

Chronic Diseases and Multimorbidity

Instructor: Jackie Torres, PhD (she/her)

Friday, February 19, 2021, 8:45am – 10:15am

by Zoom

Outline

- Definitions
- The Epidemiology of Chronic Disease
 - Prevalence and heterogeneity
 - Chronic disease mortality
- Multimorbidity

What is a chronic disease?

WHO Definition

“Noncommunicable diseases, also known as chronic diseases, tend to be of long duration & are the result of a combination of genetic, physiological, environmental & behavioral factors.”

- Leading cause of death and disability worldwide
- Heart disease, stroke, and diabetes cost low- and middle-income countries up to 5% of GDP

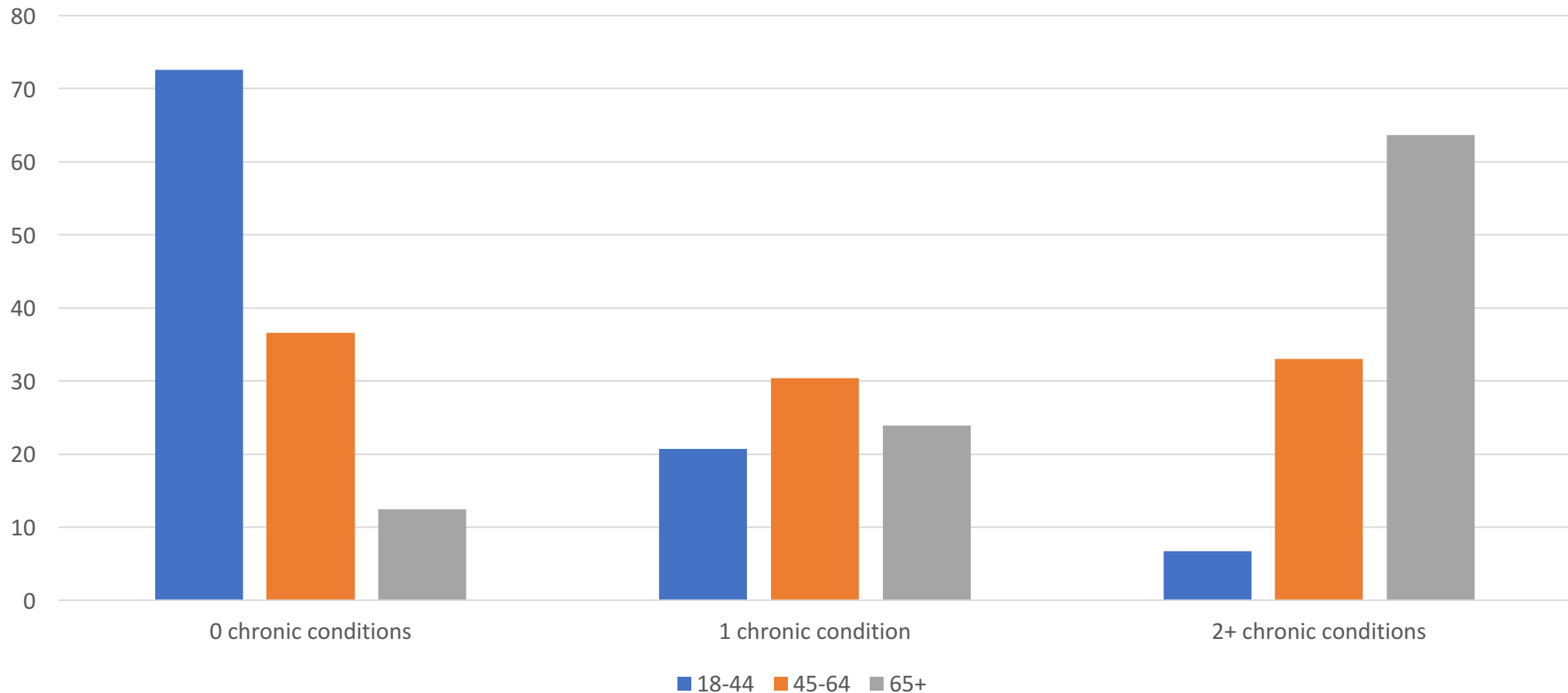
CDC Definition

“Conditions that last one year or more and require ongoing medical attention or limit activities of daily living or both”

- Leading cause of death and disability in the US
- Account for 75% of nation’s \$3.3 trillion annual health care costs

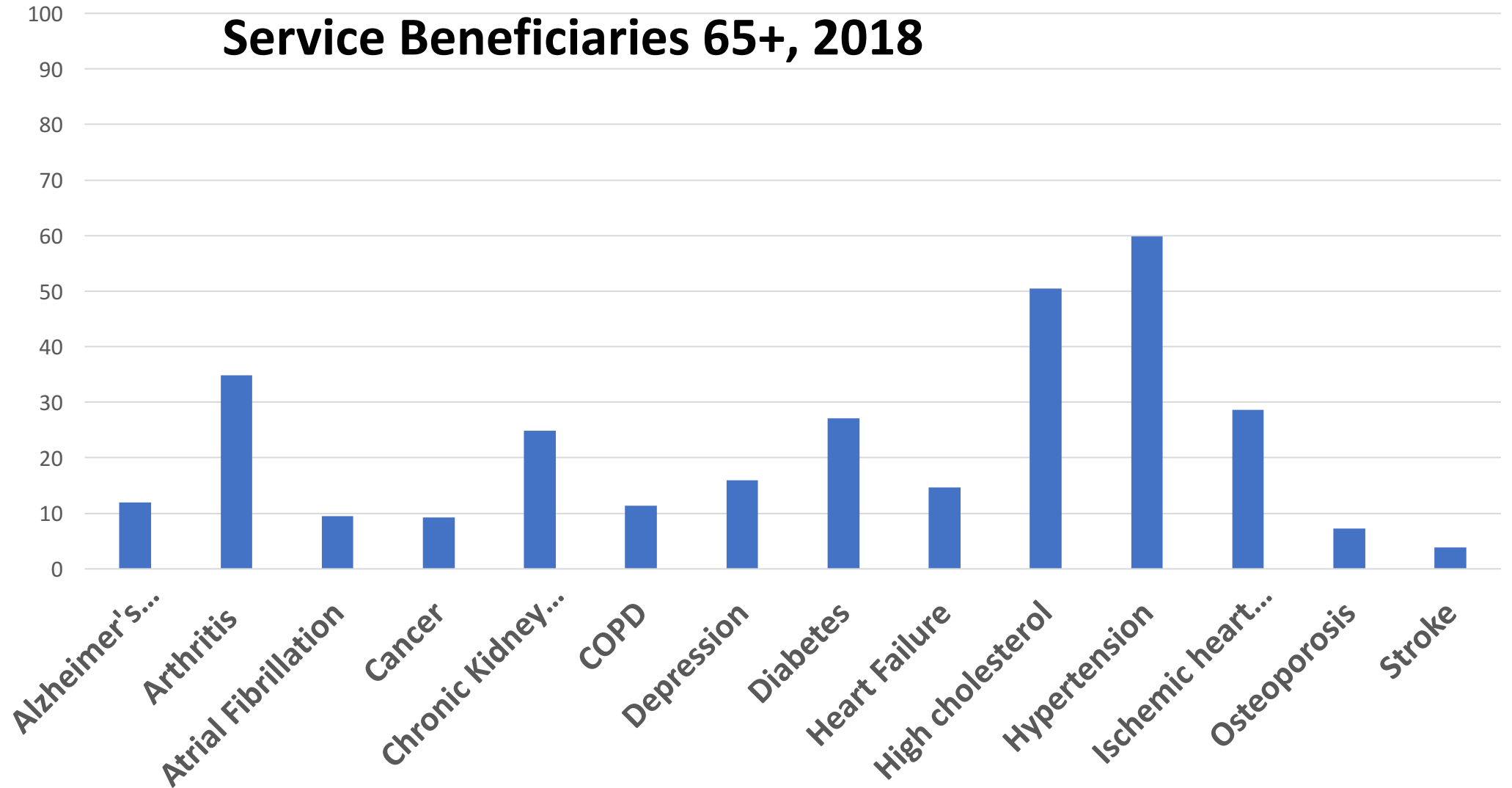
Epidemiology of Chronic Disease in the United States

Prevalence of Chronic Disease in the US, 2018



Source: National Health Interview Survey, 2018; in Boersma et al. Preventing Chronic Disease, 2020, https://www.cdc.gov/pcd/issues/2020/20_0130.htm#results

Prevalence of Chronic Conditions, Medicare Fee-for-Service Beneficiaries 65+, 2018

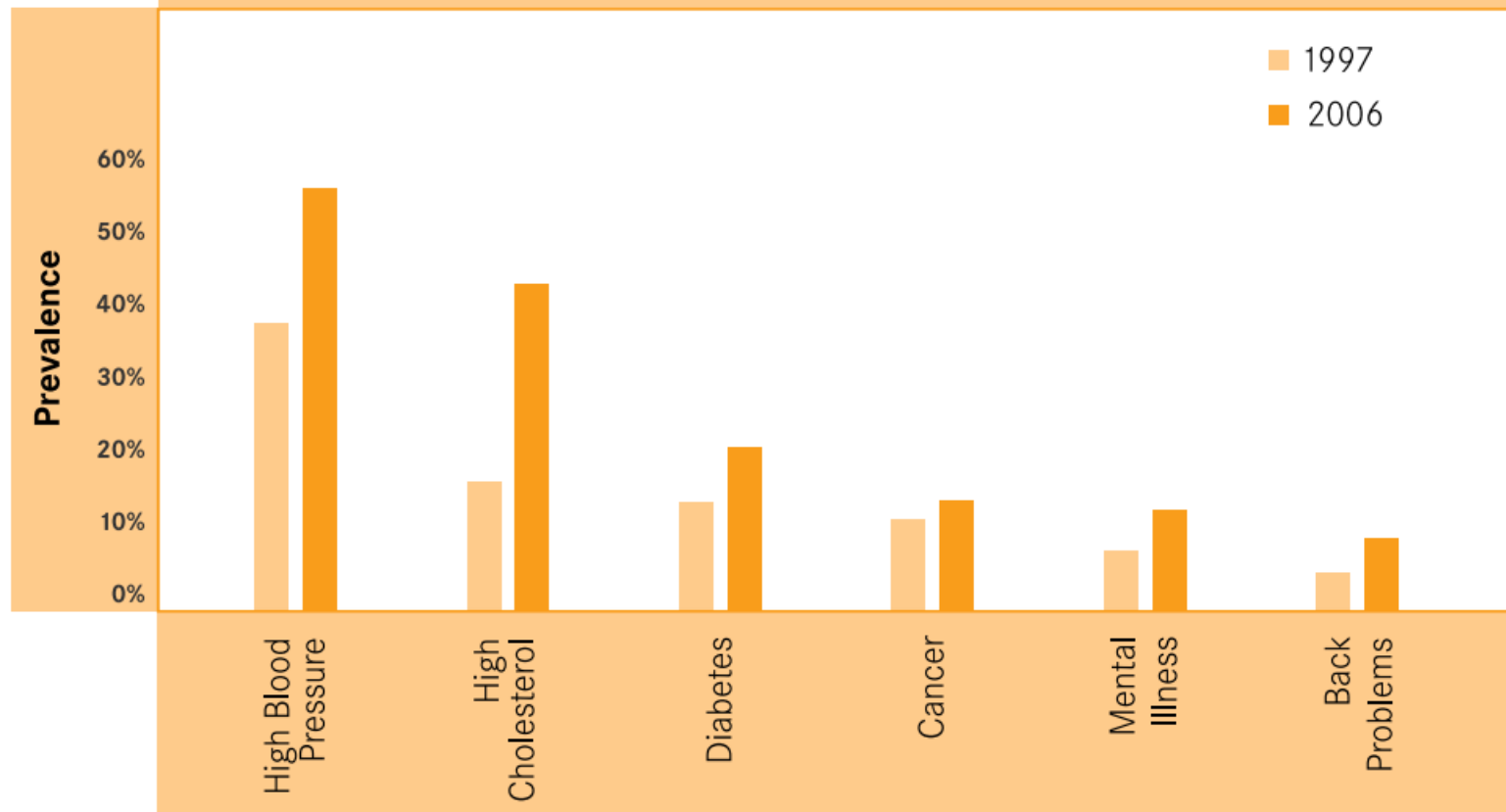


Source: Centers for Medicare and Medicaid Services, 2018

Available for download at: https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Chronic-Conditions/Chartbook_Charts

