

Epidemiology and Prevention of Chronic Disease: Global Public Health Perspectives



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Department of Epidemiology & Biostatistics, Western University



EUPHA-Steering Committee Chronic Disease Section

Name	Affiliation	Country
Saverio Stranges	Professor and Chair, Department of Epidemiology and Biostatistics, Western University	Canada/Italy
Sarah Cuschieri	Lecturer, University of Malta (Vice-President)	Malta
Elio Riboli	Founding Dean, School of Public Health Imperial College London	UK
Tatjana Makovski	Researcher, Sante Publique France, Paris	France
Andrzej M. Fal	President, Polish Society of Public Health	Poland
Valentina A. Andreeva	Associate Professor Nutritional Epidemiology Research Group/EREN Université Sorbonne Paris Nord	France
Julian Mamo	Professor, University of Malta (Vice-President)	Malta
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Robby De Pauw	Researcher, Sciensano	Belgium
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Antonio Sarria-Santamera	Professor, Nazarbayev University School of Medicine	Kazakhstan
Franca Barbic	Associate Professor, Humanitas University, Milan	Italy
Piotr Wilk	Associate Professor, Department of Epidemiology and Biostatistics, Western University	Canada



Outline

- ✓ Global epidemiological trends with focus on CVD (“Paradigm Shift”)
- ✓ Reconciling ageing, multimorbidity and COVID-19...
- ✓ Traditional and emerging risk factors
- ✓ Role of social determinants of health
- ✓ Lessons learned, policy implications & way forward...



My Academic & Professional Journey so far...



From the Mediterranean Sea and Vesuvius...



