attributed to alcohol consumption (22.2% for males; 8.3% for females)

WHO (2018)

Causes of deaths – United States 2006-10

- More than half of these deaths involved those over age 50
- Leading causes
  - Alcoholic liver disease and cirrhosis – 24,000
  - Motor vehicle crashes – 13,000
  - Poisoning, homicides and suicides – 8,000 each
  - After reviewing global reporting, the relative lack of reported cardiovascular and cancer deaths attributable to alcohol suggests to the author that total drinking-attributable death estimates may be underestimated

The moderate drinking issue

- Question: is moderate drinking protective (compared with not drinking)?
  - Many earlier studies indicated that moderate levels of alcohol intake were associated with a lower risk of morbidity and mortality than for non-drinkers
  - However, several recent studies have challenged this hypothesis due to methodological deficiencies, e.g., failure to disaggregate the current non-drinking group

The moderate drinking issue

- Many studies have found that heavy drinking and binge drinking have serious adverse health consequences, including death
- Heavy drinking has been consistently associated with greater all-cause, liver and cancer mortality risk, particularly in males
- A large study* of the relation between alcohol consumption and cardiovascular disease found that moderate alcohol consumption is associated with a lower risk of several, but not all, cardiovascular diseases
  - Found an increased risk of coronary heart disease, cardiovascular disease, and all-cause mortality when former and occasional drinkers were removed
  - Compared with moderate drinkers, heavy drinkers had an increased risk of all but coronary heart disease
  - In most outcomes where a protective effect of moderate drinking was found, the risk was greater in former drinkers, consistent with the "sick quitter" hypothesis, i.e., not all non-drinkers should be treated alike

*1.93 million adults without cardiovascular disease at baseline in Bell et al. (2017)

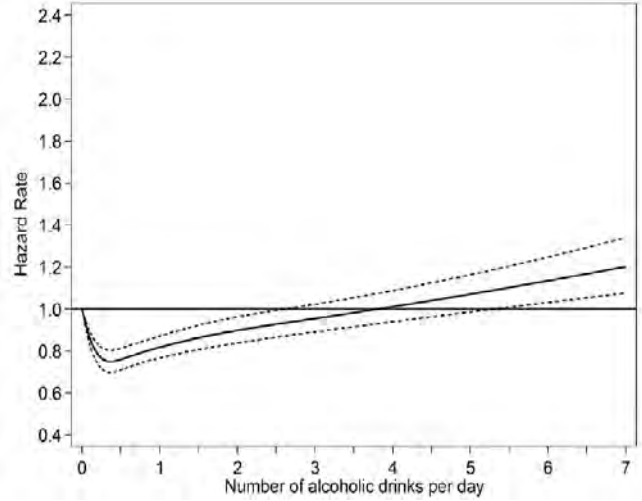
Another large study*

- All-cause mortality had a positive and curvilinear association with alcohol consumption, with the lowest risk being for those consuming less than 100 grams per week
- Those who drank between 100 and 200 grams weekly lost between 1 and 2 years of life at age 40 compared with those who drank less than 100 grams weekly, while those who drank between 200 and 350 grams weekly lost 4 to 5 years of life
- In the U.K., men who drank more than 112 grams weekly lost 1.6 years and men who drank more than 196 grams weekly lost 2.7 years, while females who drank more than 112 grams weekly lost 1.3 years
- Cardiovascular deaths
  - Accounted for about 20% of these losses
  - J-shaped association for aggregate cardiovascular deaths
  - Greater alcohol consumption was roughly linearly-related to a higher risk of cardiovascular disease subtypes other than myocardial infarctions
- Those who drank spirits or beer and who binged experienced worse mortality

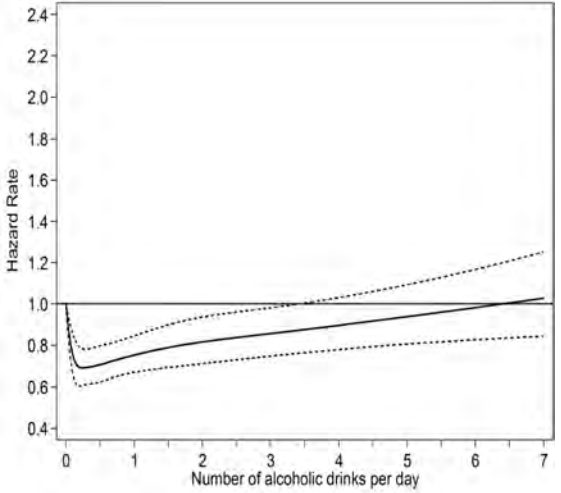
*Wood et al. (2018) – considered 83 long-term prospective studies in 19 high-income countries

Mortality in relation to alcohol intake

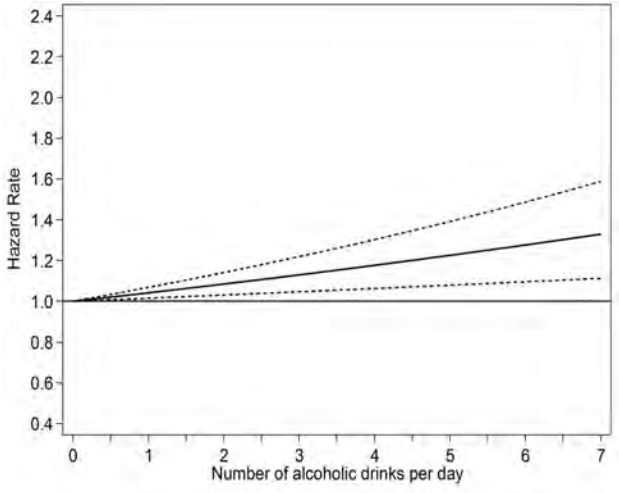
All-causes



Cardiovascular-related



Cancer-related



- This study of about 100,000 U.S. adults suggests that, although risk of some cancers increase with each additional alcoholic drink consumed weekly; overall moderate drinking can be mortality-protective

Source: Kunzmann et al. (2018)

The moderate drinking issue

- Care is needed to conclude on this issue
  - If practical, separate categories of non-drinkers
  - Study by cause of death may reveal different patterns of mortality by cause
- It appears that, in the aggregate, moderate drinking can be of value
  - However, for certain causes, the effects of any drinking can be adverse

Policy prescriptions

- Maximum permissible blood alcoholic concentration while driving
- Increasing prices through, for example,
  - Taxation
  - Insurance pricing
- Restricting accessibility
  - To youth
  - Governmental policy/licensing of one level of product cycle
- Restricting/banning marketing/advertising
- Disclosure/education of contents and dangers

Overall conclusions

- Despite some favorable recent global trends in prevalence of heavy and episodic alcohol-related mortality and morbidity and youth drinking in the United States, there has been no progress in reducing total per capita alcohol consumption
- Global burden of disease attributable to alcohol remains high, especially for males, and even increasing in some countries and for some causes
- Recognition and management of high alcohol consumption, especially in binges, remain essential

References in Slides

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Will Growing Inequality Make Social Security & LTC Financing Fixes Harder?

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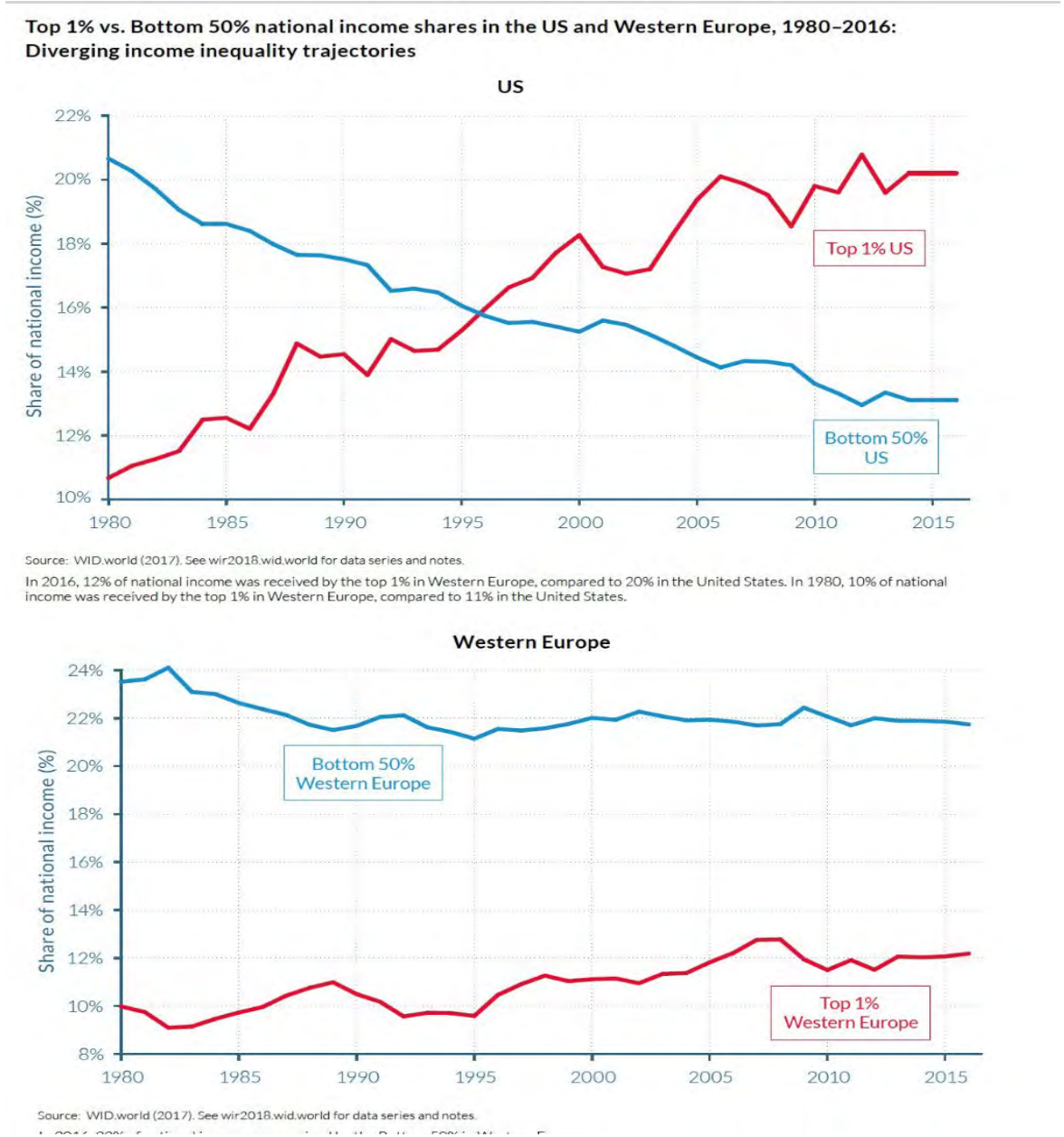
Topics of Discussion

