Defining Normal Aging and Health Disparities

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Workshop on Measuring Biologic Age

Research Centers Collaborative Network

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Normal aging carries with it a gradual decline of mental and physical functions. For most people, we can't run as fast, jump as high, lift as much, or remember things as easily as when we were younger.

Attempting to get up off the floor after 45.

HOLY CRAP! I'M WOLVERINE!
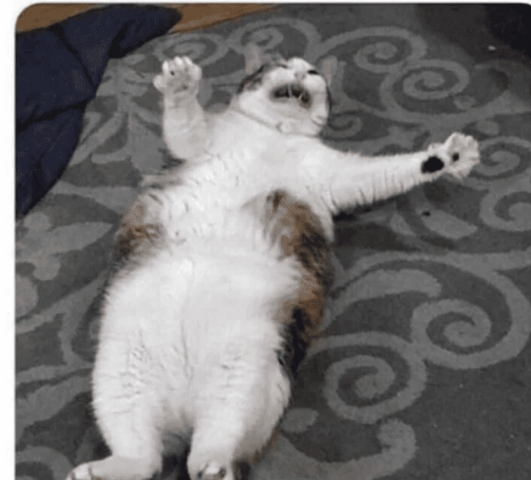
The stupid moment when you have your pill bottle in front of you but you can't remember if you already took it or not.
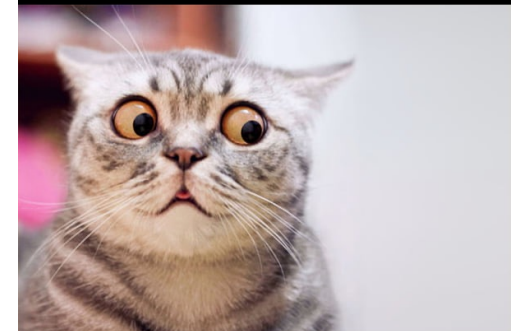
The DEATHS preceding were caused by Diseases and Casualties as follows, viz.

Cause	Count	Cause	Count
Abscesses	1	Hernia, or Rupture	3
Aneurism	1	Jaundice	10
Apoplexy	13	Inflammation of the bowels	1
Burns or Scalds	6	——————— of the stomach	1
Cancer	5	Killed by lightning	1
Casualties	15	Insanity	1
Childbed	14	Intemperance	2
Cholera Morbus	6	Locked jaw	2
Colic	2	Mortification	11
Consumption	221	Old Age	26
Convulsions	36	Palsy	12
Cramp in the stomach	2	Pleurisy	8
Croup	1	Quinsy	15
Debility	28	Rheumatism	1
Decay	20	Rupture of blood vessels	1
Diarrhœa	15	Small-Pox, (at Rainsford's Island)	2
Drinking cold water	2	Sore throat	1
Dropsy	21	Spasms	2
——— in the head	23	Stillborn	49
Drowned	13	Suicide	1
Dysentery	14	Sudden death	25
Dispepsia or Indigestion	15	Syphilis	12
Fever, bilious	7	Teething	15
——— pulmonic	46	Worms	11
——— inflammatory	24	Whooping Cough	14
——— putrid	6	White swelling	2
——— typhus	33	Diseases not mentioned	48
Flux infantile	57		
Gout	3	Total,	942
Hoemorrhage	4		

Causes of death in 1811. Abstract of the Bill of Mortality for the town of Boston

Instructions to fill out a death certificate

- The death certificate should document the immediate cause of death, which can be an event, clinical condition, or disease process, which is unsuitable for the continuation of life

- Clinicians are discouraged from using terminologies such as "old age"

Prince Philip passed away on April 9, 2021, at the age of 99. Sir Huw Thomas (physician to the Queen) noted that Philip died from "old age."

Health disparities **are preventable differences in the burden of disease, injury, violence, or in opportunities to achieve optimal health experienced by socially disadvantaged racial, ethnic, and other population groups, and communities**

Health disparities exist in all age groups.