Figure 1.3

Many Chronic Conditions Are on the Rise among Medicare Beneficiaries 65+

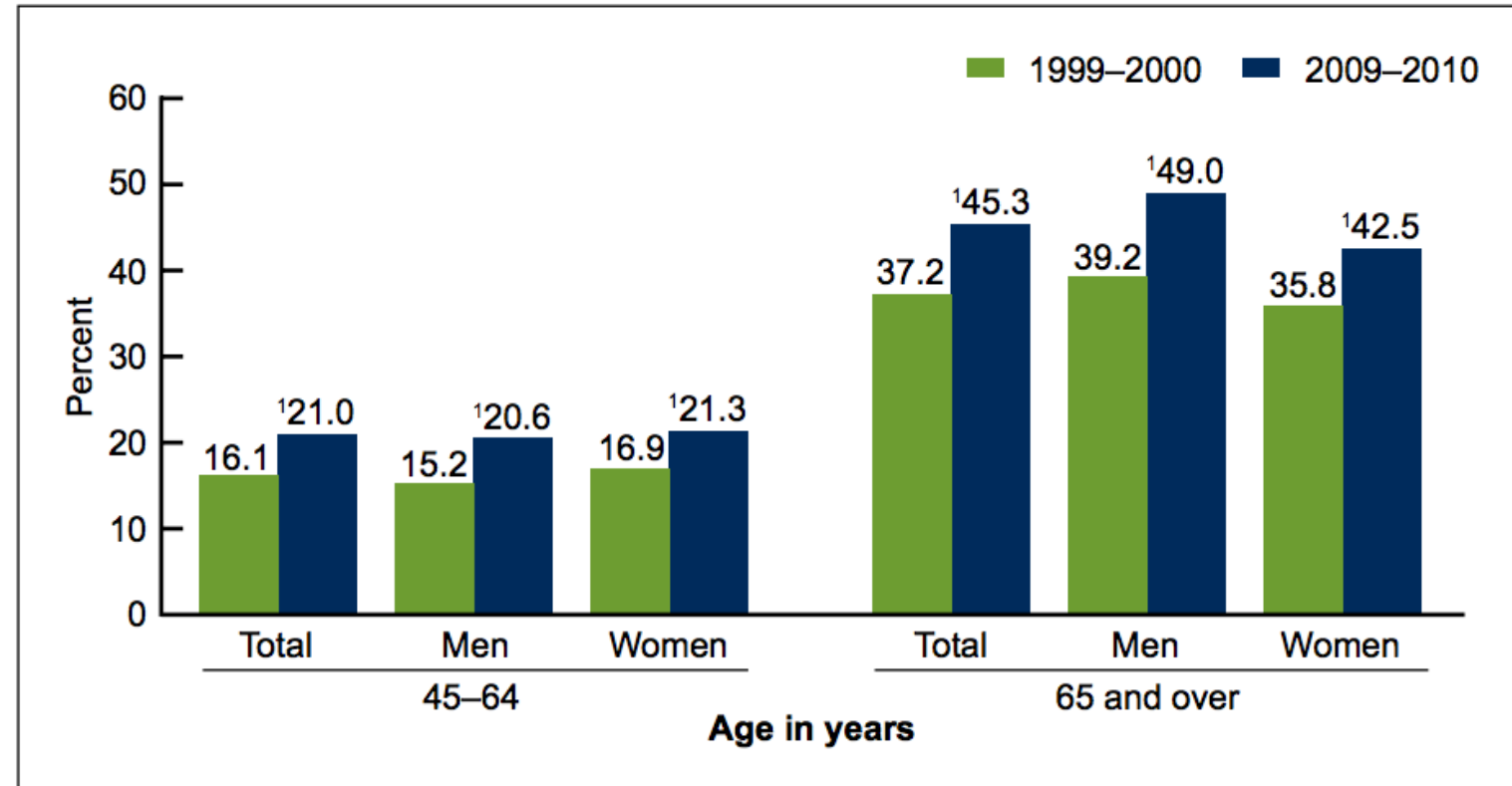


Source: Johns Hopkins Bloomberg School of Public Health analysis of Medicare claims data.

Note: Prevalence figures shown here are based on Medicare claims data and vary significantly from prevalence data drawn from MEPS data. Medicare claims data are derived from 5 percent sample of beneficiaries over 65 enrolled in Parts A and B, excluding Part C and ESRD.

The percentage of adults aged 45–64 and 65 and over with two or more of nine selected chronic conditions increased between 1999–2000 and 2009–2010.

Figure 1. Prevalence of two or more of nine selected chronic conditions among adults aged 45 and over, by age and sex: United States, 1999–2000 and 2009–2010

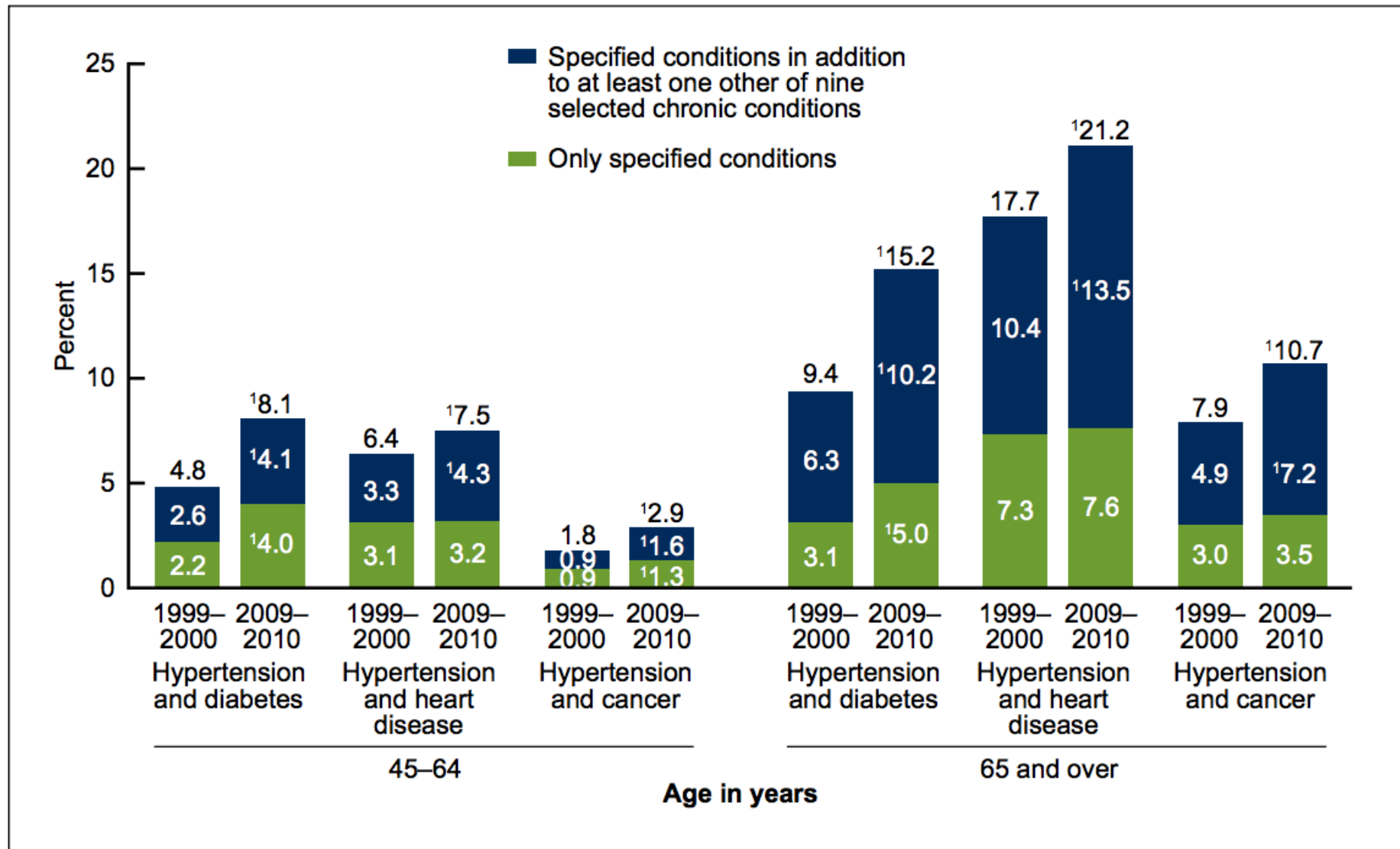


¹Significantly different from 1999–2000, $p < 0.05$.

NOTE: Access data table for Figure 1 at: http://www.cdc.gov/nchs/data/databriefs/db100_tables.pdf#1.

SOURCE: CDC/NCHS, National Health Interview Survey.

Figure 4. Prevalence of the three most common combinations of the nine selected chronic conditions, by age and type of chronic condition: United States, 1999–2000 and 2009–2010

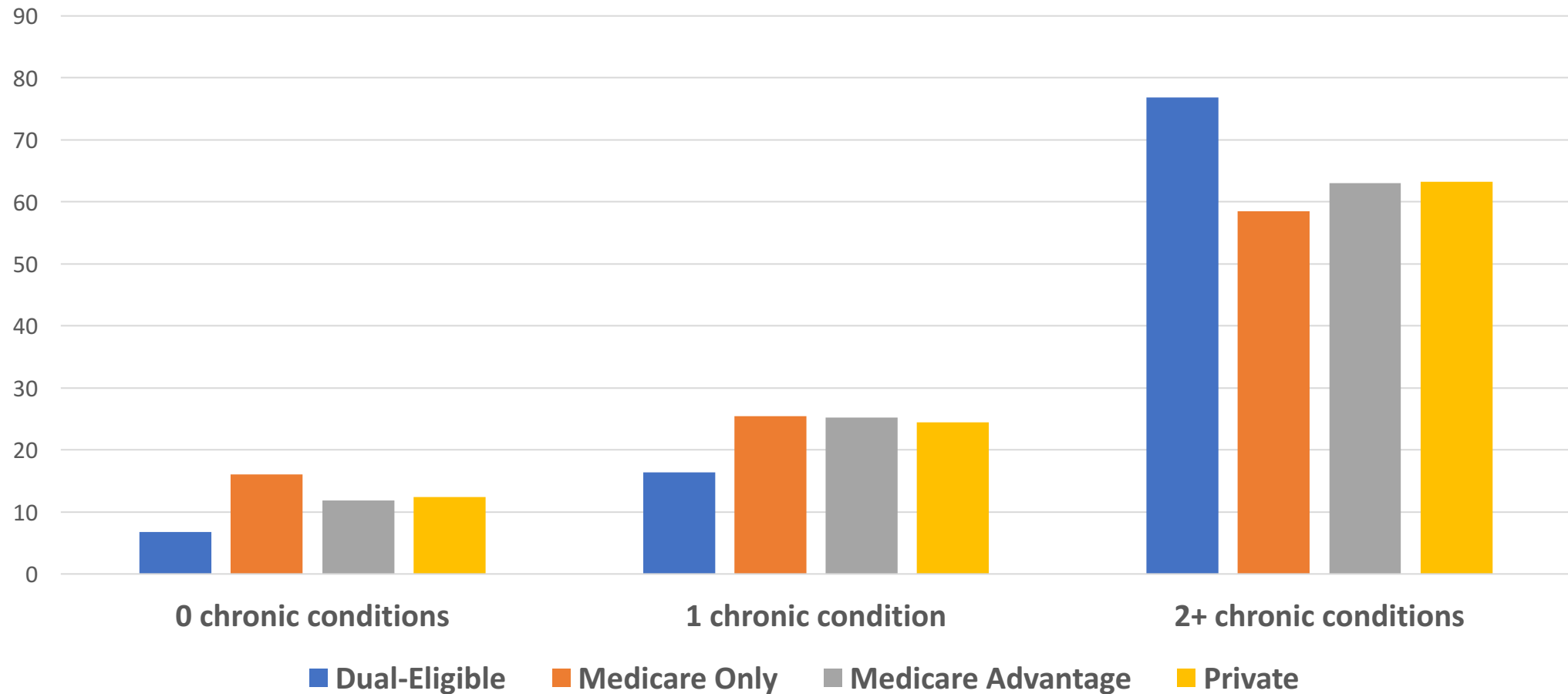


¹Significantly different from 1999–2000, $p < 0.05$.