University of Naples Federico II

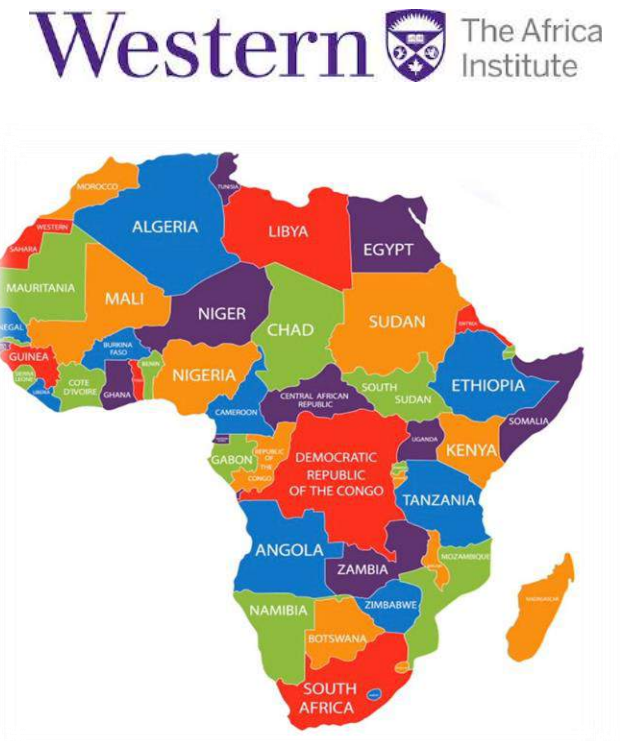
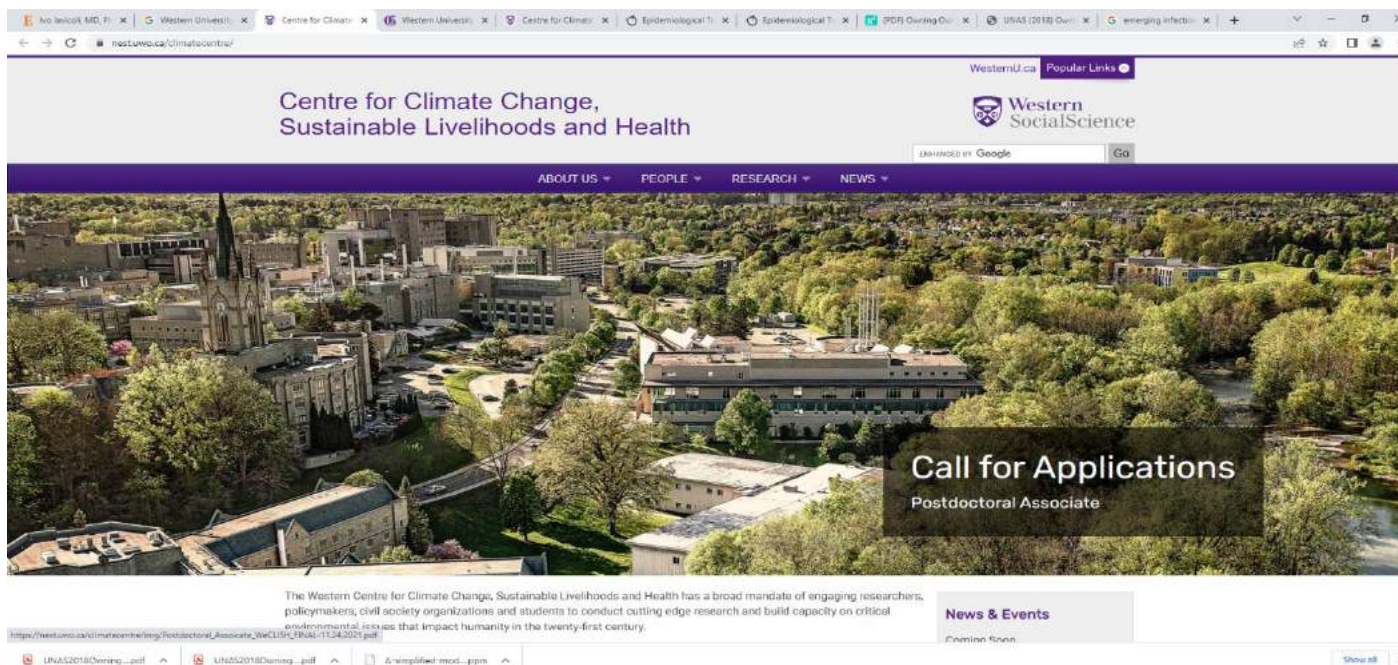
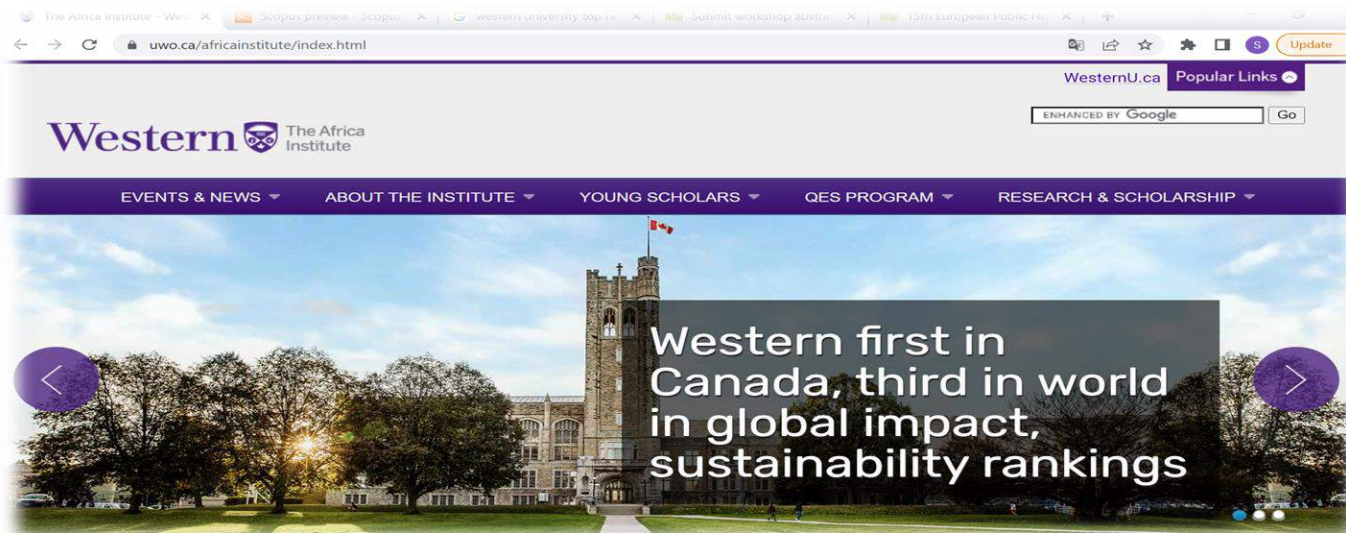