When you realise Mando will die of old age before Baby Yoda is even a teenager

soupmemes.com

Heartbreaking realisation

Defining normal aging is surprisingly difficult

- Normal aging classically refers to a gradual decline of mental and physical functions

- Normal *cognitive aging* may mean **slower processing speeds** and more trouble multitasking, but routine memory, skills, and knowledge are stable and may even improve with age

- Changes happen across a continuum as the reserve capacity in almost every organ system declines

Normal aging involves a complex relationship between aging and disease

- Example: Impossible to study a normal aging heart without considering heart disease
  - Age-related artery changes increase the risk of cardiovascular diseases. Cardiovascular diseases, in a catch-22, speed up arterial aging.
- Aging and disease go hand in hand
  - Aging is a key risk factor for human chronic diseases
  - Many treatments and interventions targeting age-related diseases can increase the lifespan, and interventions extending lifespan often delay diseases of aging
  - Core issue is what is considered normal vs. pathological. There is often no right or wrong answer, as the answer is shaped by societal attitudes, political forces, religious issues and business interests, and *not just medicine*

Aging combines all age-related diseases and their preclinical forms, in addition to other pathological changes
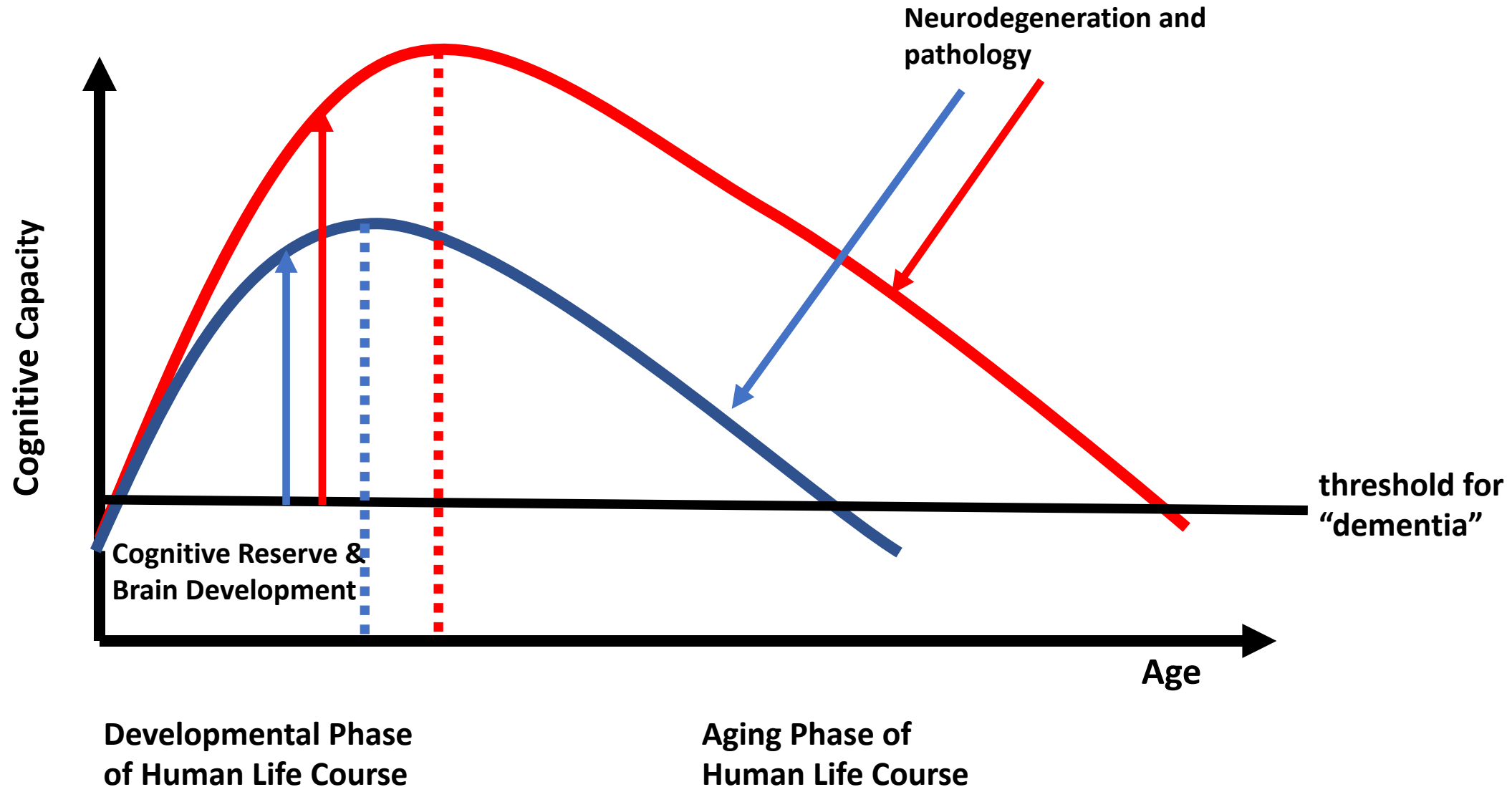
Source: Gladyshev, T.V.and V.N. Gladyshev. 2016. "A Disease or Not a Disease? Aging As a Pathology." *Trends in Molecular Medicine* 22(12):995-996.