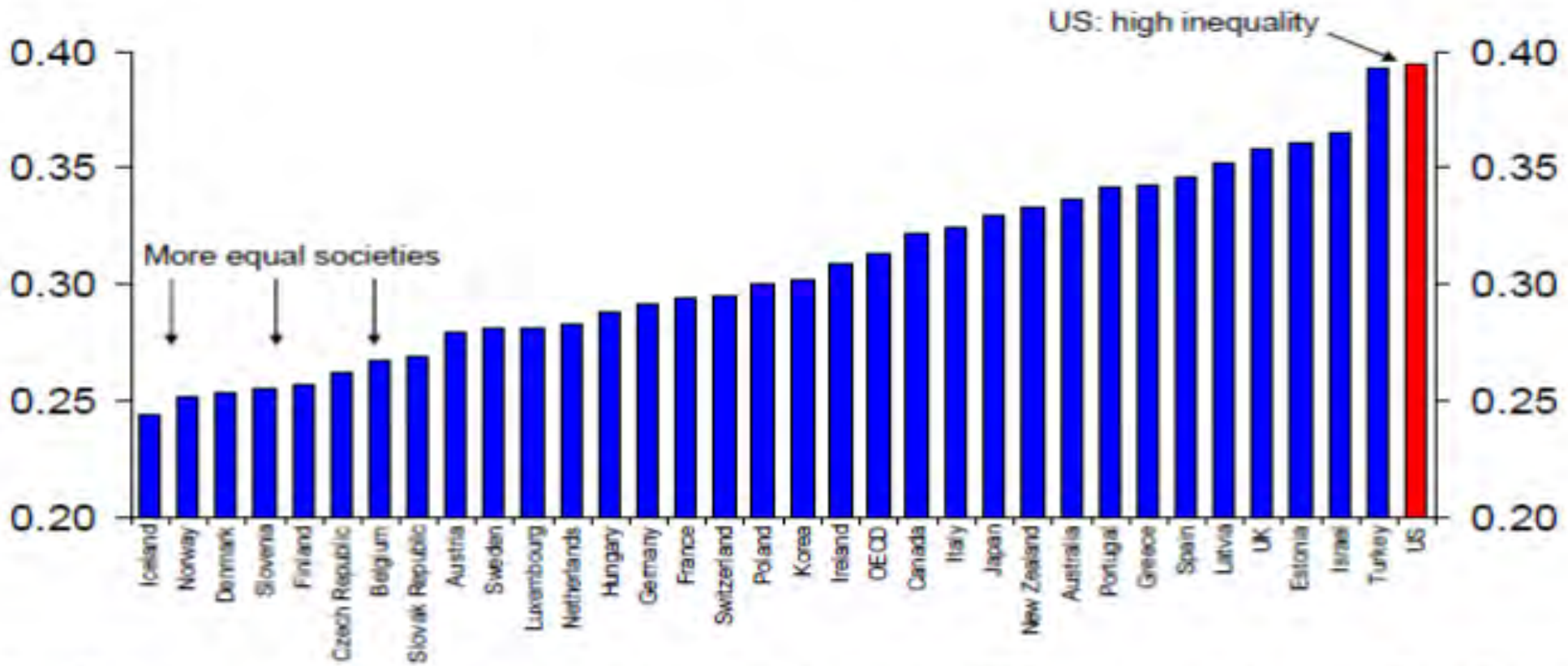
1. **Rising inequality in the United States.**
2. **Challenges for Financing Long Term Care - SOA Essay.**
3. **Challenges for Funding Social Security.**
4. **Will More Inequality Make Policy Consensus/ Compromise on Social Insurance Harder?**



U.S. income inequality has grown.

Share of national income: Top 1% vs. Bottom 50% in U.S. and Western Europe, 1980-2016

Income inequality very high in the United States



Note: Gini coefficients (disposable income, post taxes and transfers) are based on equivalised incomes for OECD countries, Colombia, Latvia and the Russian Federation; per-capita incomes for other countries; and per-capita consumption for India and Indonesia. Data from 2014 or latest year available.

Source: OECD , DB Global Markets Research

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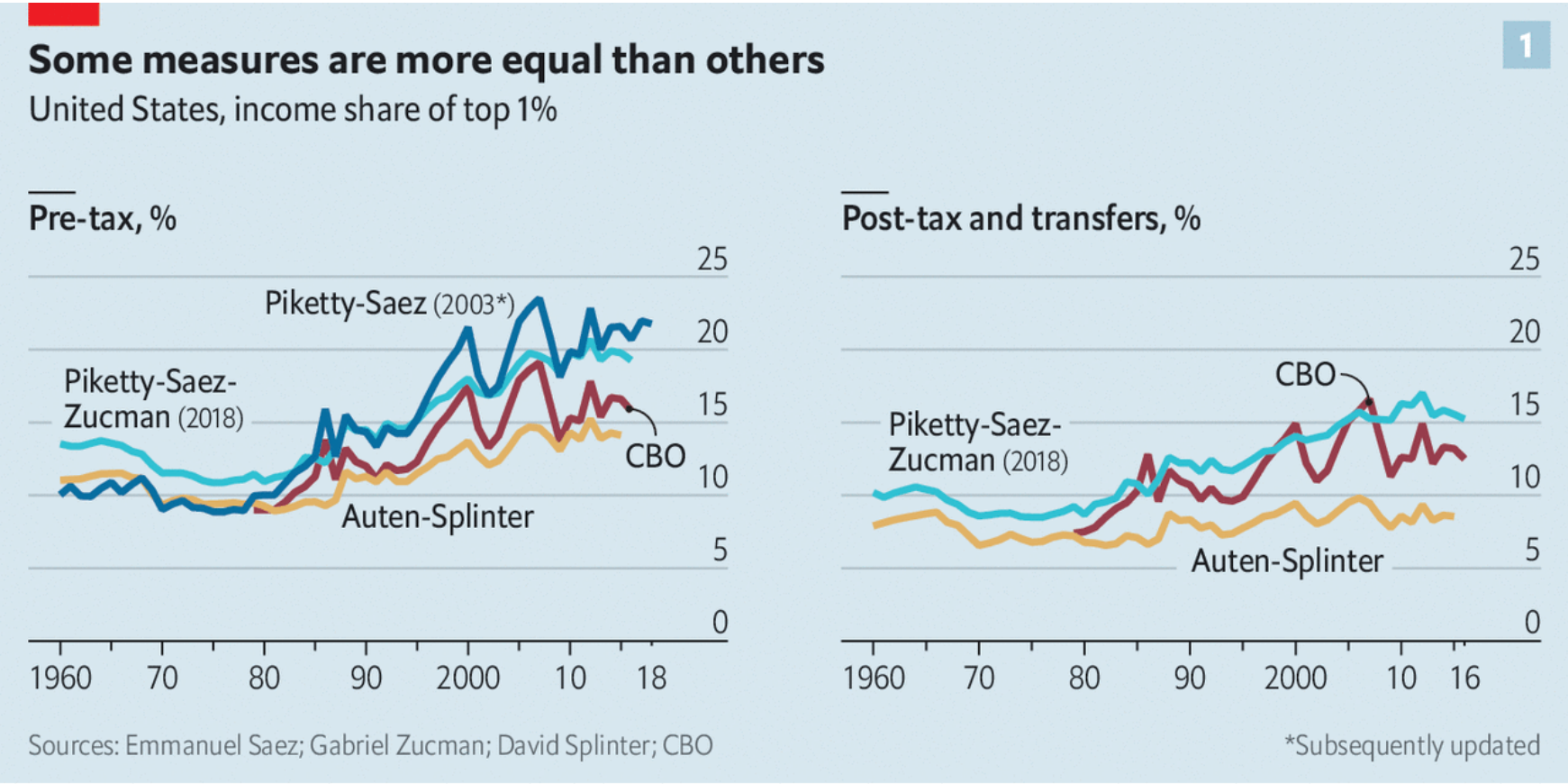
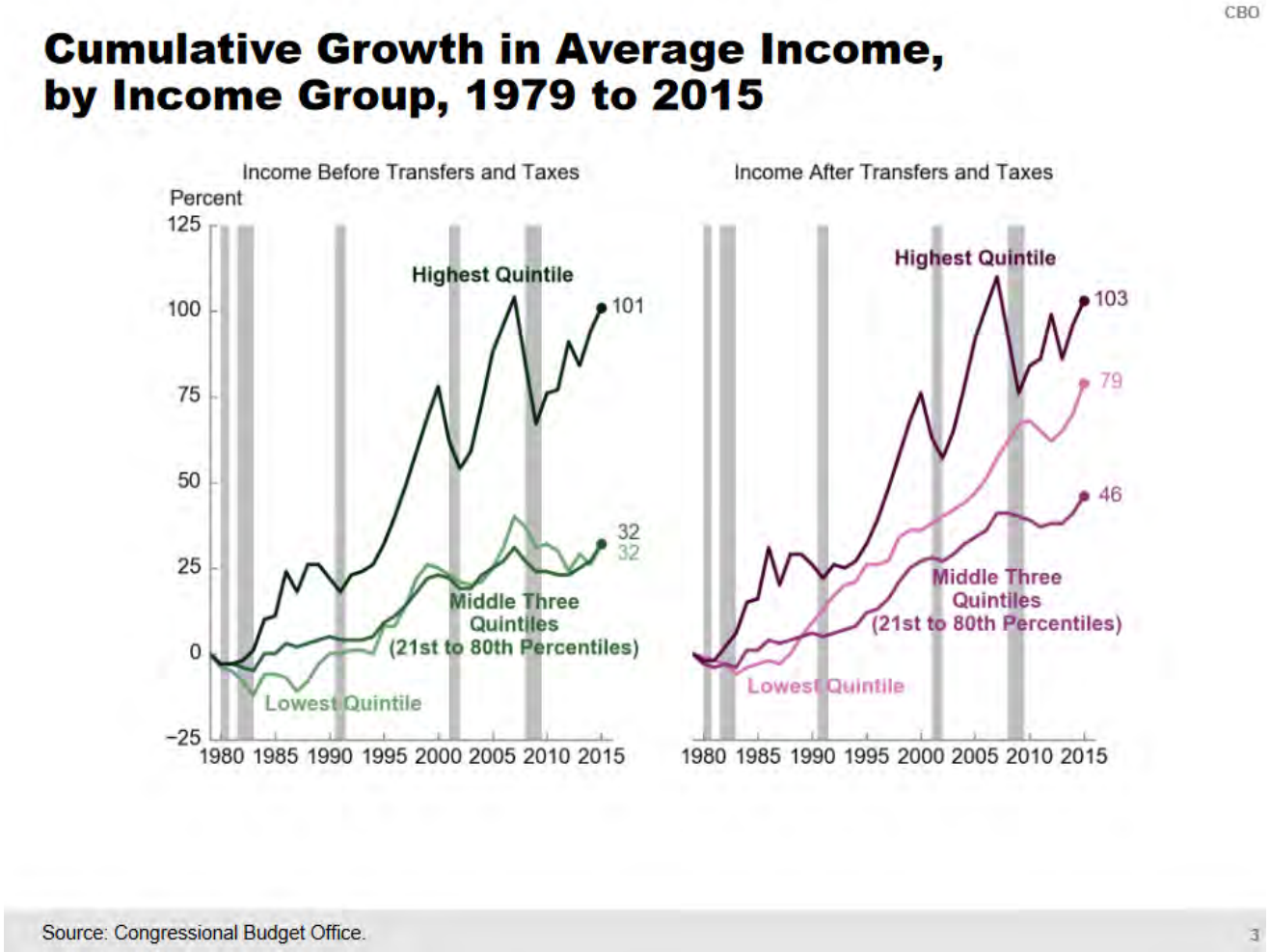
Inequality has grown, but…
policymakers, analysts fighting over how much.