NOTES: Parts may not sum to total due to rounding. Access data table for Figure 4 at: http://www.cdc.gov/nchs/data/databriefs/db100_tables.pdf#4.

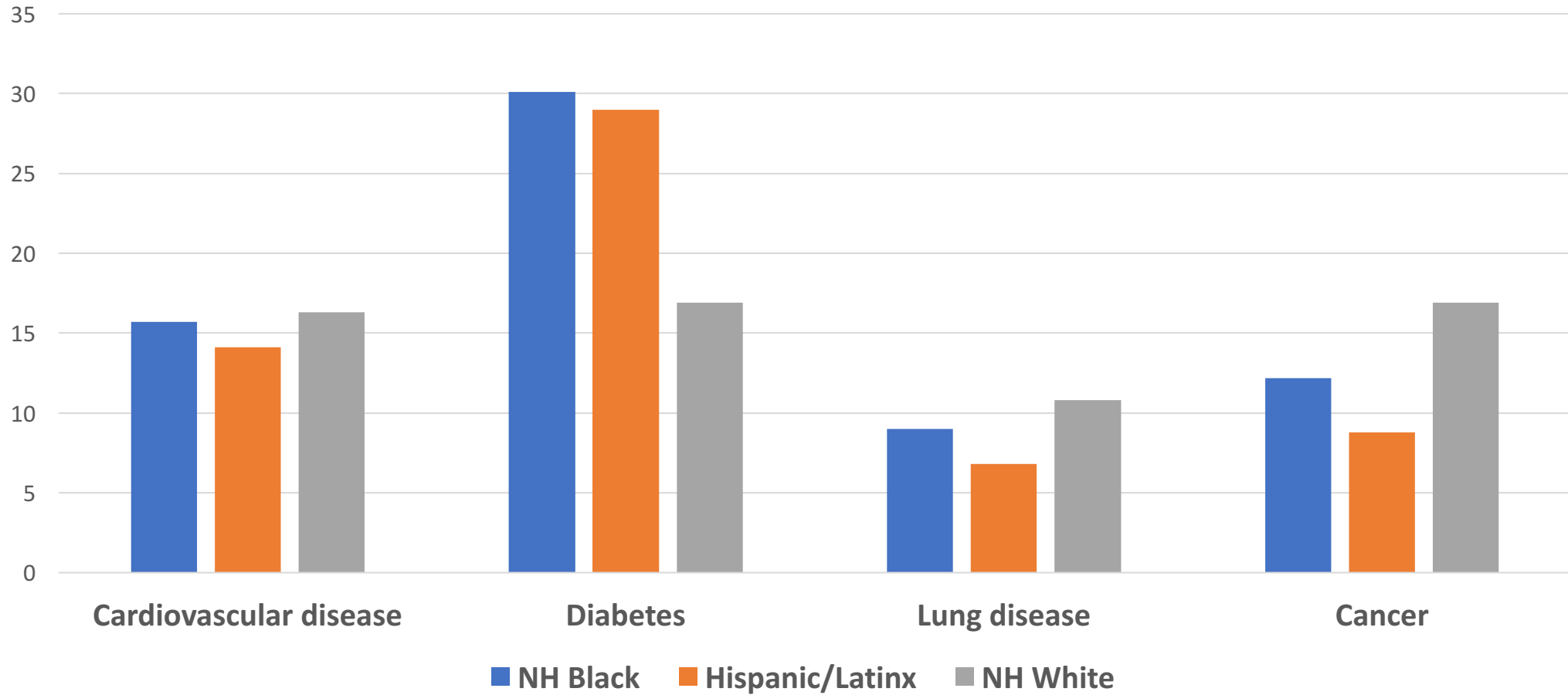
SOURCE: CDC/NCHS, National Health Interview Survey.

Prevalence of chronic disease in the U.S., 2018, 65+ by insurance type



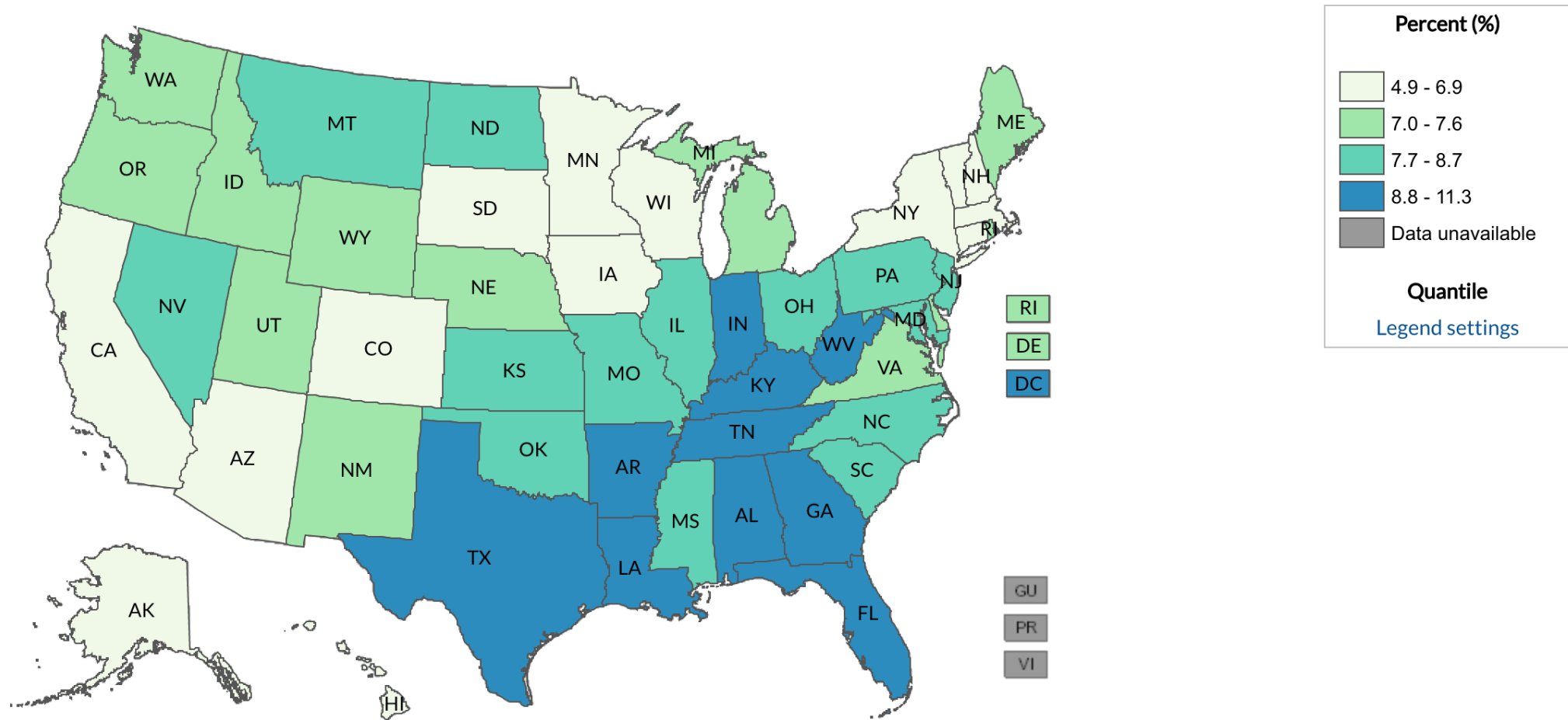
Source: National Health Interview Survey, 2018; in Boersma et al. Preventing Chronic Disease, 2020, https://www.cdc.gov/pcd/issues/2020/20_0130.htm#results

Prevalence of chronic conditions, 60-80 years, by race/ethnicity, 2006-2014



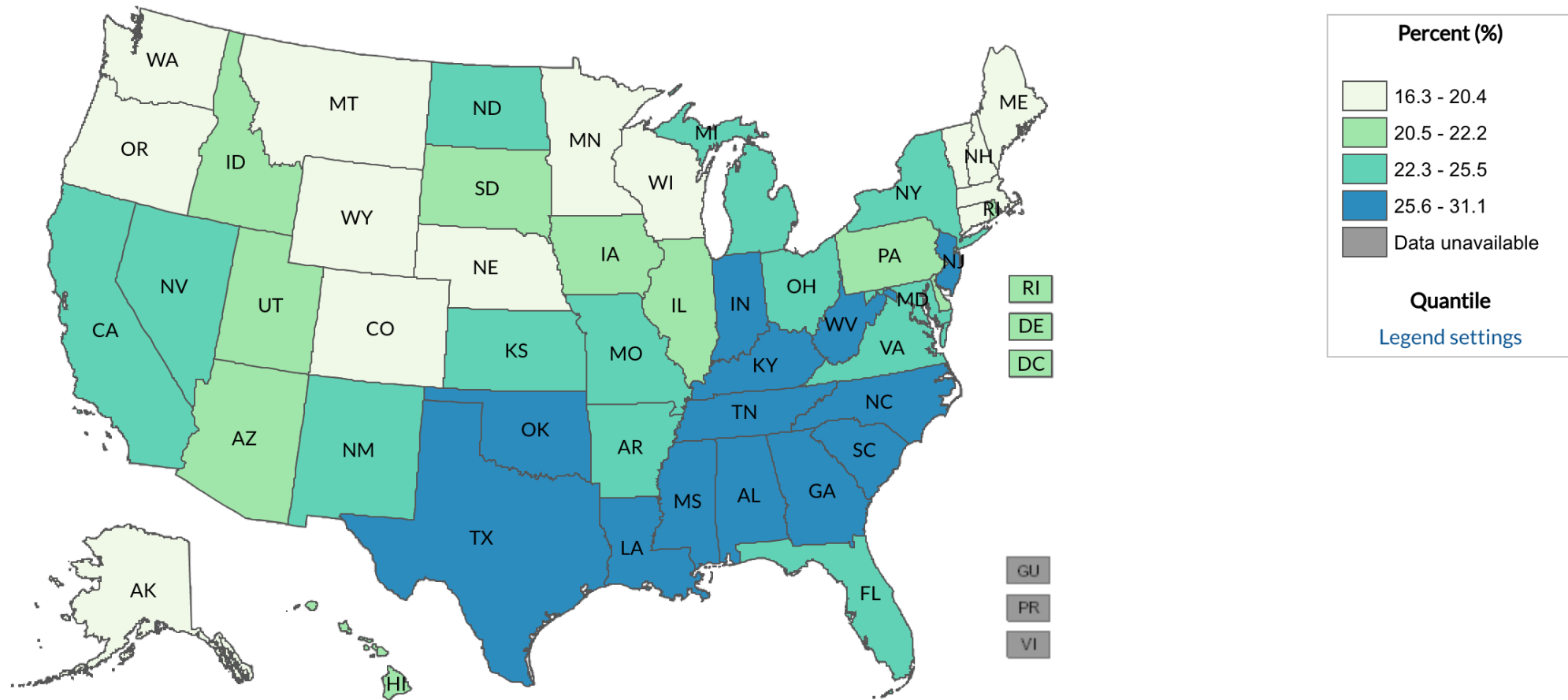
Source: National Health Interview Survey, 2006-2014; in Davis et al. Preventing Chronic Disease, 2017, https://www.cdc.gov/pcd/issues/2017/16_0241.htm#table1_down