Normal Aging Usually Involves both Developmental and Aging Components

The Human Life Course, Cognitive Capacity & Dementia for Advantaged/Disadvantaged (Red/Blue) Persons

Neurodegeneration and pathology

Cognitive Capacity

threshold for "dementia"

Cognitive Reserve & Brain Development

Age

Developmental Phase of Human Life Course

Aging Phase of Human Life Course

An example of a pre-clinical form of aging

- **Age-specific level of allostatic load in the U.S. population**

- Allostatic load an indicator of physiological challenge and population frailty
  - the extent to which the body is at risk of adverse health outcomes because of physiologic dysregulation
  - Linked to mortality as well as other adverse health outcomes such as cardiovascular disease, physical functioning, and cognitive failure
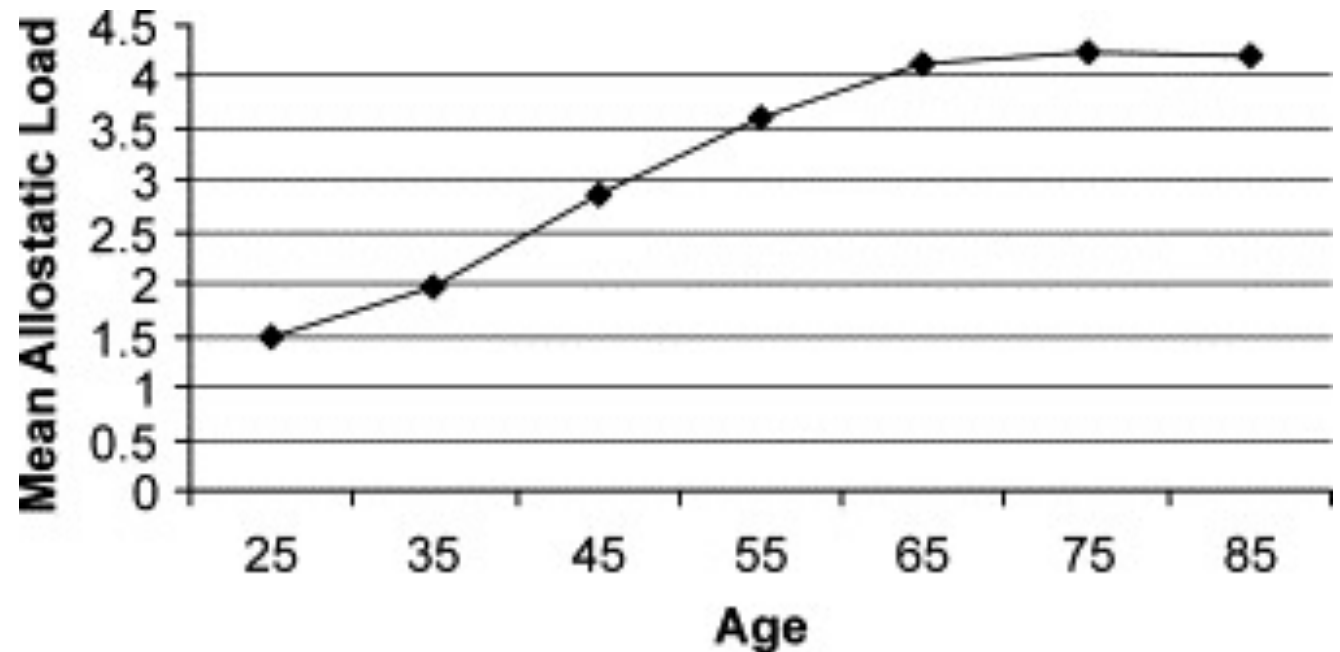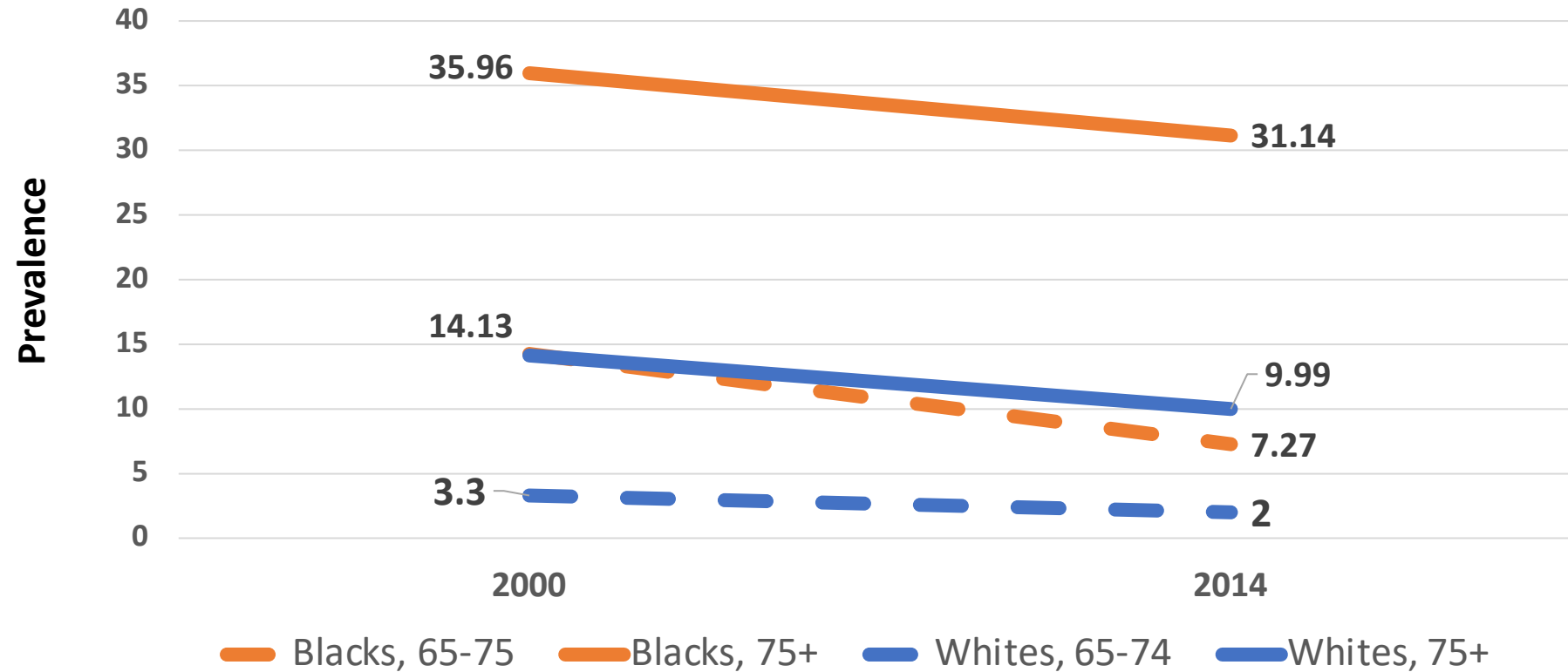
Examples of disparities in cognitive aging