The Economist

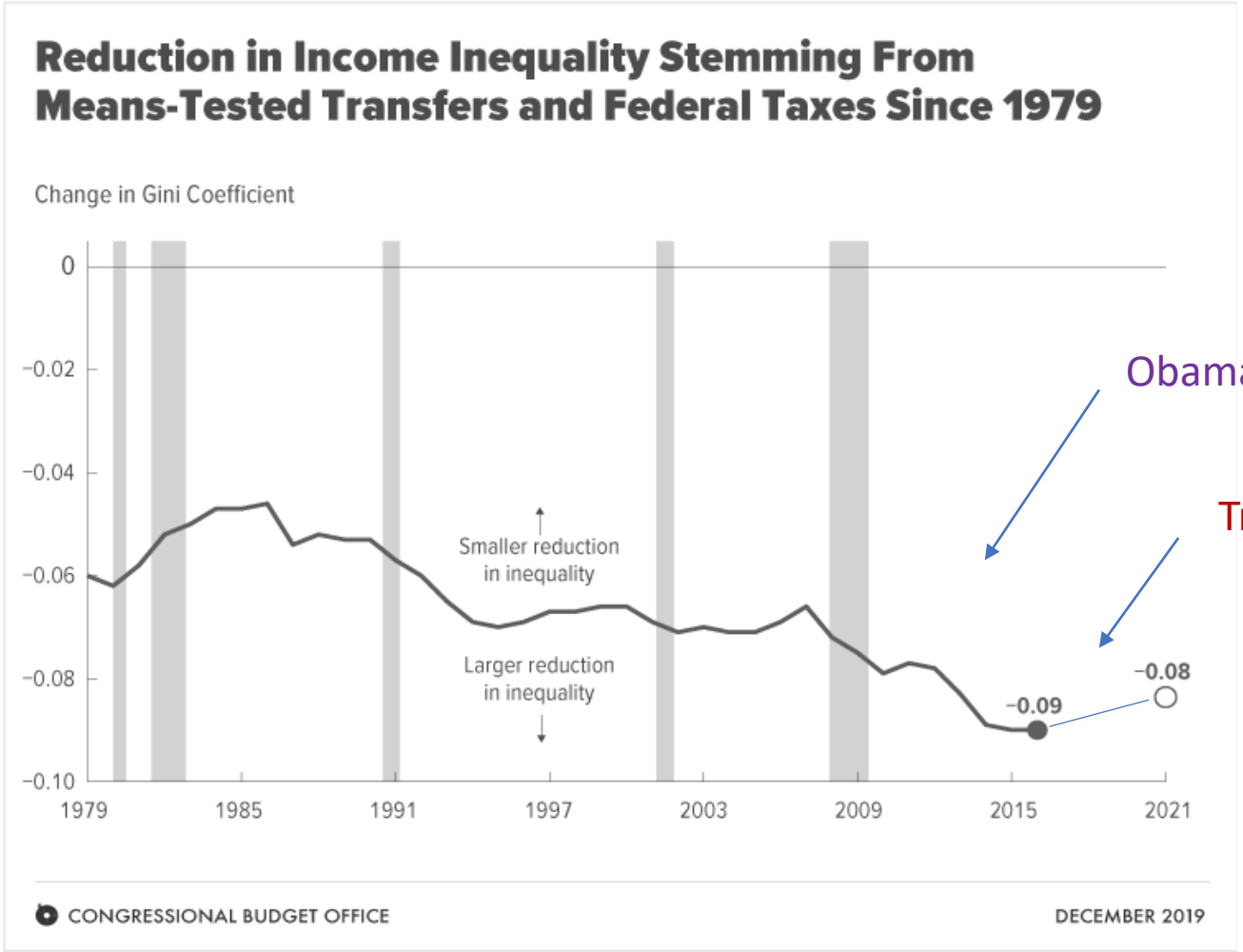
Govt. programs, taxes have softened impact of cumulative growth in income inequality



Policies have provided relatively more support for bottom 1/5 than for middle 3/5s

CBO expects current policies will result in less reduction in income inequality

CBO forecasts:
- continued rise in inequality,
- income growth skewed toward the top,
- less government support for workers in the middle and bottom.



Obama era health coverage expansion

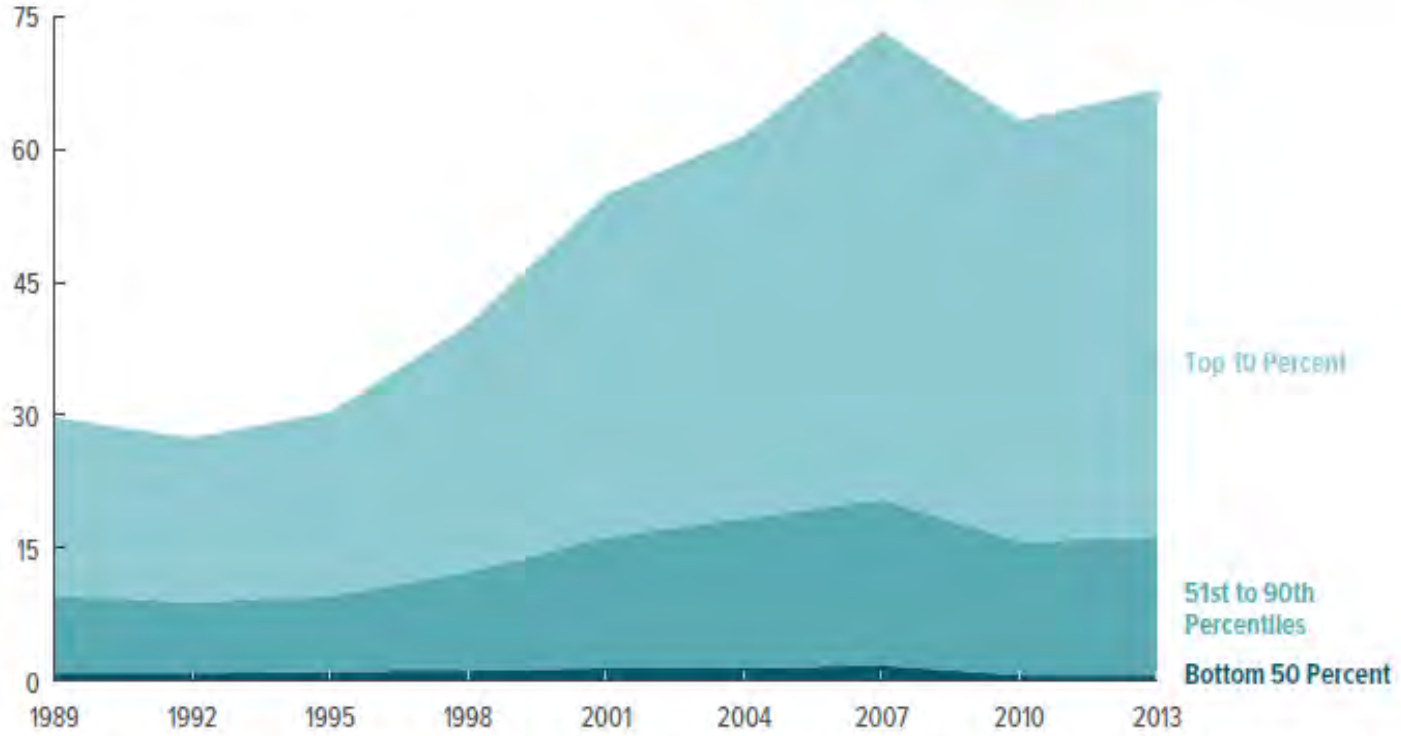
Trump era tax cuts

Growth in U.S. wealth concentration

Exhibit 1.