Geographic Variation – Prevalence of Stroke, 65+, 2018



Source: <https://www.cdc.gov/dhdsp/maps/dtm/index.html>

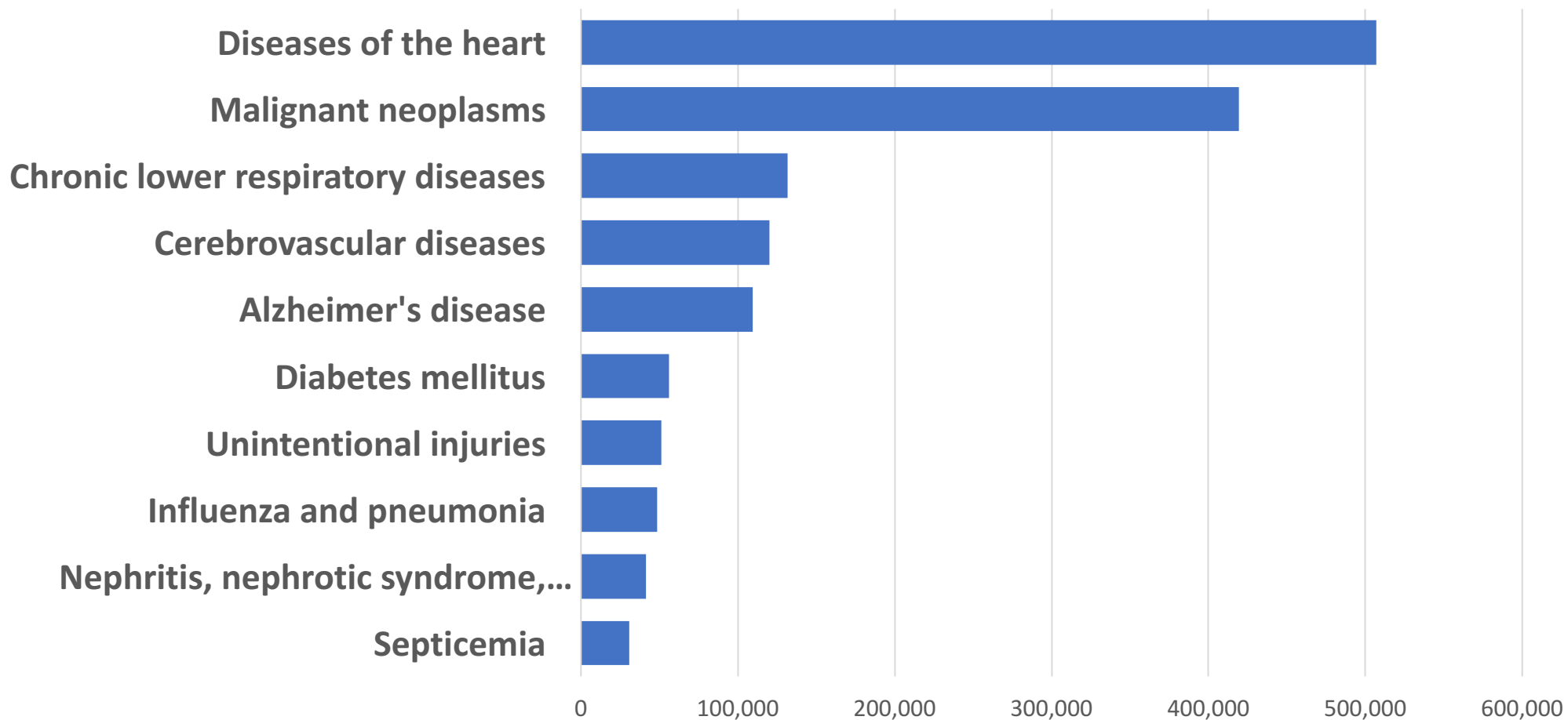
Geographic Variation – Prevalence of Diabetes, 65+, 2018



Source: <https://www.cdc.gov/dhdsdp/maps/dtm/index.html>

Impacts of chronic disease for older adults

Leading Causes of Death Among Older Adults, U.S., 2015



Leading Causes of Death, Updated

Table. Age-Specific Mortality Rates (per Million) for COVID-19 (March-October 2020) and Other Leading Causes of Death (March-October 2018)^a

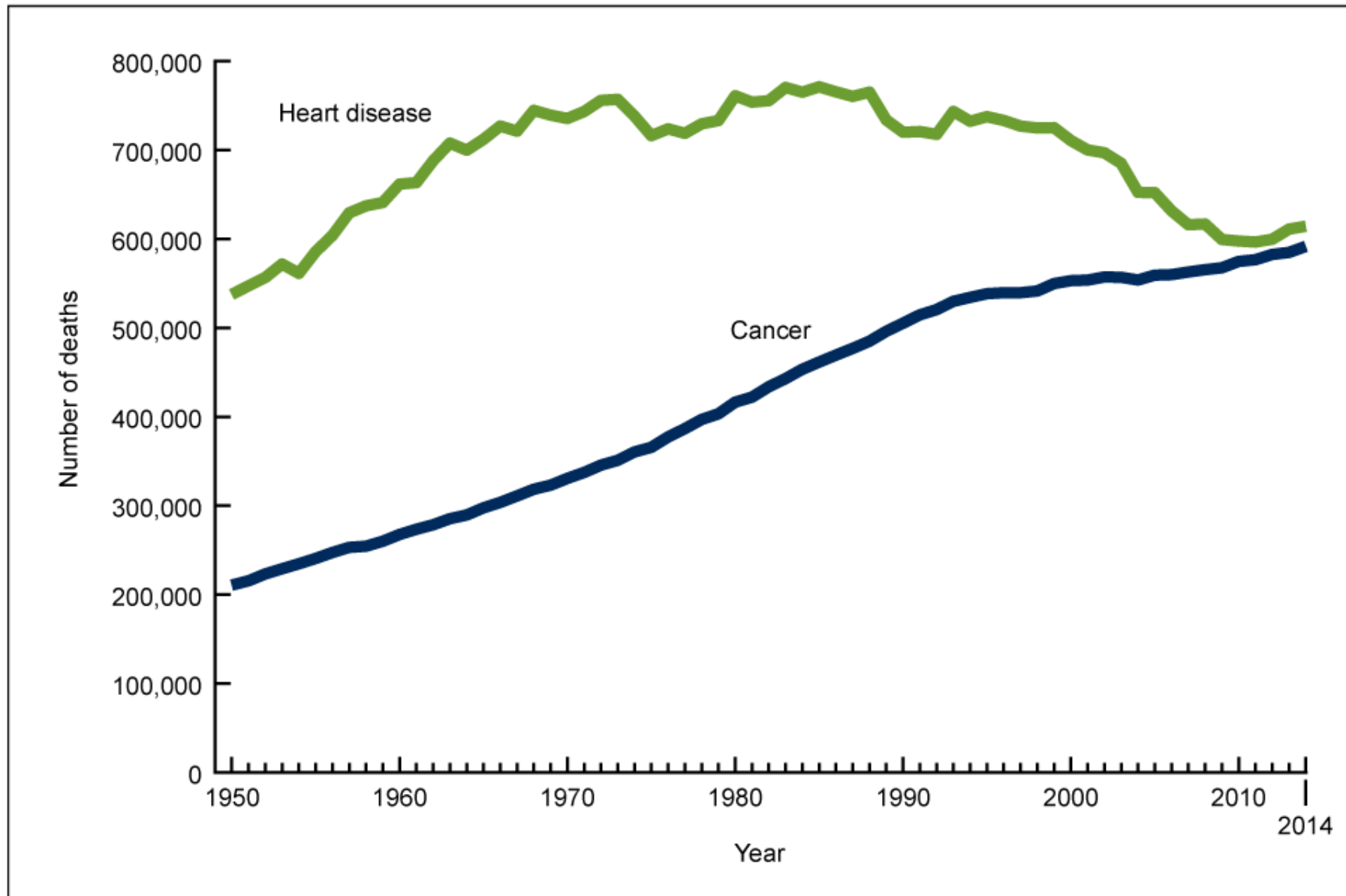
Age, y	Causes of death ^b										
	COVID-19	Heart disease	Malignant neoplasms	Chronic lower respiratory disease	Unintentional injuries Transport accidents	Accidental drug overdoses	Intentional injuries Suicide	Homicide	Leading causes of infant deaths Birth defects	Short gestation	SUID
45-54	294.8	509.7	597.5	56.1	100.7	208.2	140.3	33.9	11.2		
55-64	683.3	1239.8	1802.4	285.8	105.0	161.2	139.8	23.7	17.8		
65-74	1574.6	2516.9	3702.0	809.9	99.2	50.8	114.1	15.7	13.4		
75-84	3832.4	6478.5	6845.7	2117.3	129.9	16.0	129.6	13.2	14.9		
≥85	10 699.7	24 530.2	10 442.4	4278.4	139.1	14.7	133.4	13.3	31.2		
Total	698.8	1287.7	1219.8	307.5	89.2	122.3	102.3	39.0	19.4		

Abbreviations: COVID-19, coronavirus disease 2019; SUID, sudden unexpected infant death (including sudden infant death syndrome).

^a Table presents 8-month aggregate COVID-19 mortality rates during the period of March through October 2020⁵ and mortality rates for other causes during the period of March through October 2018,⁴ the most recent year for which detailed cause-of-death data are available.

^b Causes of death are defined by *International Statistical Classification of Diseases and Related Health Problems* codes for heart disease (I00-I09, I11, I13, I20-I51), malignant neoplasms (C00-C9), chronic lower respiratory disease (J40-J47), transport accidents (injuries) (V01-V99, Y85), accidental drug overdoses (X40-X44), suicide (*U03, X60-X84, Y87.0), homicide (*U01-*U02, X85-Y09, Y87.1), birth defects (Q00-Q99), short gestation (P05-P08), and sudden unexpected infant death (R95, R99, W75).

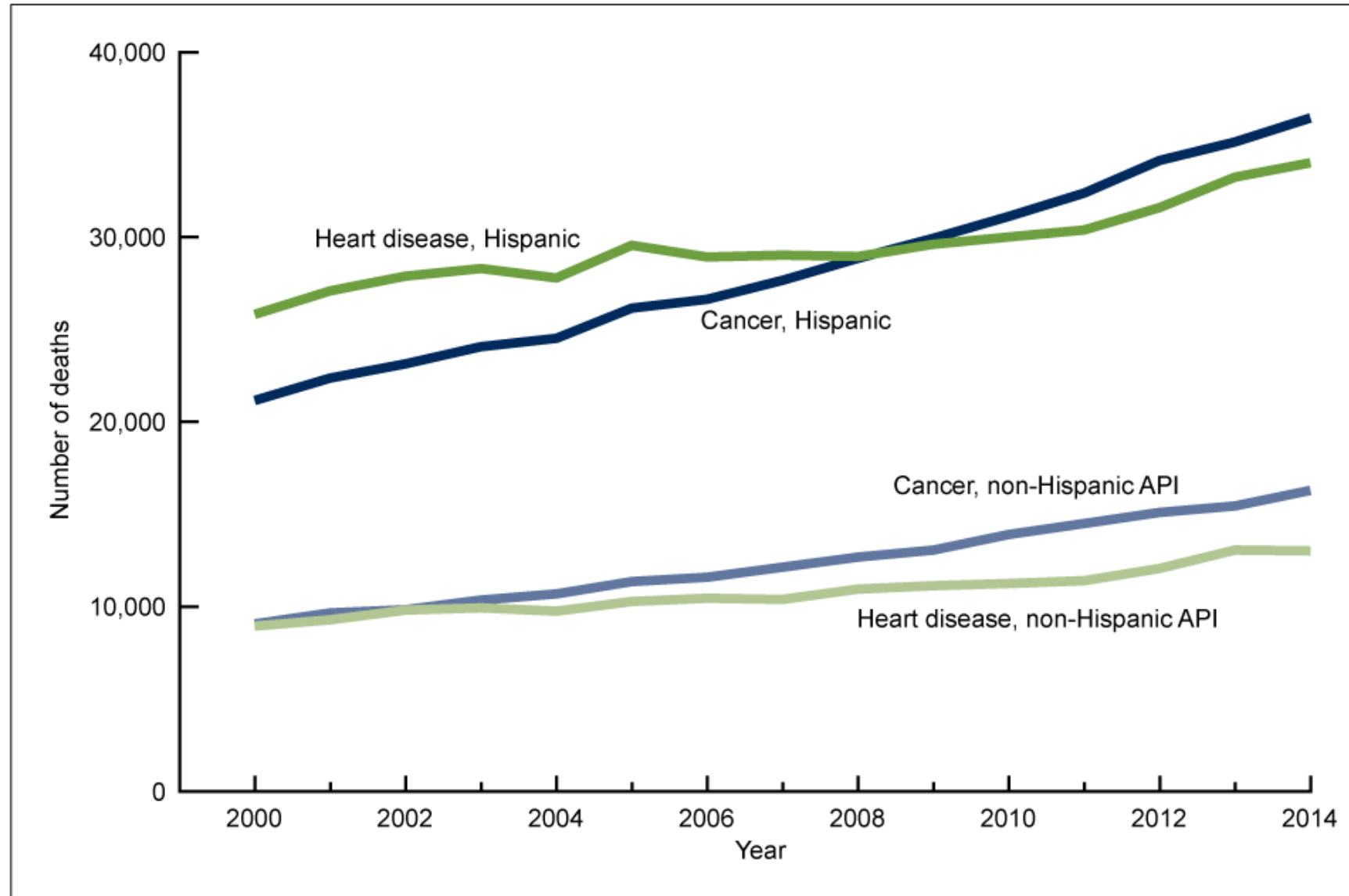
Figure 1. Number of deaths due to heart disease and cancer: United States, 1950–2014