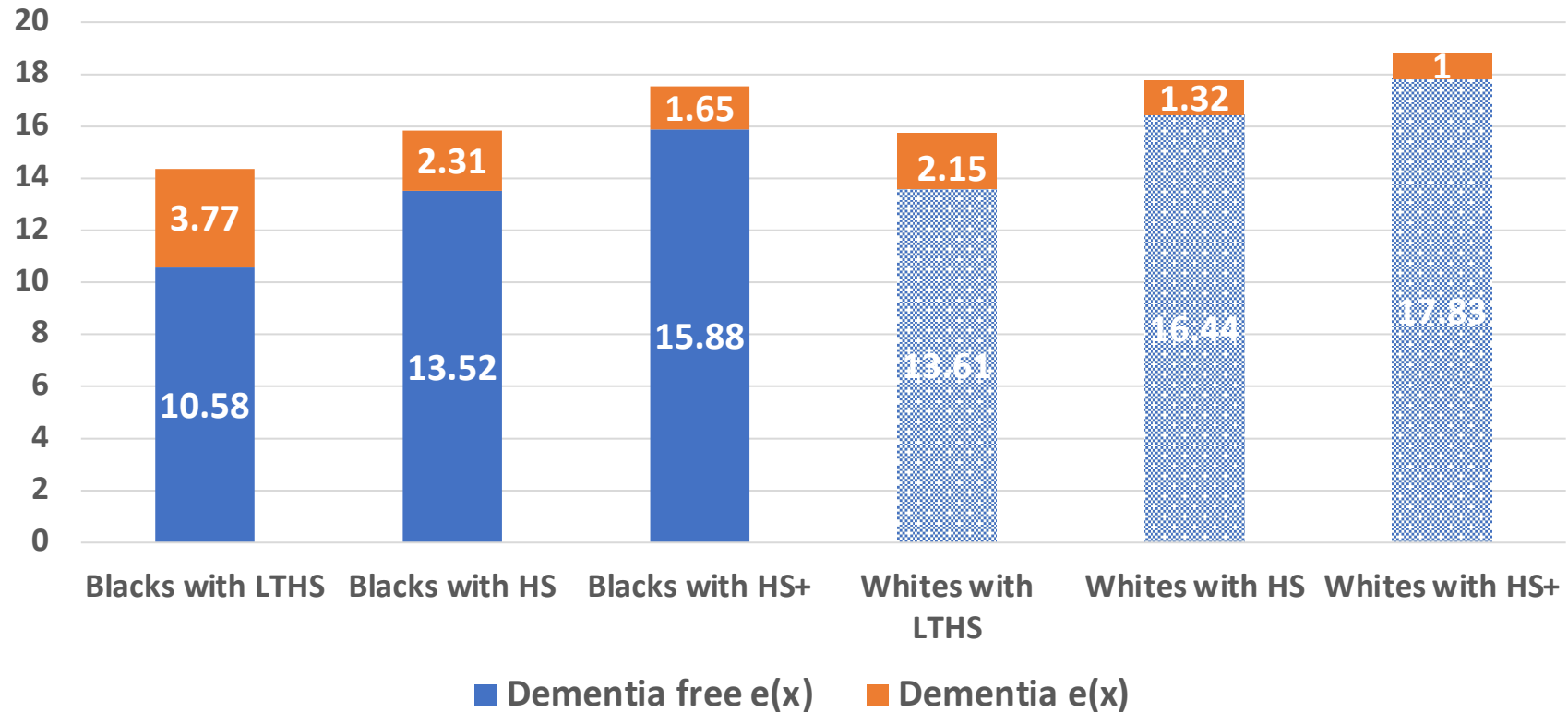**Race and educational differences in dementia**