Holdings of Family Wealth, by Wealth Group

Trillions of 2013 Dollars



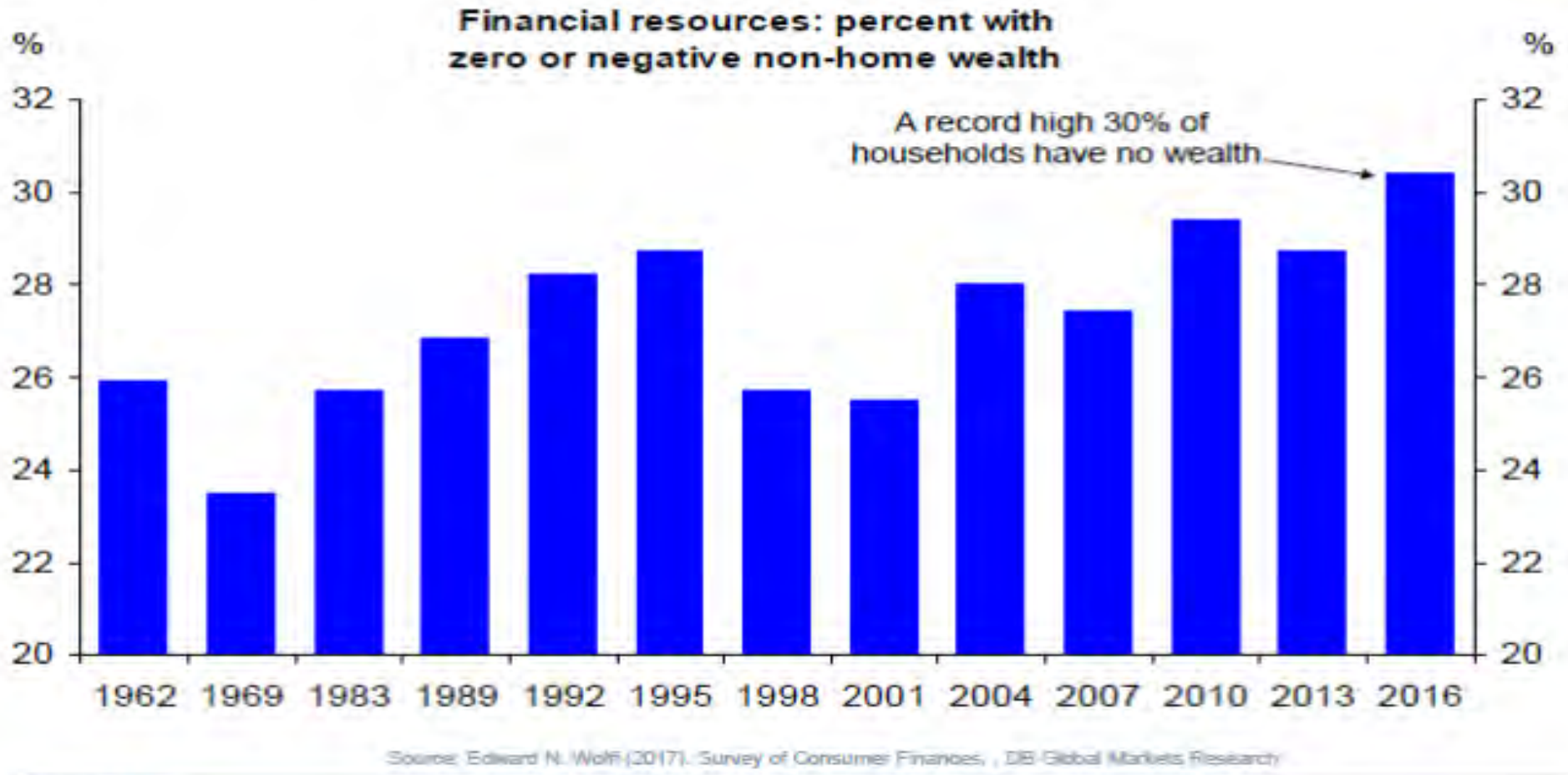
Source: Congressional Budget Office, using data from the Survey of Consumer Finances, supplemented with data from *Forbes* magazine's list of the nation's 400 wealthiest people.

The Survey of Consumer Finances is conducted every three years.

Wealth is typically much more unequally distributed than income.

Bottom 50% have small amounts or zero net assets.

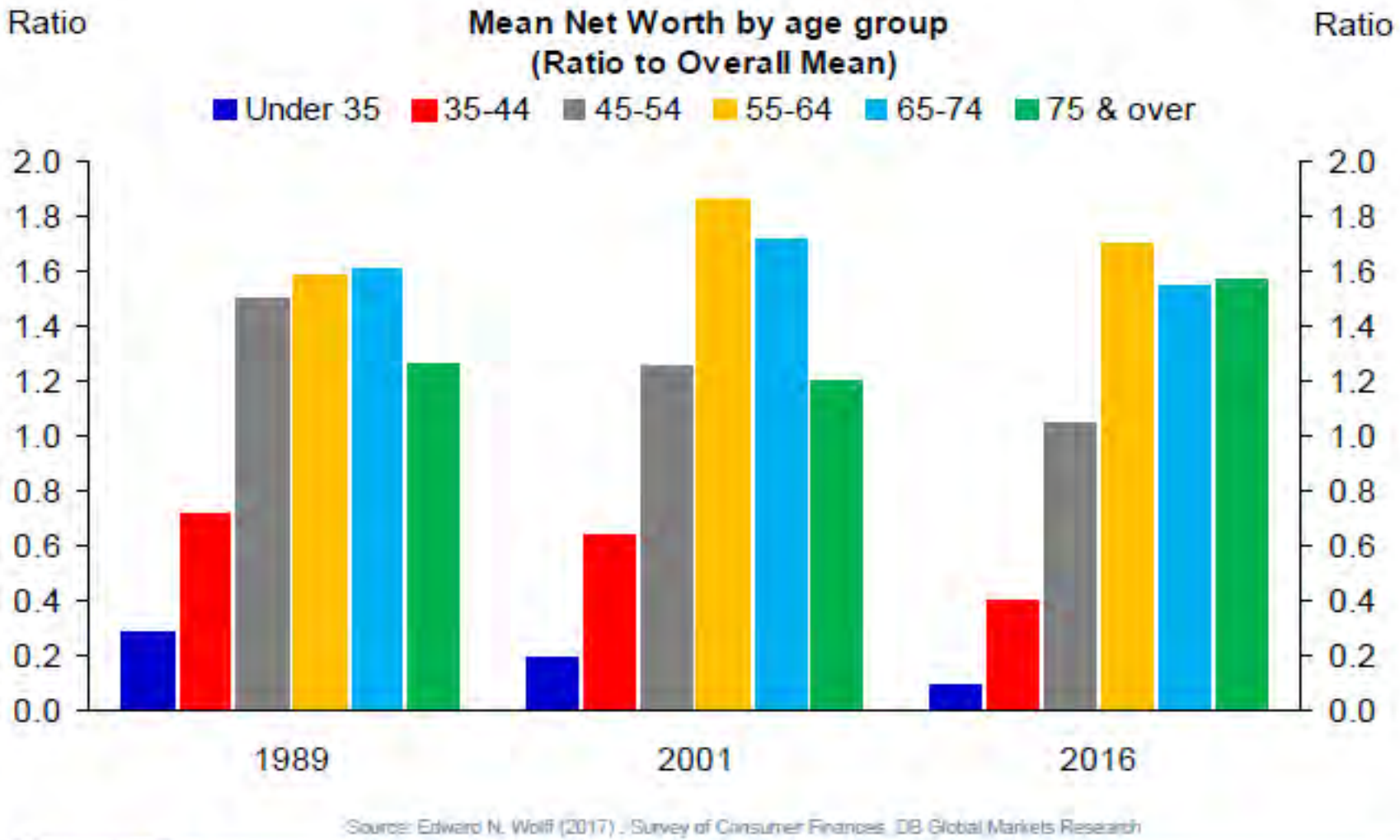
More families than ever before have zero or negative non-home wealth



Deutsche Bank Research

Torsten Slok, torsten.slok@db.com +1 212 250-2155
January 2018

Younger generations have smaller and smaller net worth



Source: Edward N. Wolff (2017) , Survey of Consumer Finances, DB Global Markets Research

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Drivers of U.S. Inequality

Macro factors include: 1) Globalization, 2) Shift to Capitalism Focused More on Financial Transactions and Arbitrage, Less on Producing Value.