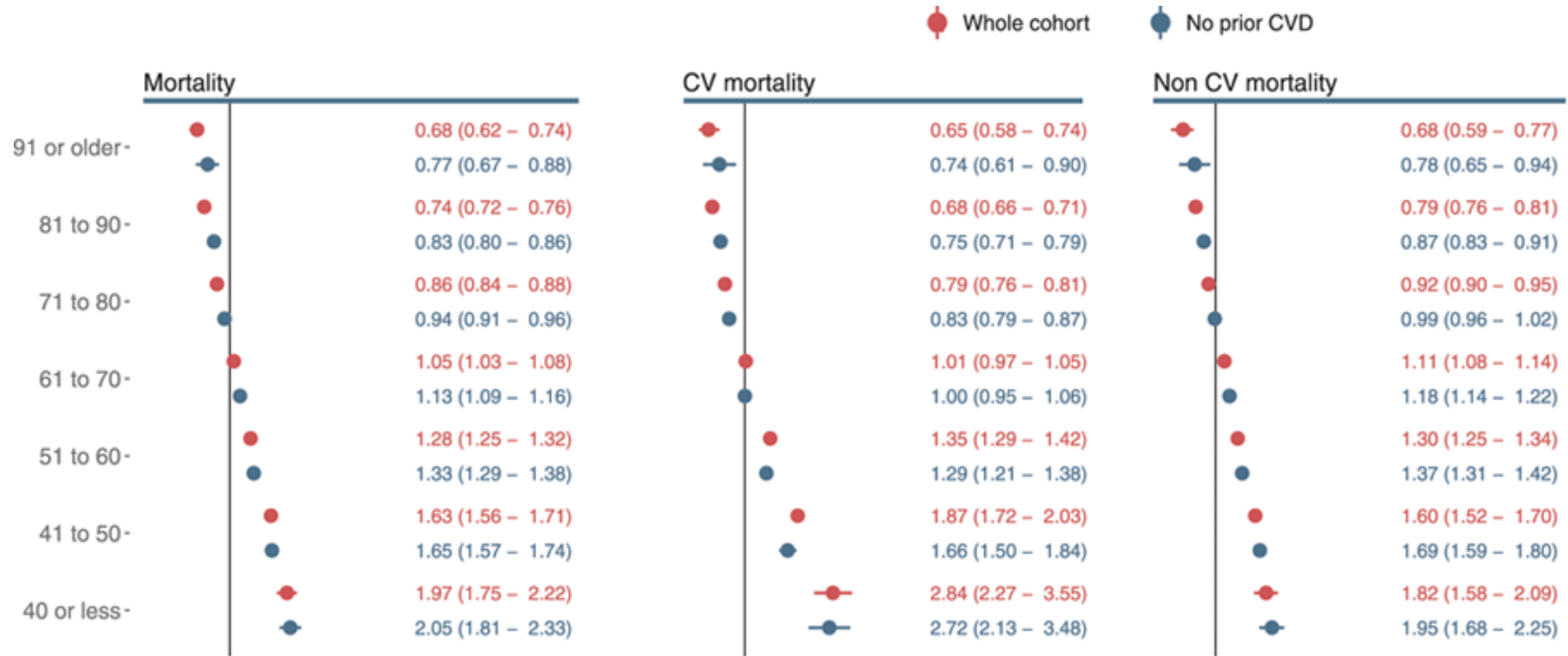
NOTES: Leading cause is based on number of deaths. Access data table for Figure 1 at: http://www.cdc.gov/nchs/data/databriefs/db254_table.pdf#1.

SOURCE: NCHS, National Vital Statistics System, Mortality.

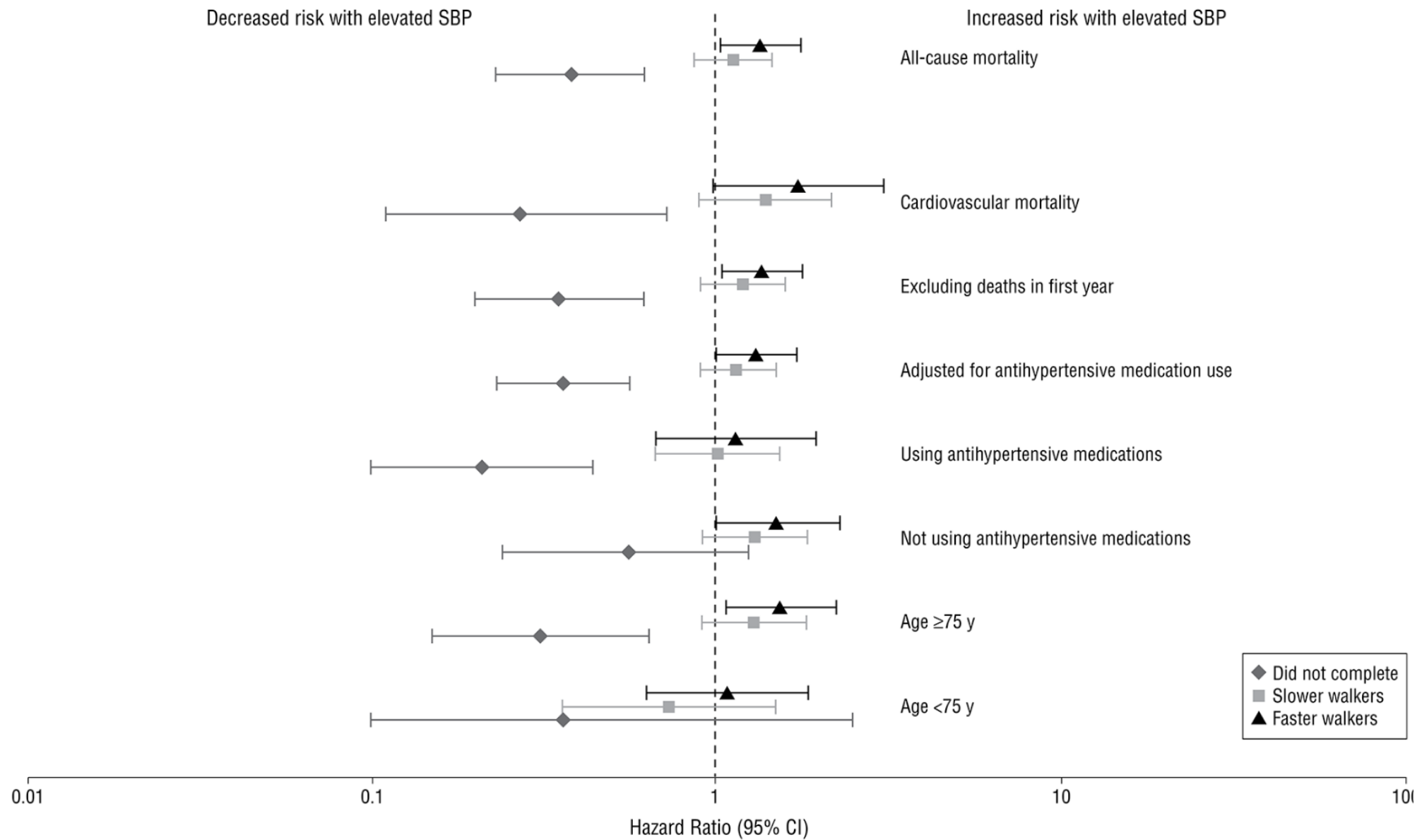
Figure 5. Number of deaths due to heart disease and cancer for the non-Hispanic Asian or Pacific Islander and Hispanic populations: United States, 2000–2014



NOTES: API is Asian or Pacific Islander. Deaths for the non-Hispanic API and Hispanic populations are underreported by 3% each; see "Data source and methods." Leading cause is based on number of deaths. Access data table for Figure 5 at: http://www.cdc.gov/nchs/data/databriefs/db254_table.pdf#5. SOURCE: NCHS, National Vital Statistics System, Mortality.



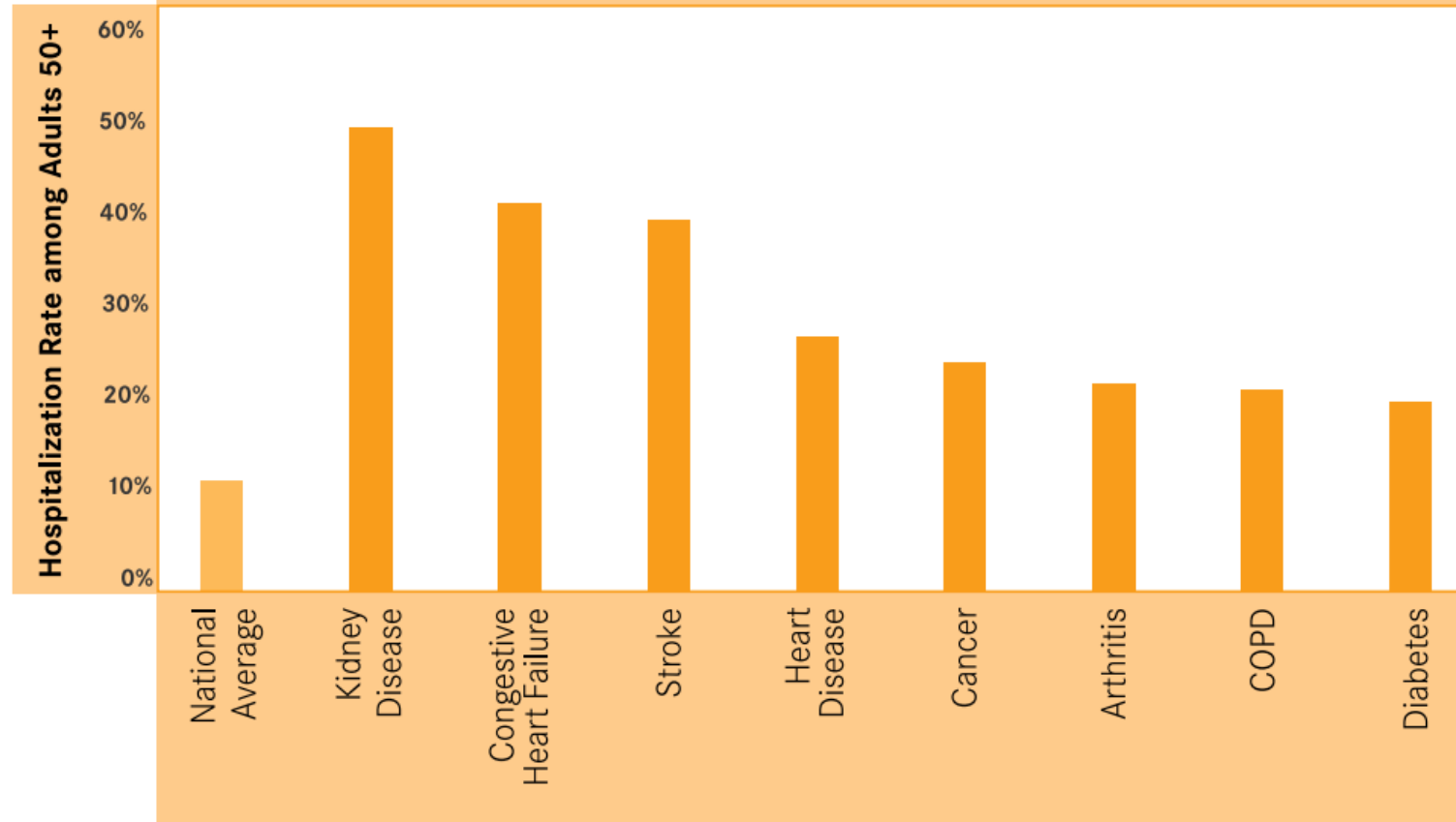
Naveed Sattar. Circulation. 2019. Age at Diagnosis of Type 2 Diabetes Mellitus and Associations With Cardiovascular and Mortality Risks, Volume: 139, Issue: 19, Pages: 2228-2237, DOI: (10.1161/CIRCULATIONAHA.118.037885)