Normal Aging Can Vary Over Time and Across Groups

## Change in Dementia Prevalence in the U.S. by Race and Age Group, 2000-2014

https://doi.org/10.1093/geronb/gbab015

Disparities in cognitive aging have implications for individuals' lives

Dementia Status Life Expectancy at Age 65 by Race and Education, U.S.

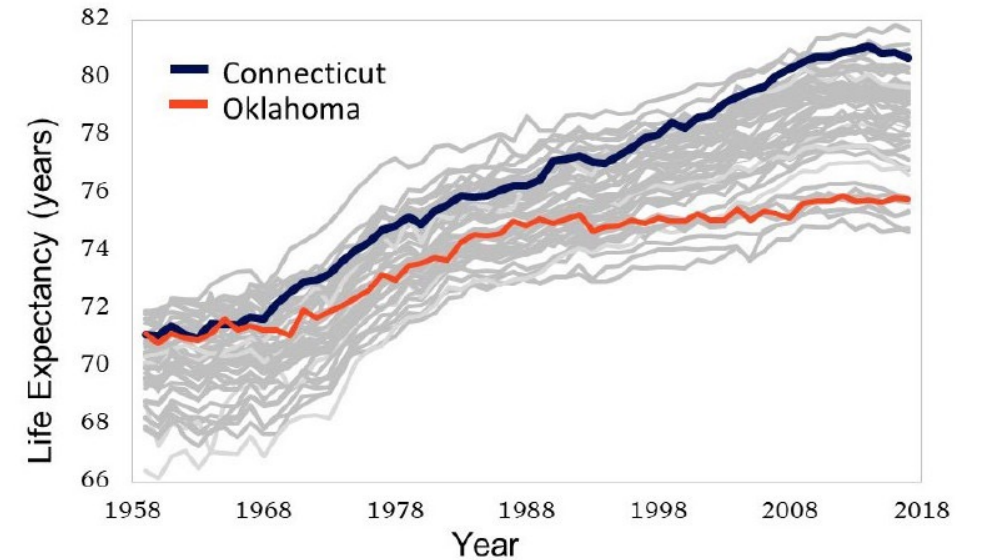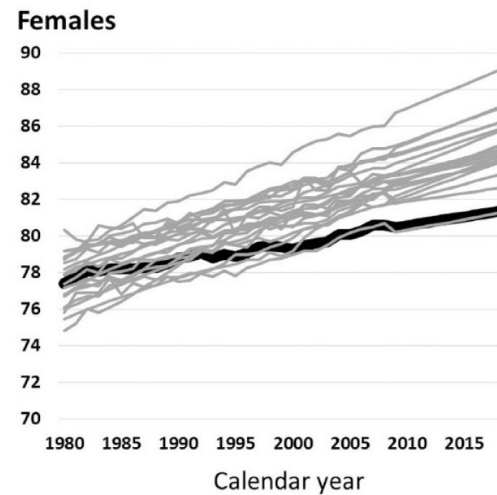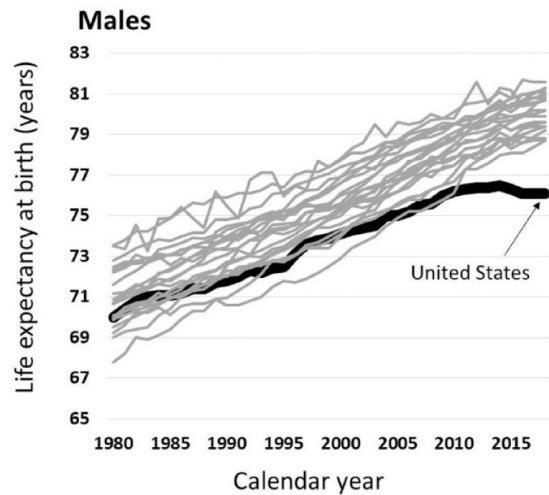|	Dementia free e(x)	Dementia e(x)
Blacks with LTHS	10.58	3.77
Blacks with HS	13.52	2.31
Blacks with HS+	15.88	1.65
Whites with LTHS	13.61	2.15
Whites with HS	16.44	1.32
Whites with HS+	17.83	1