In "Global Inequality: A New Approach for the Age of Globalization," Branko Milanovic identifies five forces pushing up inequality in the United States:

- The increasing share of national income that accrues to owners of capital.
- Very high and rising concentration of incomes from capital.
- People holding high-paying jobs also often have high capital income.
- The tendency of high-income individuals to marry each other.
- The rising political power of the rich.

Consequences of More Inequality

- A shrinking middle class.
- Lower demand for goods and services. Smaller markets.
- Lower productivity growth.
- Higher personal, corporate, and government debt – a time bomb?
- More stress at the bottom:
  - U.S. life expectancy has stopped rising, fallen a bit.
  - More disease and drug use.
- More political conflict, legislative stalemate.

Challenges for LTC Financing

"How Growing Inequality in the US Makes LTC Financing Reform a Lot Harder" *Karl Polzer & John Cutler, SOA 2020*

Based on 2018 Health Affairs Blog (Polzer) "How Growing Inequality Is Altering The Long-Term Care Policy Battlefield, While Tightening The Financing Knot"

- **Policy battle for many years: Progressives favor expanded social insurance v. Pro-Market Advocates want to tighten Medicaid eligibility to spur more LTC saving, planning.**
- **Critical developments:**
  - **Collapse of the market for LTC insurance.**
  - **Growing economic disparities: a "hollowed out" middle class.**
- **Result: Less ability either to buy LTC insurance or pay taxes for LTC *except for people in the roughly top 15-20% of income distribution.***

More than half of middle-income seniors won't have the financial resources to pay for seniors housing and care

- 54% lack sufficient resources with 100% of income and home equity.
- 81% lack sufficient resources with 100% of income.
- Only 19% have sufficient resources.

-- National Investment Center for Seniors Housing & Care - 2019

LTC Financing Reform Challenges

- **Where to find the $$? Who will pay?**
- **A new flat payroll tax to finance LTC expansion (e.g. Washington state) may be doubly unfair to low-wage workers.**
  - **It's regressive – would make it harder for low earners to buy life necessities.**
  - **Also, benefits provided may replace LTC services low-income and middle class already get under Medicaid (which is financed through more progressive taxes). Half the population has zero or very small amounts of net assets (so, many face little asset spend-down to access Medicaid).**
- **A progressive tax (e.g., on income) would impact the upper income more.**
  - **Higher-income people and businesses have the greatest political influence and ability to shape policy.**
- **LTC ranks a lot lower than many other public spending priorities.**
- **The trillions need to fix Social Security will trigger similar battles over who will pay.**

LTC/Retirement Financing: Finding the Middle Ground

from: "Financing future LTSS and long life through more flexible 401(k)s and IRAs: Exploring Reform Options," *Polzer, 2014, SOA Monograph*

Goal: Incentivize Personal Financial Responsibility Where Possible; Expand Social Insurance Where Needed

- Expanding "policy bargaining table" to include both LTC risk and retirement security creates opportunity to help different income groups in different ways.

1) Feds provide catastrophic LTC coverage (for greater than 3-4 yrs. equivalent of NH costs), which would help almost everyone.

- Most LTCI doesn't cover catastrophic costs > 4 yrs. NH cost.
- Many more people could save enough cover LTC if they knew they only had to cover a few years.
- Fed $$ could overlay Medicaid.
- Could improve care quality for those receiving services for long time.

2) Bolster Medicaid coverage, while tightening eligibility for those at the top and loosening it for those near the bottom.

- e.g., allow poorer beneficiaries keep more income, assets.
- Make eligibility harder for wealthier (reduce allowable beneficiary home value established in Deficit Reduction Act of 2005.)

LTC Financing Reform Ideas cont.

The Secure Act helps some

3) Change minimum distribution requirements to help reduce longevity, LTC risk.

- e.g., LTSS/longevity accounts, annuities described in this paper.

What about people with little or no DC savings?

4) Help annuitize retirement savings at favorable yields for small accounts.

- DC system echoes TIAA-CREF in many ways. But where's the TIAA?
- Is a fiduciary organization needed to stabilize payouts, assume greater risk than individuals, especially with low income, assets? Could a "myRA" be a starting point for such an approach?
- Could significantly augment combined DC/SS income for people at SS mean.

5) *Raise the bottom*: Increase Supplemental Security Income (SSI) to poverty level.

- SSI provides funds for room, board, and living expenses for the lowest-income aged, blind, and disabled people receiving LTC under Medicaid. SSI levels are currently far below the federal poverty level. (In 2014, SSI = $8,657 annually; poverty level = $11,670.)

6) Cover living expenses and LTC costs for the very old (age >92? >95?)

- Knowing they will have cover a finite # of years of retirement living will reduce risk. Otherwise, when can a risk-averse healthy person ever retire? Also, may increase $$ available for LTC.

7) Improve participation and consumer education early in life – at the "front end" of the DC system.

Financing Social Security

Fixing Social Security – Who Pays?

- Automatic, across-the-board 20% cuts in monthly Social Security benefits that will occur if Congress fails to raise sufficient revenue to cover scheduled benefits by sometime in the mid-2030s.

Major options include:

- Raising payroll tax, lifting payroll tax cap or applying new taxes
- Cutting benefits (e.g., trimming inflation adjustments)
- Raising the retirement age

Growing Inequality Creates New Challenges

Issue 1: Growing inequality has shrunk Social Security's tax base in two ways.

1) In the U.S., labor's share of national earnings fell about eight percentage points between 1995 and 2013 – while the share from capital rose. Social Security now relies on labor-income taxes.
2) As wages of lower-income Americans have stagnated, those at the top have grown significantly. As a result, the portion of wage income that Social taxes has dropped by about six percentage points. Unless the tax cap on earnings keeps up with the growing prosperity of those at the top, Social Security's tax base shrinks as a portion of national income.

Restoring Social Security Solvency without Benefit Cuts

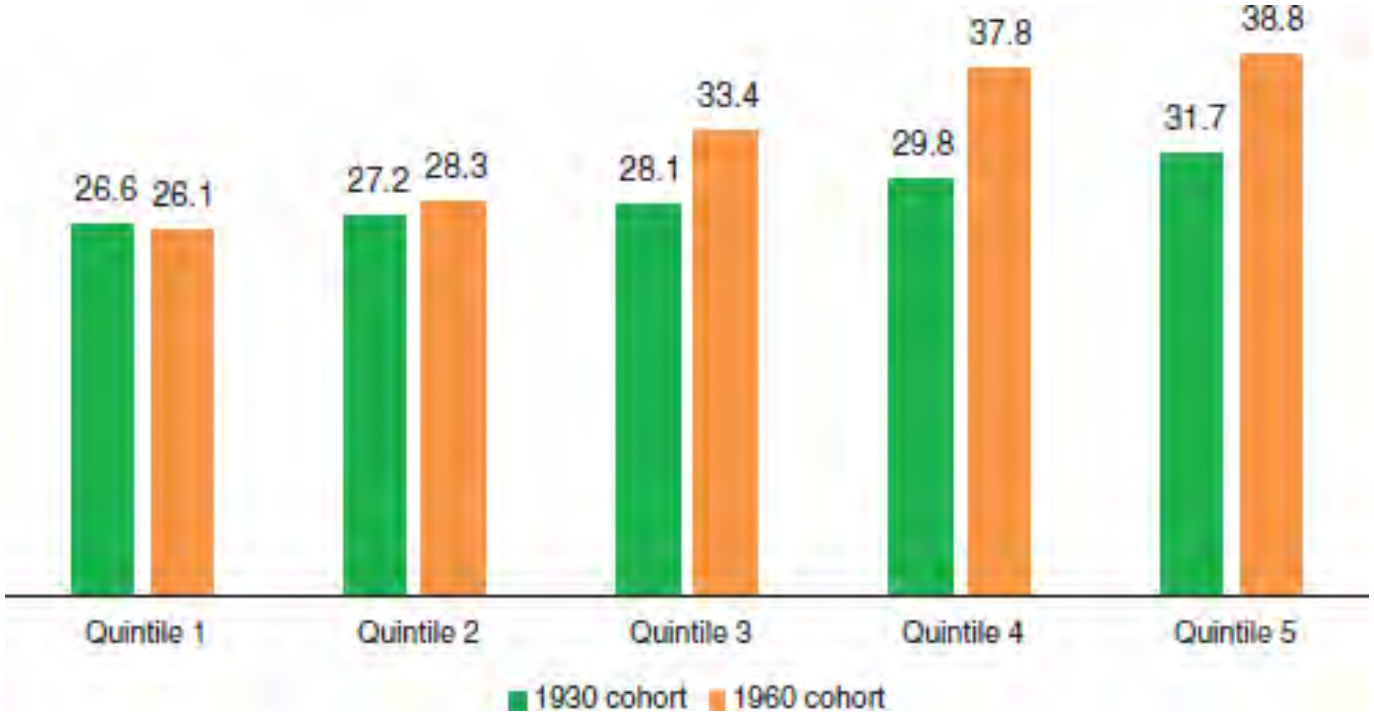
The two policy options below could restore program's financial health. Taxpayers at the top of the heap would bear most of the burden, but none would end up driving a smaller car or living in a smaller house as a result:

- **Taxing invested capital**: Beginning in 2019, Congress could apply an additional 6.2 percent tax on investment income (which mostly accrues to the wealthiest), gradually extending it from top earners to the middle class. *SSA actuaries estimate this policy would close about one third of Social Security's long-run shortfall.*
- **Taxing high-earner income**: Beginning in 2019, Congress could apply the payroll tax to earnings above $400,000, leaving a "donut hole" that would gradually disappear as the current indexed tax cap rises, and provide some benefit credit for newly taxed earnings. *This change could close up to two thirds of the program's long-range shortfall*.