Impacts on Hospitalization

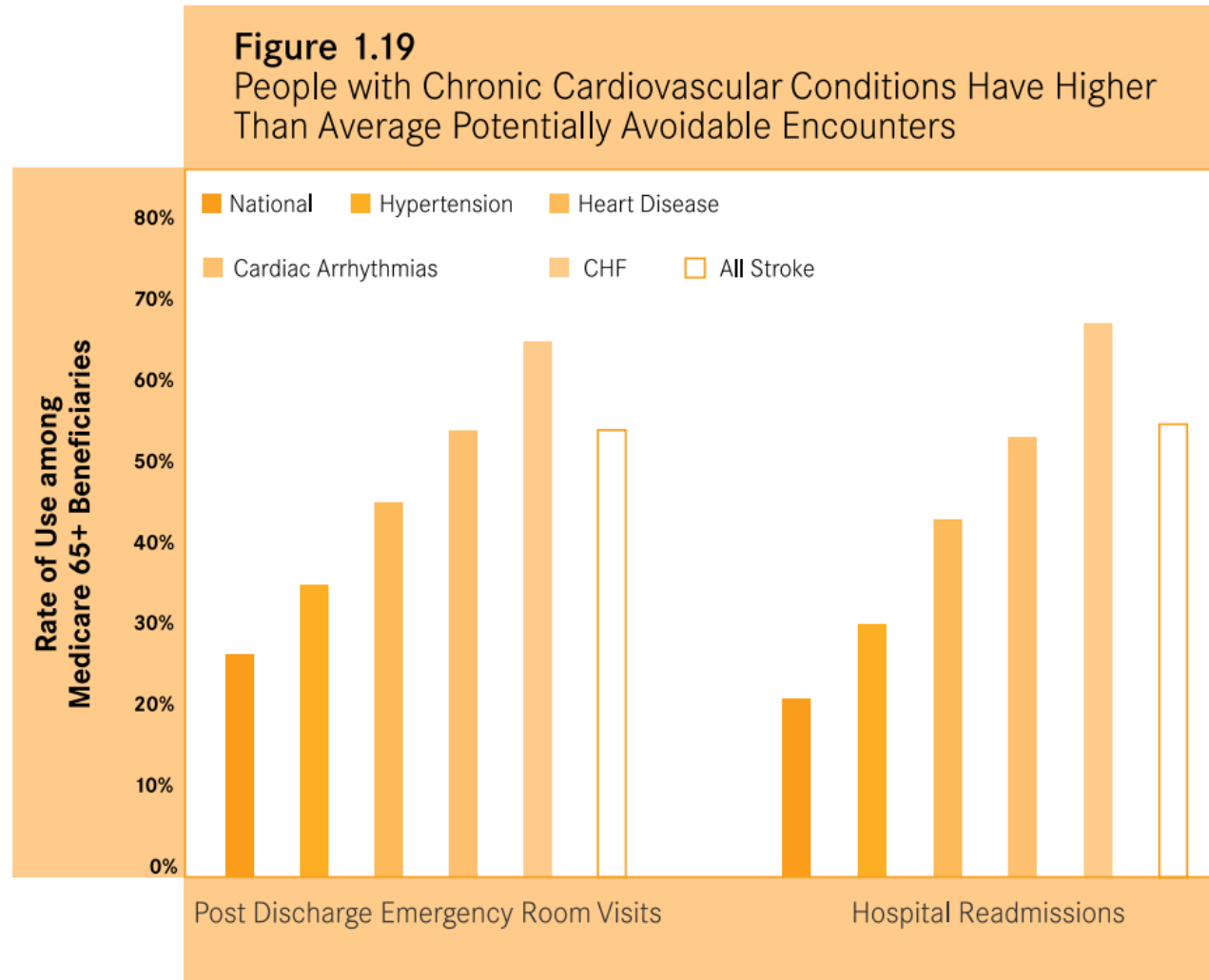
Figure 1.9

Chronic Conditions Lead to Higher Risk of Being Hospitalized



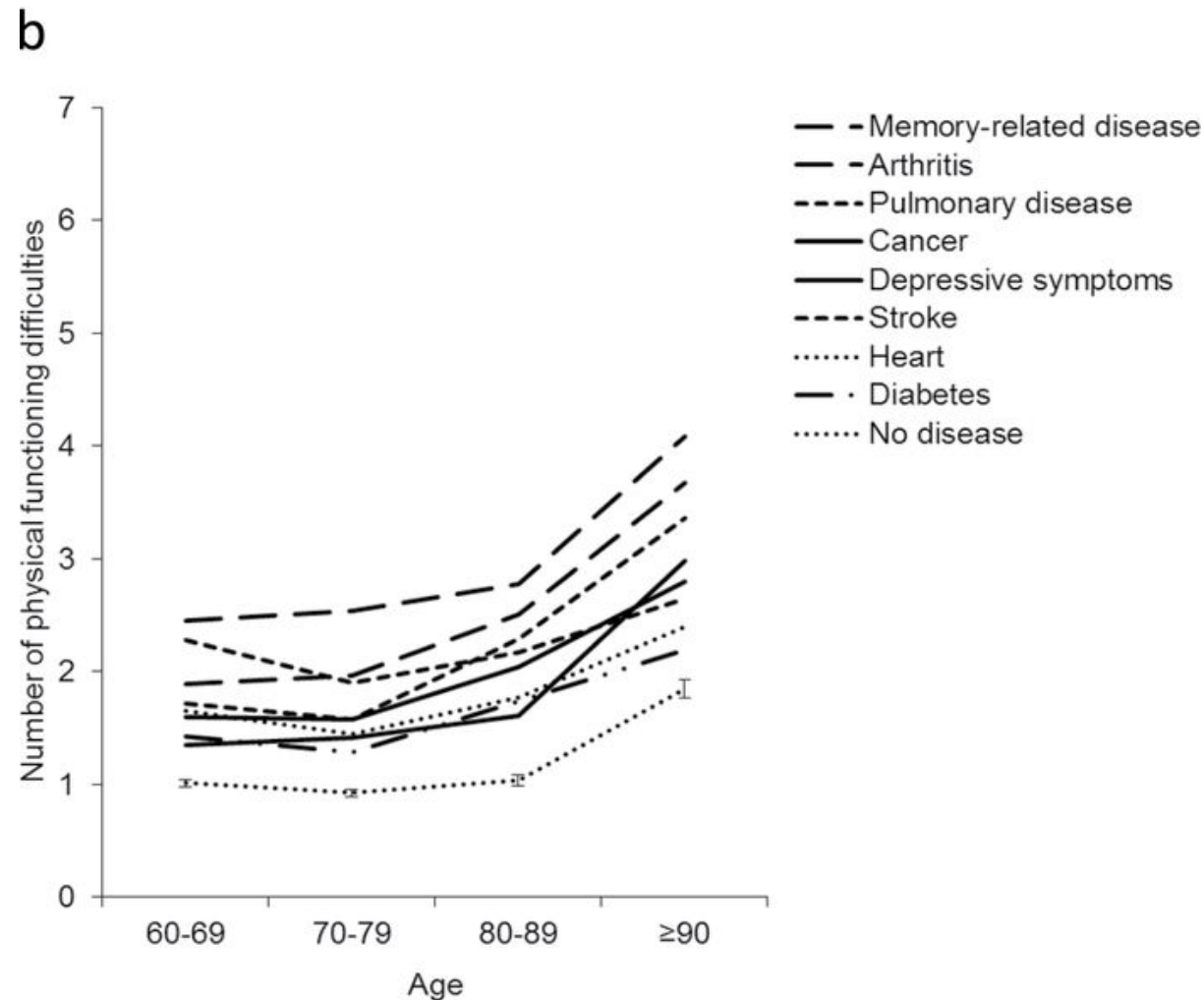
Source: Johns Hopkins Bloomberg School of Public Health analysis of Medical Expenditure Panel Survey, 2005.

Impacts on Avoidable Encounters



Source: Johns Hopkins Bloomberg School of Public Health analysis of Medicare claims data.

Impacts on Physical Functioning



Exacerbating poor outcomes

Lunde et al.
2019. Am J
Epidemiol

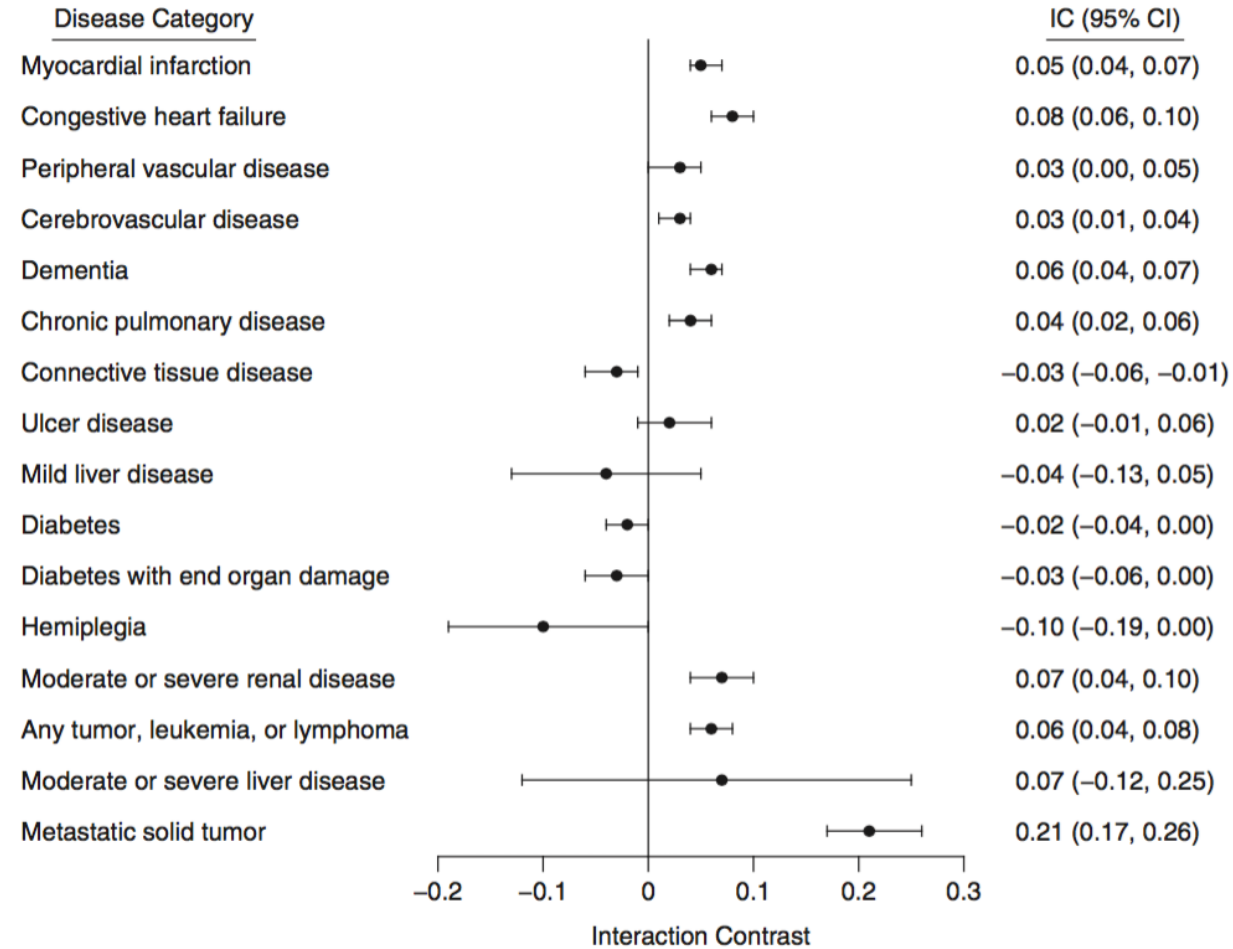


Figure 2. Interaction contrast (IC; additive comorbidity–hip fracture interaction) between hip fracture and individual diseases included in the Romano modification of the Charlson Comorbidity Index at a maximum of 1 year of follow-up, Norway, 2009–2015. Data were available for 38,126 Norwegian women with hip fracture and a matched comparison cohort. Bars, 95% confidence intervals (CIs).