Dementia free e(x) ■ **Dementia e(x)**

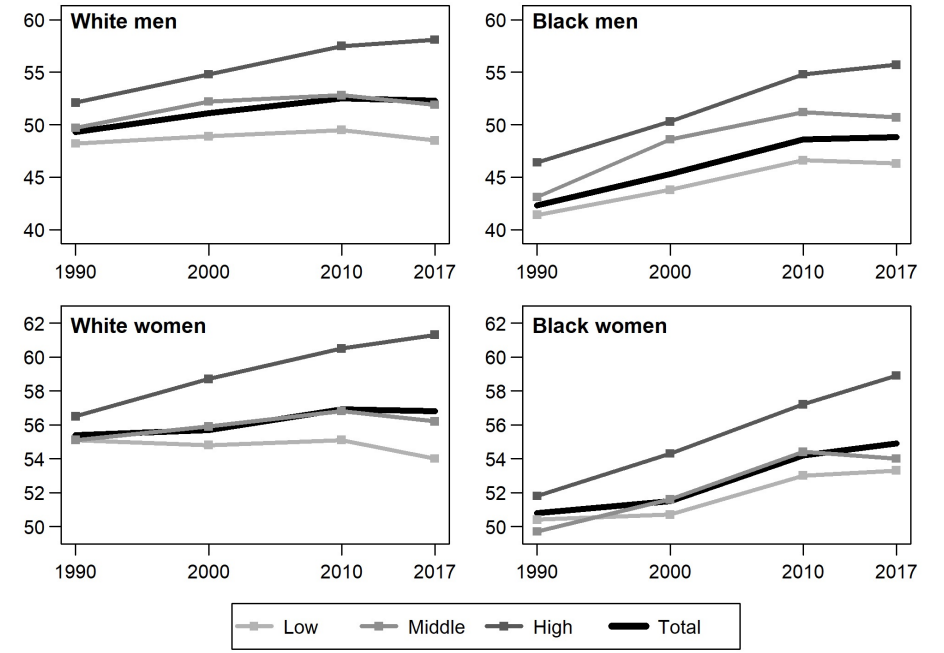# Implied Prevalence of Dementia, Blacks and Whites Aged 65+ by Education Group (Health and Retirement Study)
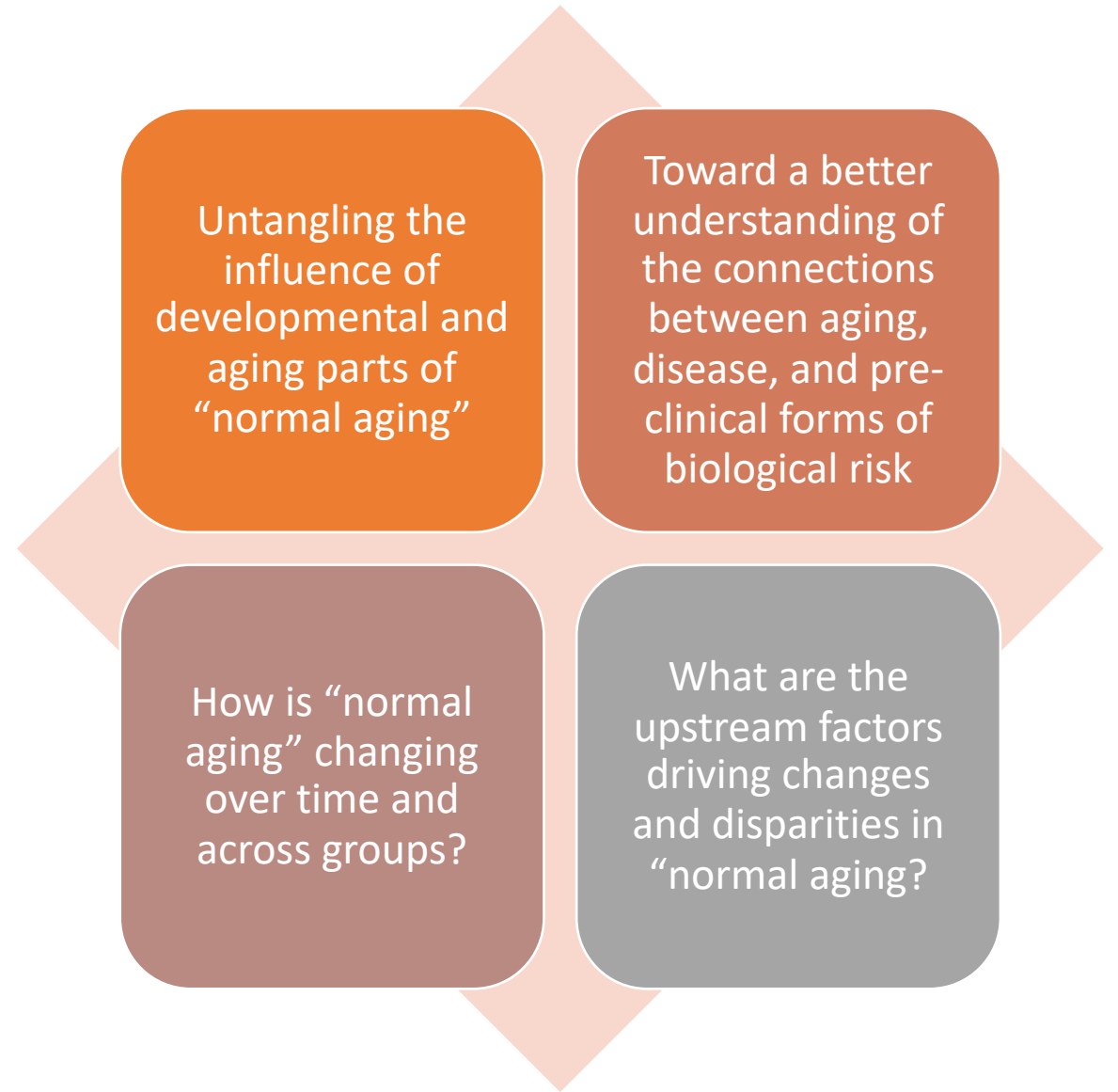