"There's a way to save Social Security, but it involves taxing the rich", Polzer, 2018.

A widening mortality gap: Living to 100 is a worry for the better off. For low earners, not so much.

Estimated and projected life expectancy at age 50 for males born in 1930 and 1960, by income quintile

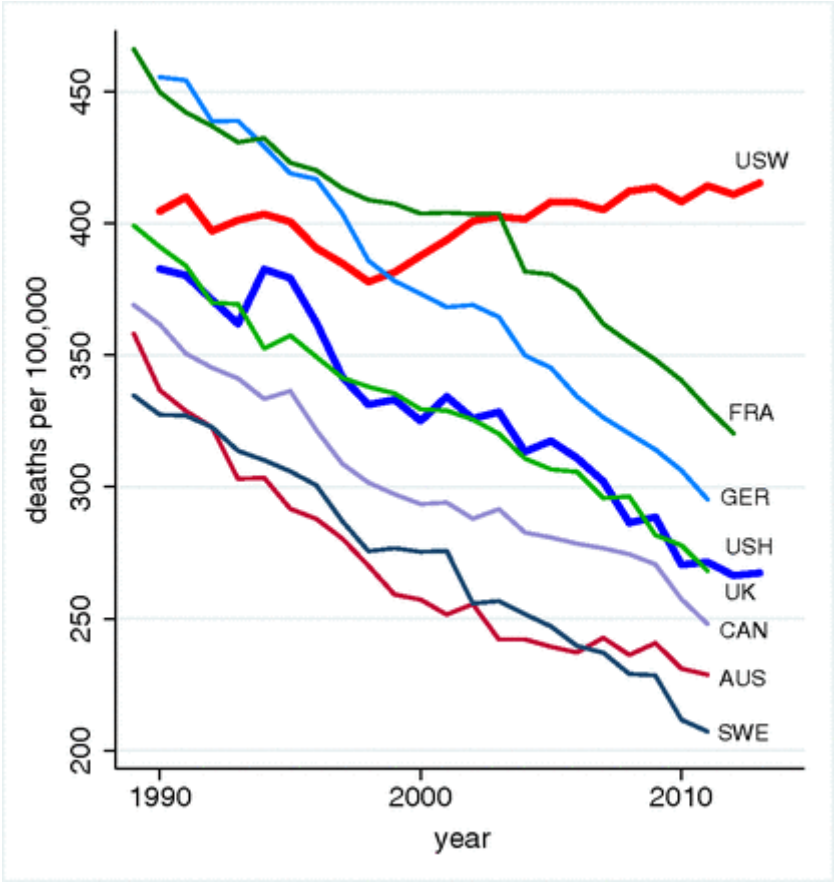


The National Academy of Sciences compared the 1930 and 1960 birth cohorts and found that life expectancy at age 50 for the bottom fifth of men decreased over 30-year period.

Meanwhile, life expectancy rose for men age 50 in higher-income quintiles.

The life expectancy gap between the bottom and top of the income distribution widened from 5.1 to 12.7 years.

Reversal of the decline in midlife mortality for US white non-Hispanics after 1998

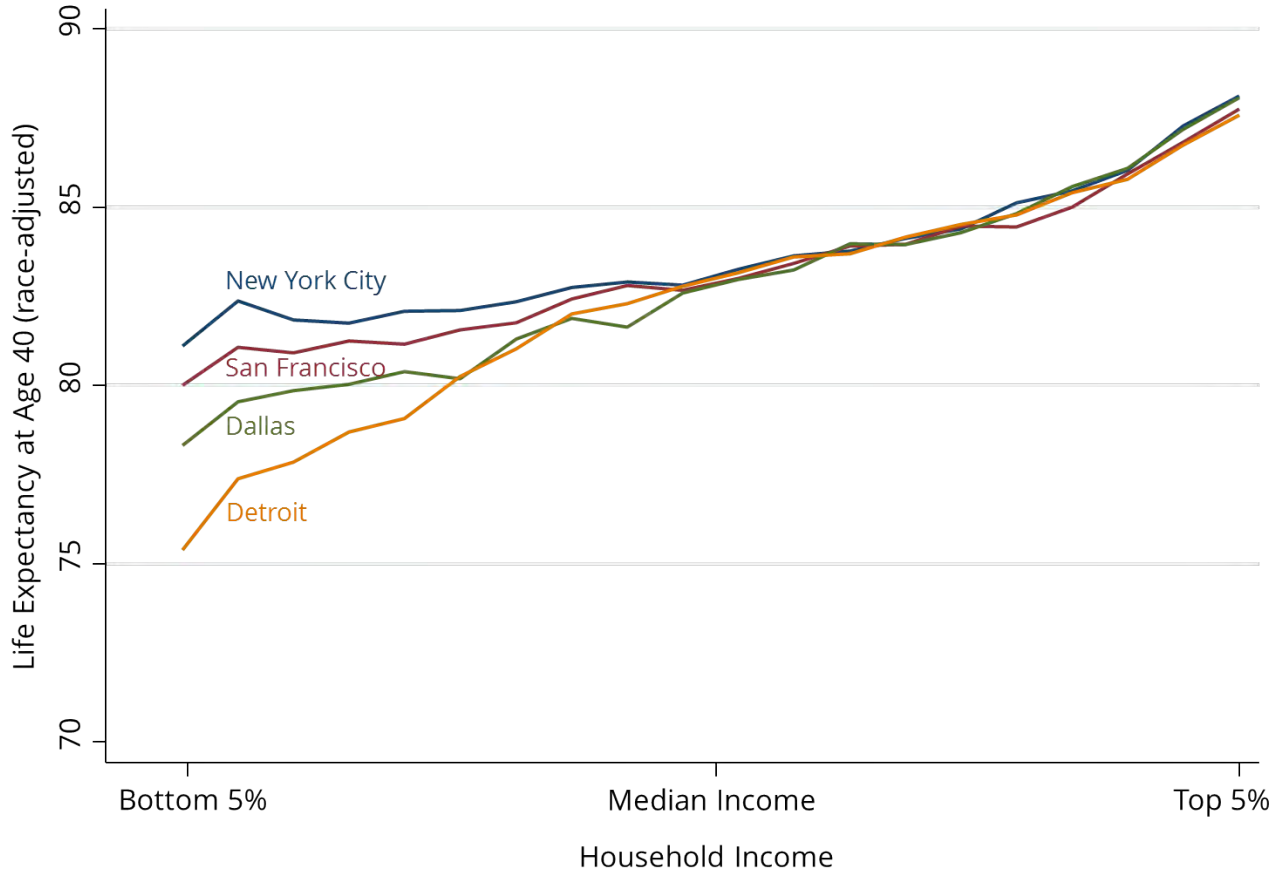


U.S. whites

U.S. Hispanics & Brits

Case and Deaton

U.S. Life Expectancy at age 40 by Income



Health Inequality Project
– Raj Chetty et al

Divergence in life span between high and low earners reduces Social Security's progressivity

Issue 2: "A Widening Gap in Life Expectancy Makes Raising Social Security's Retirement Age a Particularly Bad Deal for Low-Wage Earners," forthcoming, to be posted on Center on Capital & Social Equity web site.

- Social Security's long-term financial problems result in part from an increase in average life expectancy driven by wealthier people living longer, and, thereby, collecting more benefits.
- Differential longevity trends have had the effect of raising lifetime benefits for high earners but not for low earners.
- Policymakers should not use funding shortfalls attributable these trends as an excuse to cut benefits alike for those who have gained (high earners) and for those who haven't (low earners).

Raising the retirement age is a cut in lifetime benefits.

More low earners will never collect a cent.

Relative Change in Lifetime Social Security Income between High and Low Earner from Raising the Retirement Age

Life expectancy assumptions are illustrative

	Annual Social Sec. income	Life expectancy at age 67	Lifetime Social Sec. income	Lifetime SS income with 2-year hike in retirement age	% change in lifetime SS income from baseline
Low earner	$12,000	8	$96,000	$72,000	-25.0%
High earner: life expectancy gap stays as is	$36,000	14	$504,000	$432,000	-14.3%
High earner: life expectancy grows 3 more years	$36,000	17	$612,000	$540,000	7.1%

Source: Center on Capital & Social Equity ballpark estimates

Some Policy Options

- Raise retirement age - but compensate lifetime low income with higher benefits.
- Raise retirement age only over an income threshold (would be hard to justify a cutoff point).
- Raise retirement age in tandem with changes in average life expectancy – but significantly raise minimum benefit (Simpson/Bowles).
- Make benefits generally more progressive.
- Go back to age 65 for those with very low lifetime earnings.
- Require low earners to work fewer years to qualify.

An idea an actuary might like: Separate pools

- Annuitizing Social Security retirement benefits by income blocks of the top 10%, middle 80%, and bottom 10%, rather than in one pool.
  - This could shift benefits from top to bottom while leaving the middle largely the same.
  - Groups of workers with shorter expected life spans might collect much larger monthly checks than now. Longer expected life would likely result in smaller checks.
    - Compartmentalizing the mortality risk pool may be difficult to administer and would definitely meet resistance.
    - Modeling variants of such an approach might be a good way to illustrate the differing impacts of both the growing life expectancy gap and raising the retirement age on low and high earners.

Prospects for an Unequal Society

Will more inequality make it harder to shore up LTC and Social Security financing?

A more unequal America may find it harder to achieve the political consensus.

More disparity may result in low-income workers being unable to afford, and high-income taxpayers less willing to pay, the tax increases needed to help a smaller middle class maintain major social insurance commitments.