MULTIMORBIDITY

Definition

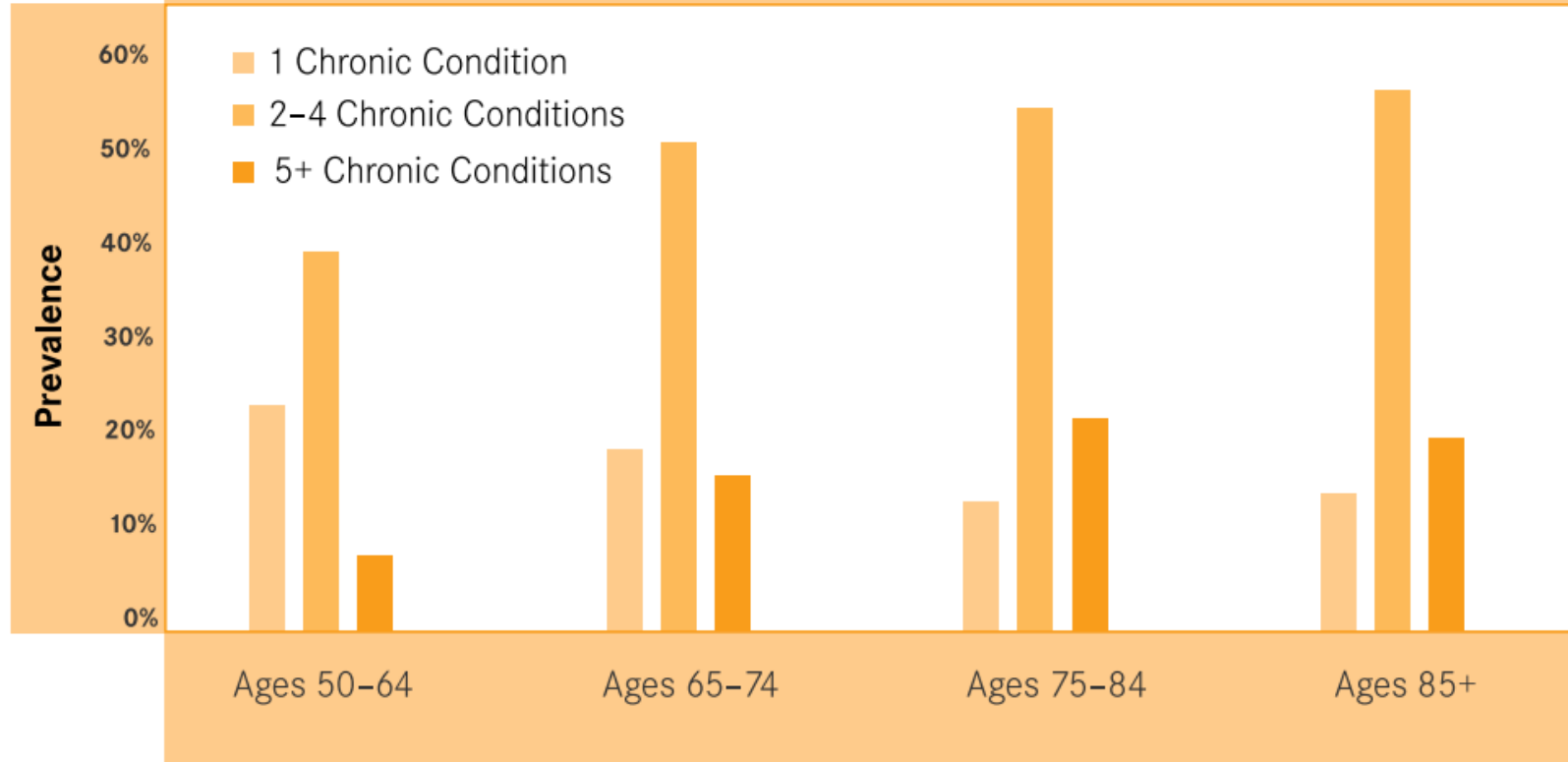
The co-existence of two or more chronic conditions, each one of which is either:

- A physical non-communicable disease of long duration, such as a cardiovascular disease or cancer.
- A mental health condition of long duration, such as a mood disorder or dementia.
- An infectious disease of long duration, such as HIV or hepatitis C.

Source: Academy of Medical Sciences, 2018

Figure 1.7

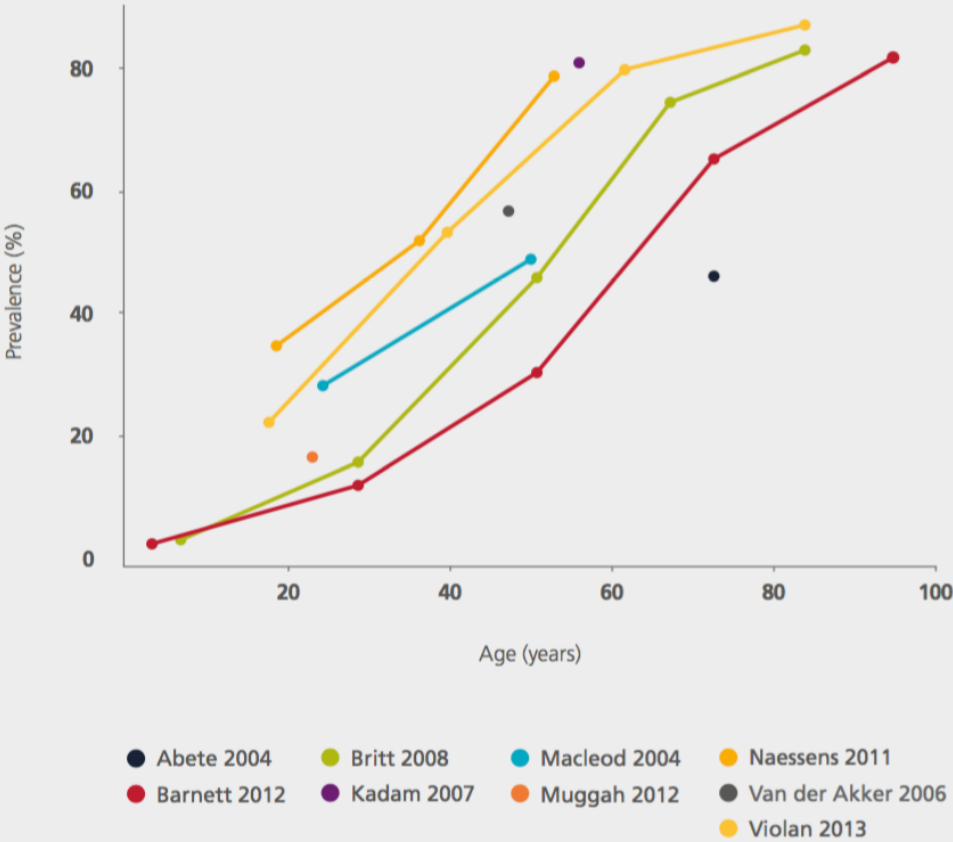
Many Older Americans Have Multiple Chronic Conditions



Source: Johns Hopkins Bloomberg School of Public Health analysis of Medical Expenditure Panel Survey, 2005.

Note: Data do not include people who live in institutions.

Figure 2. Multimorbidity prevalence by age group



Source: Violan C, *et al.* (2014).⁹⁰

The data are taken from a systematic review of 39 observational studies across 12 HICs, and illustrate a well-established positive association between age and prevalence of multimorbidity. This association is commonly seen despite the definition of multimorbidity differing between the included studies.⁹⁰

Multimorbidity Patterns by Age

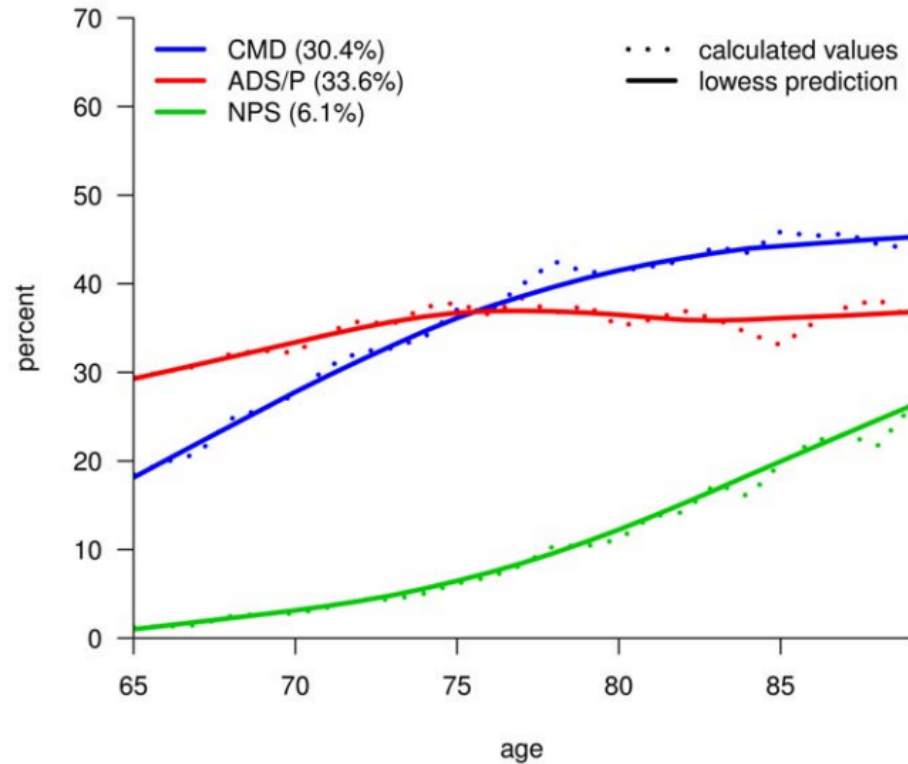


Figure 1. Prevalence by age for multimorbidity patterns of female patients. CMD: cardiovascular and metabolic disorders; ADS/P: anxiety, depression, somatoform disorders and pain; NPS: neuropsychiatric disorders.