Source: https://doi.org/10.1093/geronb/gbz046
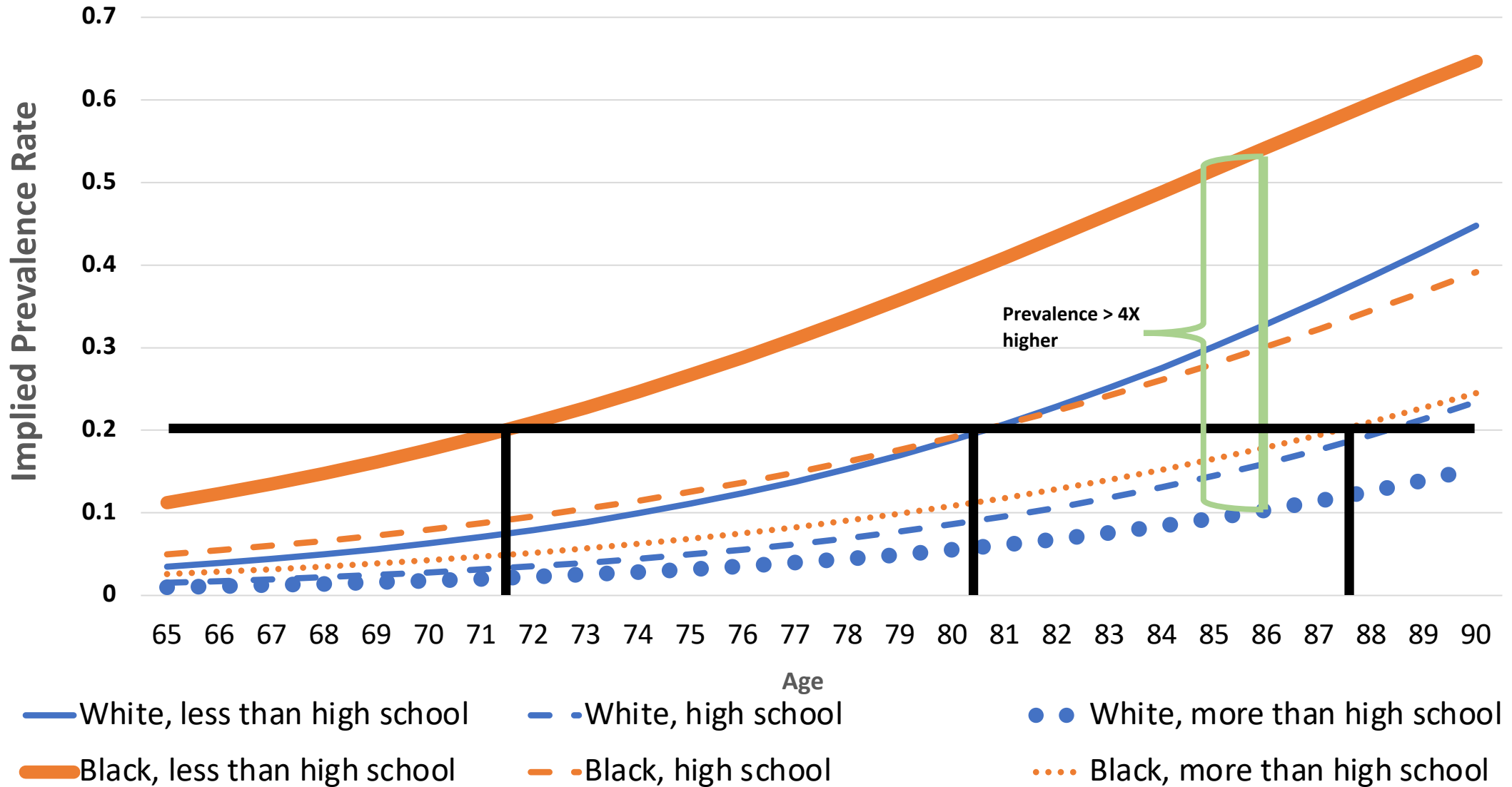
Storm clouds on the horizon?

- Americans are falling further behind in e(x)
- Potential rise in CVD risk at younger ages
- Biosocial interactions hard to untangle
- Improvements in e(x) now only occurring among college-educated
- Growing geographic differences in e(x) fueled by state policies, politics and profits
- Epidemics/pandemics exacerbating already large (and historically growing) disparities

A far-reaching and multi-level agenda for future research

Untangling the influence of developmental and aging parts of "normal aging"

Toward a better understanding of the connections between aging, disease, and pre-clinical forms of biological risk

How is "normal aging" changing over time and across groups?

What are the upstream factors driving changes and disparities in "normal aging?

Acknowledgements and key sources

Key sources for figures

- Farina, Mateo P., Mark D. Hayward, Jung Ki Kim, and Eileen M. Crimmins. 2020. "Racial and Educational Disparities in Dementia and Dementia-Free Life Expectancy." *The Journals of Gerontology: Social Sciences* 75:e105-e112. PMC7530490
- Hayward, Mark D., Mateo P. Farina, Yuan S. Zhang, Jung Ki Kim, and Eileen M. Crimmins. 2021. "The Importance of Improving Educational Attainment for Dementia Prevalence Trends from 2000-2014, among Older non-Hispanic Black and White Americans." *Journals of Gerontology: Social Sciences* 76:1870-1879. *doi:10.1093/geronb/gbab015* PMCID: PMC8557827
- Montez, Jennifer Karas, Mark D. Hayward and Anna Zajacova. 2021. "Trends in U.S. Population Health: The Central Role of Policies, Politics, and Profits." *Journal of Health and Social Behavior* 62(3):286-301. PMCID: PMC8454055
- Sasson, Isaac, and Mark D. Hayward. 2019. "Association Between Educational Attainment and Causes of Death Among White and Black US adults, 2010-2017." *Journal of the American Medical Association* 322(8):756-763. PMC6714034.

Thanks for your kind attention