But who knows? If politically awakened, a larger underclass could be a catalyst in coming to compromise.

The politics are unpredictable in a time of crisis.

Make Every Day Count!

<u>In the long run</u>, we are all dead. – John Maynard Keynes

POTENTIAL FOR MORTALITY IMPROVEMENT FROM COGNITIVE AND PSYCHOLOGICAL FACTORS

GORDON WOO

RMS LIFERISKS

Living to 100 Call for Essays

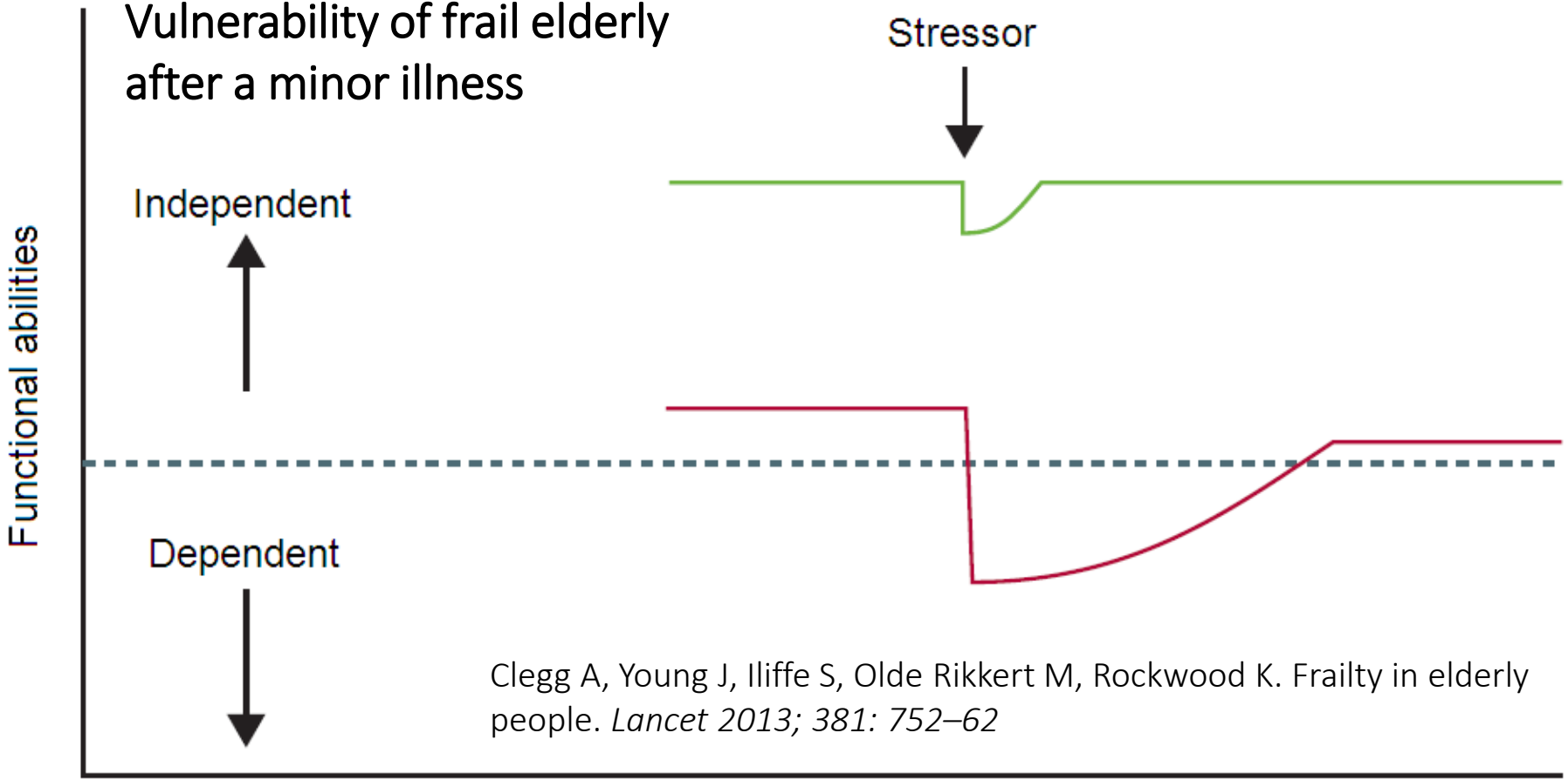
January 13, 2020

SOCIETY OF ACTUARIES®

Frailty and resilience

- **Frailty** is a biological state of decreased reserve and resistance to stressors, resulting from declines across multiple physiological systems.
- **Resilience** represents a state of adequate reserve and resistance to stressors.
- Understanding mortality improvement requires understanding what keeps people alive.

Vulnerability of frail elderly after a minor illness



Clegg A, Young J, Iliffe S, Olde Rikkert M, Rockwood K. Frailty in elderly people. *Lancet 2013; 381: 752–62*

The resilient Old Old

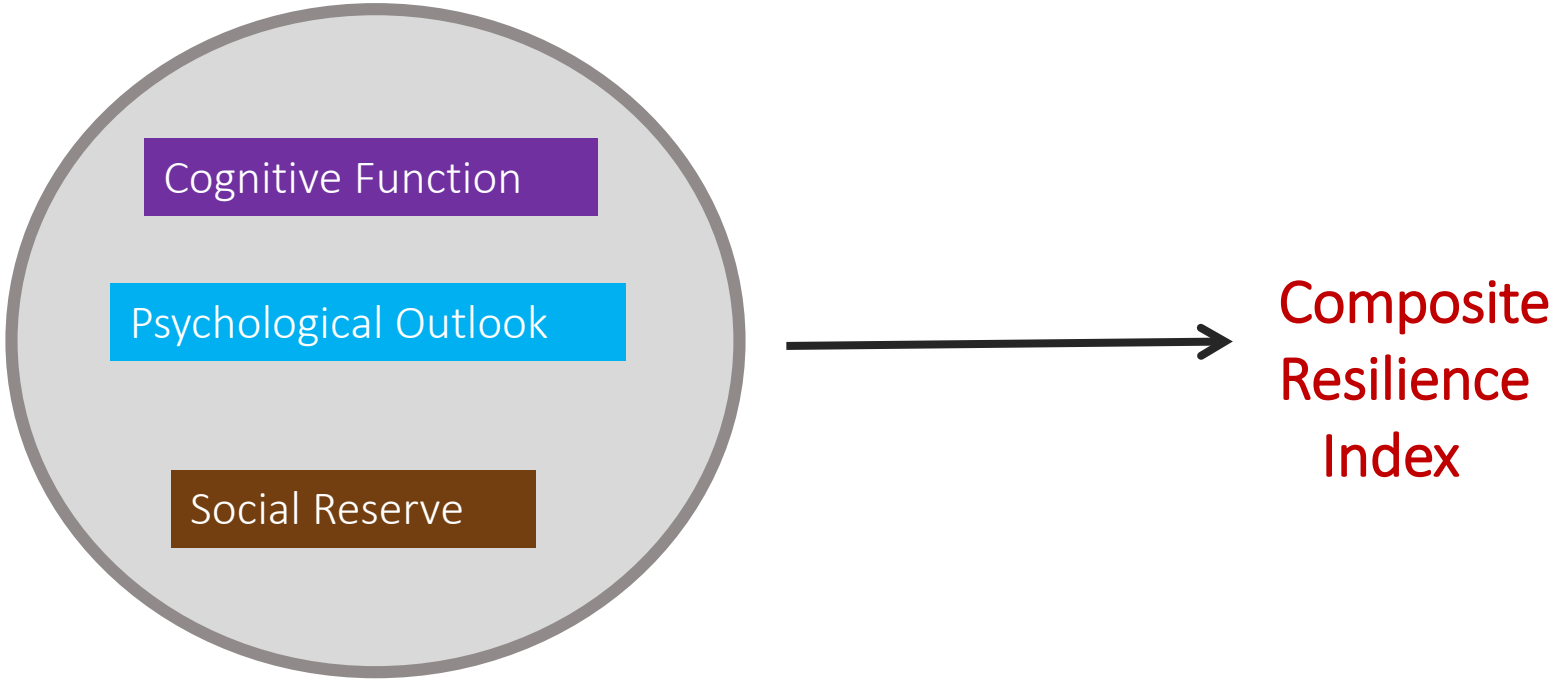
What (above the neck) keeps people alive in their **Old Old** age?

Survival Enhancement Factors
Cognitive functioning
Psychological well-being
Social functioning

Criteria for successful aging: beyond disease avoidance

- Gerontologists have established that, apart from disease avoidance, the criteria for successful aging include:
- Maintenance of high cognitive and physical function
- Sustained engagement in social and productive activities, having close personal relationships with family and friends

Measuring resilience



Florence Heater Wesley (90)

Cognitive Function:
Avid player of scrabble and bridge, solves challenging crossword puzzles etc.

Psychological Outlook:
She has a positive outlook, and keeps pressing on.

Social Reserve:
Large caring extended family, and many friends

Positive psychology: promoting well-being

- Positive psychology is the study of human flourishing. It focuses on personal traits such as well-being and happiness, rather than on problems. (Martin Seligman, 1998).
- Positive characteristics or feelings help people live longer.
- A Danish study of four thousand twins aged 70 or older showed that subjective well-being predicted increased longevity.

Physical and mental consequences of social functioning

- People who engage in regular social activities may maintain better brain health.
- Social support is also linked with better immune functioning.
- All human regulatory systems: blood pressure, metabolism, stress hormones etc., are affected by social relationships.