>42,000 students - 2,449 full-time staff

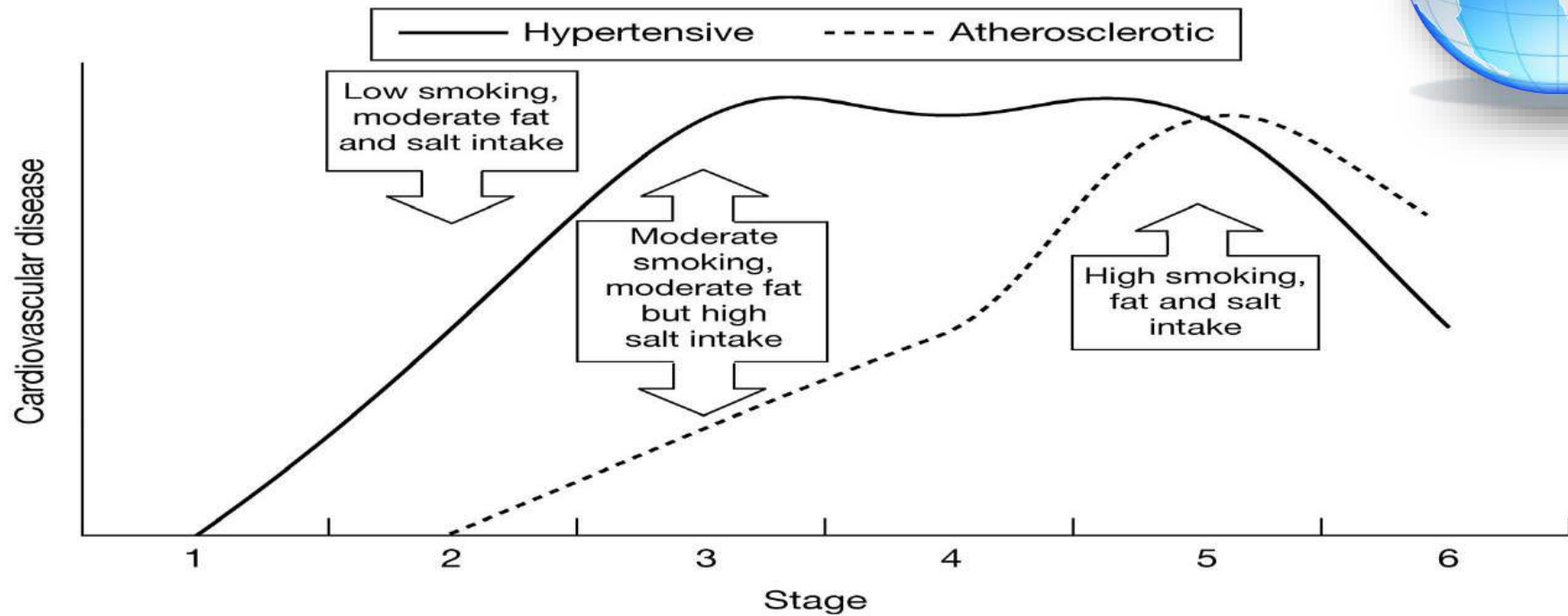
Department of Epidemiology and Biostatistics