doi:10.1371/journal.pone.0015941.g001

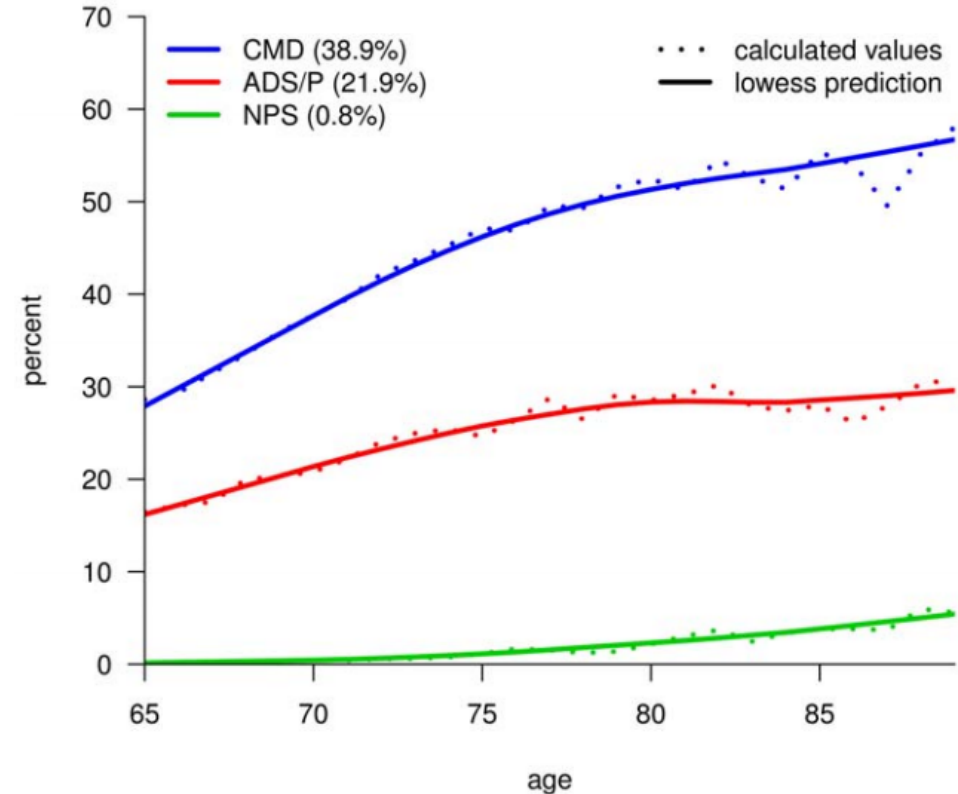
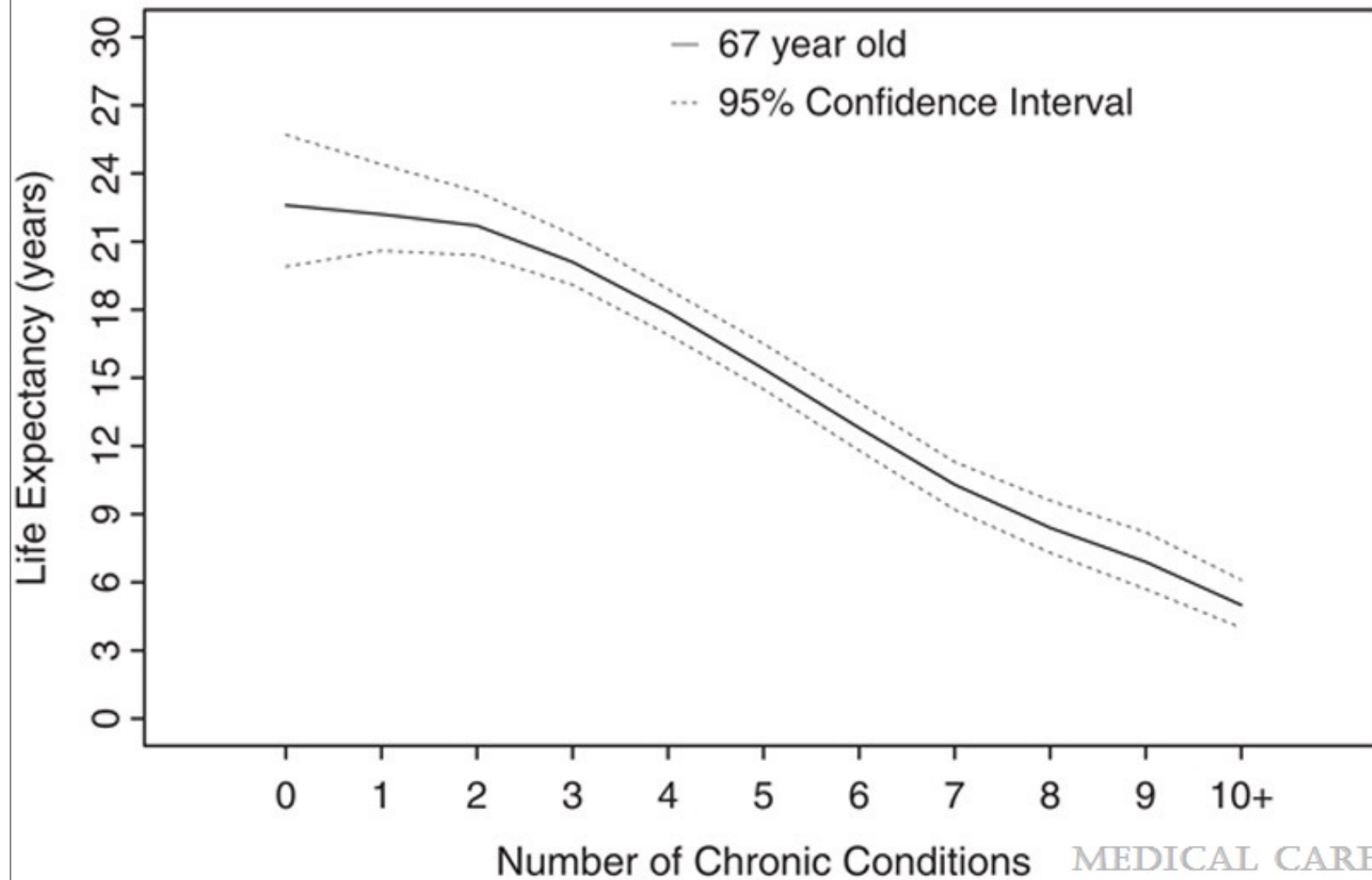


Figure 4. Prevalence by age for multimorbidity patterns of male patients. CMD: cardiovascular and metabolic disorders; ADS/P: anxiety, depression, somatoform disorders and pain; NPS: neuropsychiatric disorders.

doi:10.1371/journal.pone.0015941.g004

Life Expectancy By Number of Chronic Conditions



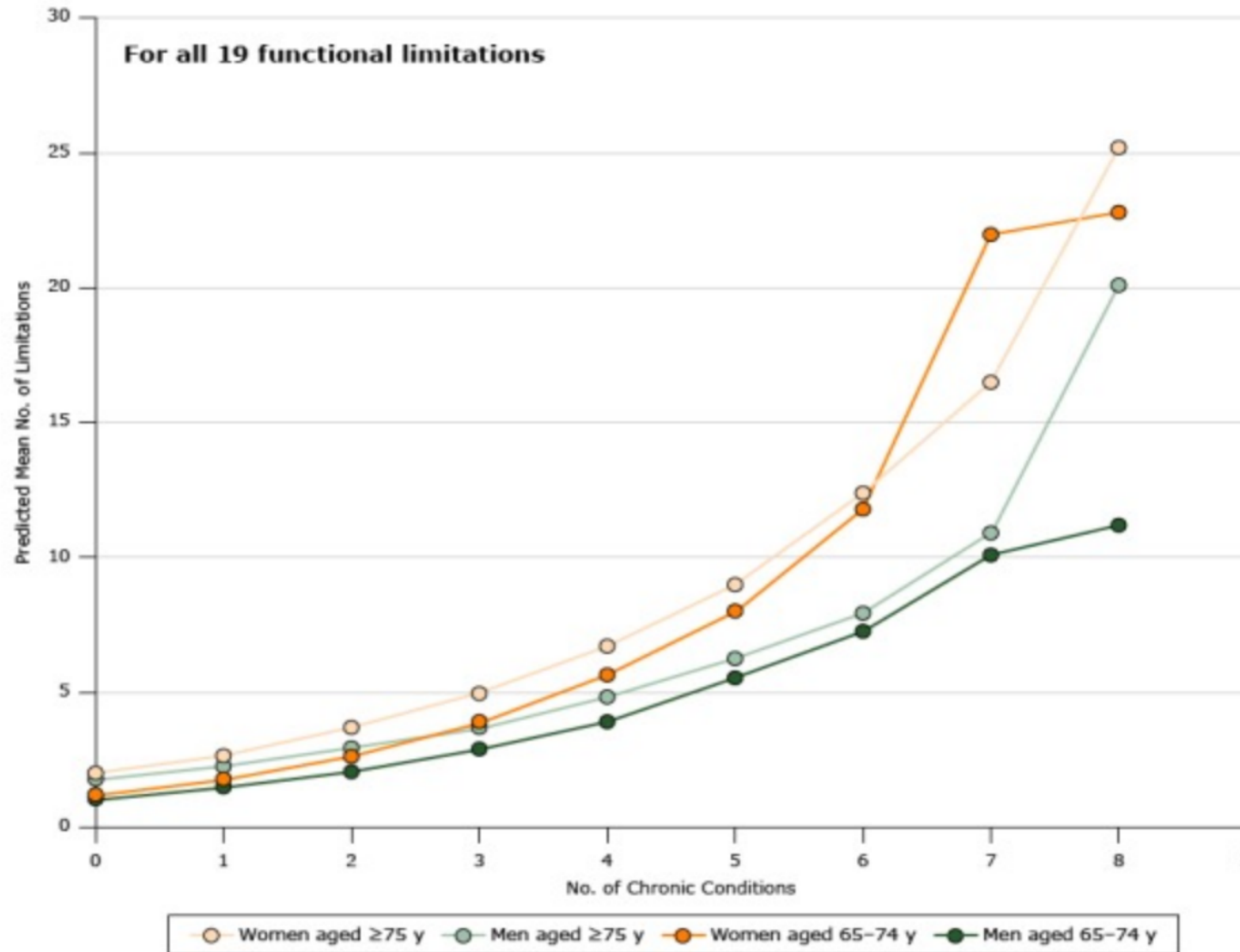
[Multiple Chronic Conditions and Life Expectancy: A Life Table Analysis](#)

DuGoff, Eva H.; Canudas-Romo, Vladimir; Buttorff, Christine; Leff, Bruce; Anderson, Gerard F.

Medical Care 52(8):688-694, August 2014.

doi:
10.1097/MLR.000000000000166

Predicted mean number of limitations by the number of chronic conditions, stratified by sex and age group, NHANES, 2005–2012



Jindai et al,
*Preventing
Chronic Diseases.*
2016; 13: E151

Discussion:

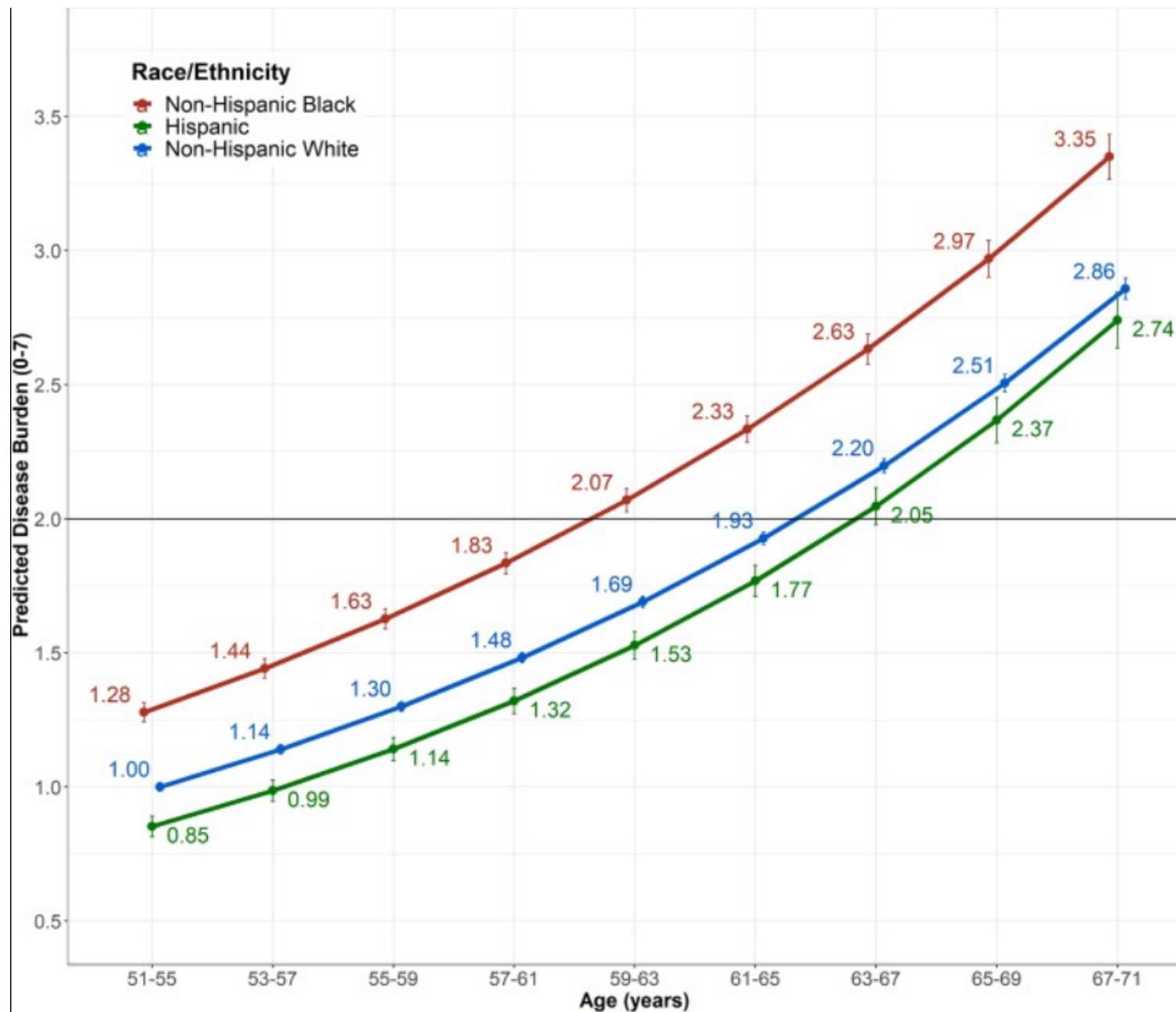
Why do comorbid disease clusters occur?

Explanations

- Random coexistence
- Causal: one condition causes another
- Shared susceptibility: common underlying mechanisms / risk factors
- Cyclic reinforcement

Measuring Multi-morbidity

- (Weighted) sum of chronic diseases
 - e.g. Charlson Comorbidity Index (Charlson et al, 1987, Quan et al, 2011)
 - e.g. Multimorbidity weighted index (Wei et al 2016)
- (Weighted) sum of prescription drugs
- Variable sources: medical records, self-report
 - In population-based survey data, conditions considered often limited



Next Week:

Lecture: The Epidemiology of
Sarcopenia, Dr. Peggy Cawthon
Homework: Reading