Health importance of cognitive functioning

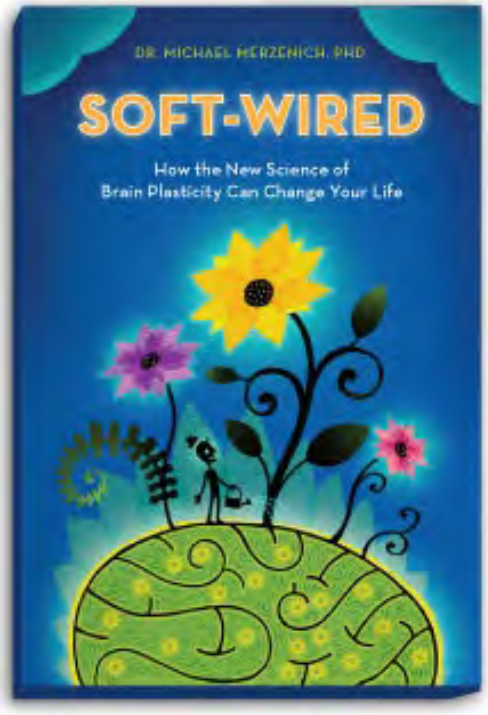
- There is no health without mental health.
- Preservation of good cognitive functioning is critical to successful aging.
- Many activities that influence longevity are very cognitively demanding.

Cognitive activity and aging

- Active mental stimulation is important for maintaining cognitive function.
- People who exercise their brains consistently throughout their lives live healthier and cognitively smarter lives as they age.
- A unique experimental study in Sweden was able to demonstrate a causal effect of additional years of education (extra cognitive capital) in reducing mortality.

Cognitive age reduction

- Brain plasticity research by Dr. Mike Merzenich has demonstrated, for older people with mild cognitive impairment, a cognitive age reduction is achievable for some mental tests.
- Participants experienced an improvement in memory equivalent to approximately 10 years.



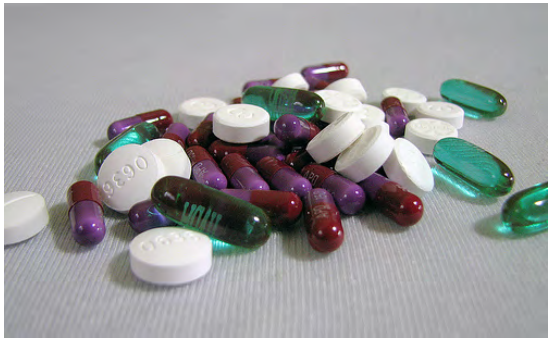
Cognitive biological age

- Cognitively, individuals may be years younger than their actual physical years.
- Cognitive brain training studies show that it is possible for the cognitive biological age of an individual to be lowered compared with their chronological age.

Tom Brady, at age 41
Think slow, play slow

Sound cognitive functioning for making life-and-death decisions

- Chronic illnesses require self-regulation to limit damage.
- Better knowledge and reasoning help manage disease.
- Simple errors in daily dosage of a cocktail of drugs can have life-threatening consequences.



Counterfactual mortality risk analysis

What if there were an effective treatment for Alzheimer's ?

ADUCANUMAB

Biogen

Religious orders study

- Participants were older Catholic nuns, priests and brothers from across the United States.
- From January 1994 to February 2013, 1168 persons aged 65 years and older were recruited into the study and completed a baseline evaluation.

Rush memory and aging project

- Participants were older community-dwelling persons from retirement communities and subsidized senior housing facilities across Illinois.
- From September 1997 to February 2013, 1574 persons completed a baseline evaluation.

After excluding those with dementia after clinical examination, there were 2566 left for analysis. Both cohort studies are autopsy studies requiring brain and tissue donation.

Outcome of longitudinal studies

- Over an average of follow-up 8 years per person, 559 out of the 2566 participants were diagnosed with Alzheimer's; 31 had other forms of dementia, and 1090 died.
- The mean age of incipient Alzheimer's was 86.5
- 72% of those who developed Alzheimer's died, compared with 34.5% who did not develop Alzheimer's.

Population attributable risk

From James et al., Neurology 2014
Contribution of Alzheimer disease to mortality in the United States

Table 2 Attributable risk of AD and on mortality estimates by age strata[a]

	Ages 65–74 y	Ages 75–84 y	Ages 85 y and older
AD prevalence (US estimate),[b] %	3.0	17.6	32.3
In age range at baseline	906	1,197	463
Years of follow-up (SD)	8.58 (5.41)	6.21 (4.39)	4.31 (3.38)
Developed AD, n (%)	115 (12.7)	293 (24.5)	151 (32.6)
Deaths (deaths after AD)[c]	57 (4)	343 (83)	690 (311)
Mortality HR_{AD}[d]	—	4.30 (3.33, 5.58)	2.77 (2.37, 3.23)
Crude PAR%	—	16.93	30.20
Adjusted PAR%[e]	—	37.00	35.76

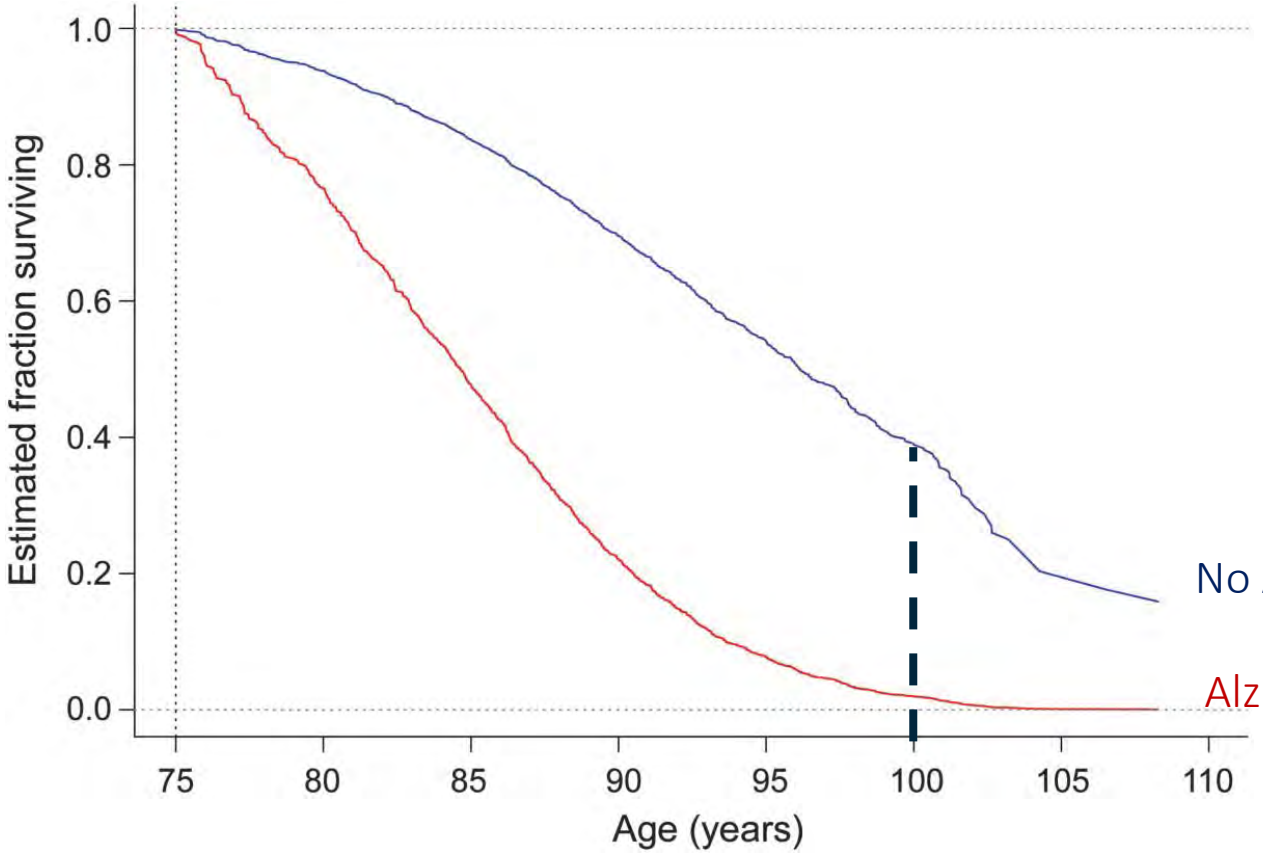
PAR

represents the proportion of deaths that occur after developing Alzheimer's that is in excess of deaths among people without Alzheimer's.

$p*(r-1)/[p*r + (1-p)]$ where p is the prevalence, and r is the adjusted hazard ratio, for Alzheimer's

Predicted survival past age 75

From James et al., Neurology 2014
Contribution of Alzheimer disease to mortality in the United States



No Alzheimer's diagnosis

Alzheimer's diagnosis

Outcome of longitudinal studies

- Age-specific estimates of PAR can be applied to the number of deaths in Americans aged 75 years and older in 2010.
- This yields a figure of **503, 400** excess deaths after an Alzheimer's diagnosis.
- This is a factor of six times the **83,494** Alzheimer's deaths reported by CDC.
- Swallowing disorders, malnutrition, and pneumonia on death certificates may mask the impact of Alzheimer's.

Death from loss of resilience

- Cognitive functioning, psychological well-being, and social reserve are all severely eroded by Alzheimer's.
- 24/7 care for an elderly Alzheimer's relative is physically and emotionally exhausting, as well as financially draining.
- For middle class families, long-term nursing home care can put families into debt. And social security benefits may be cut before 2034.

Don Thomas, died aged 92

Effective affordable treatment for Alzheimer's is needed
if living to 100 is to be a realistic aspiration for many seniors.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