Western Centre for Public Health & Family Medicine

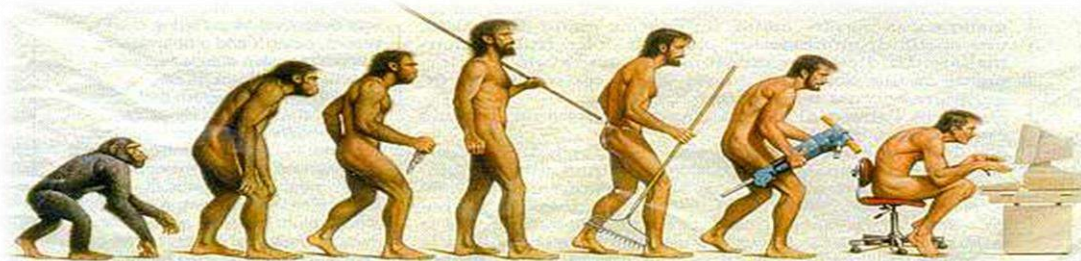


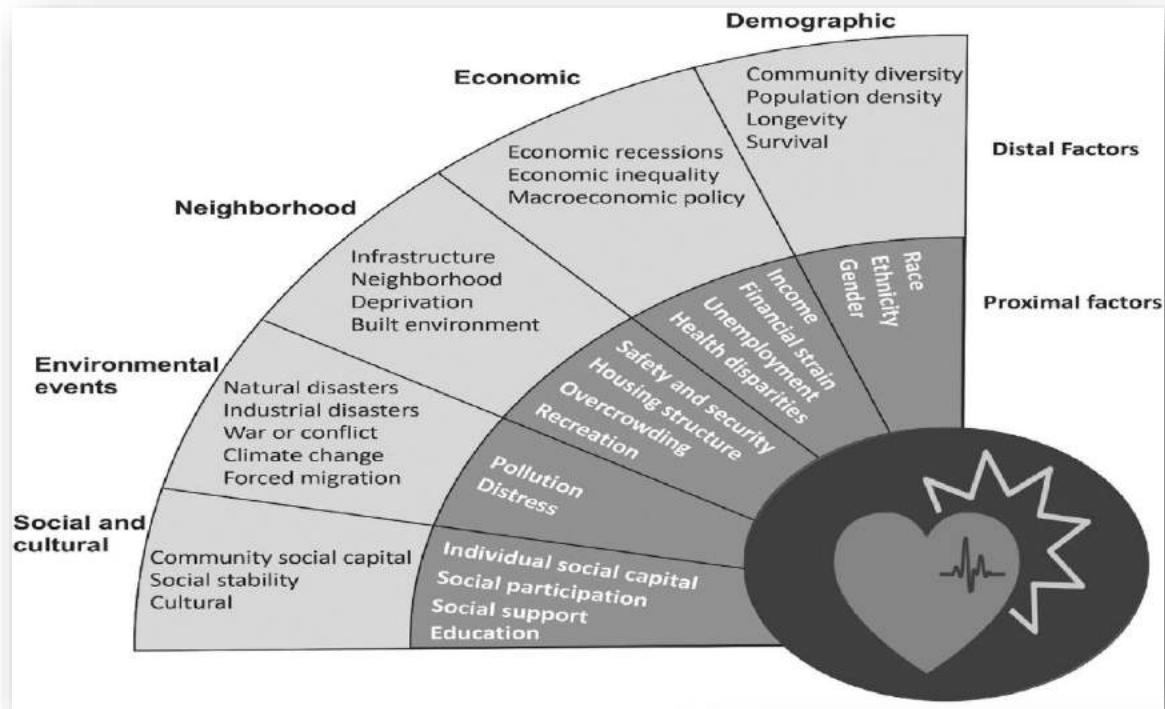


Epidemiological & Nutritional Transition: Impact on CVD in low-resource settings...

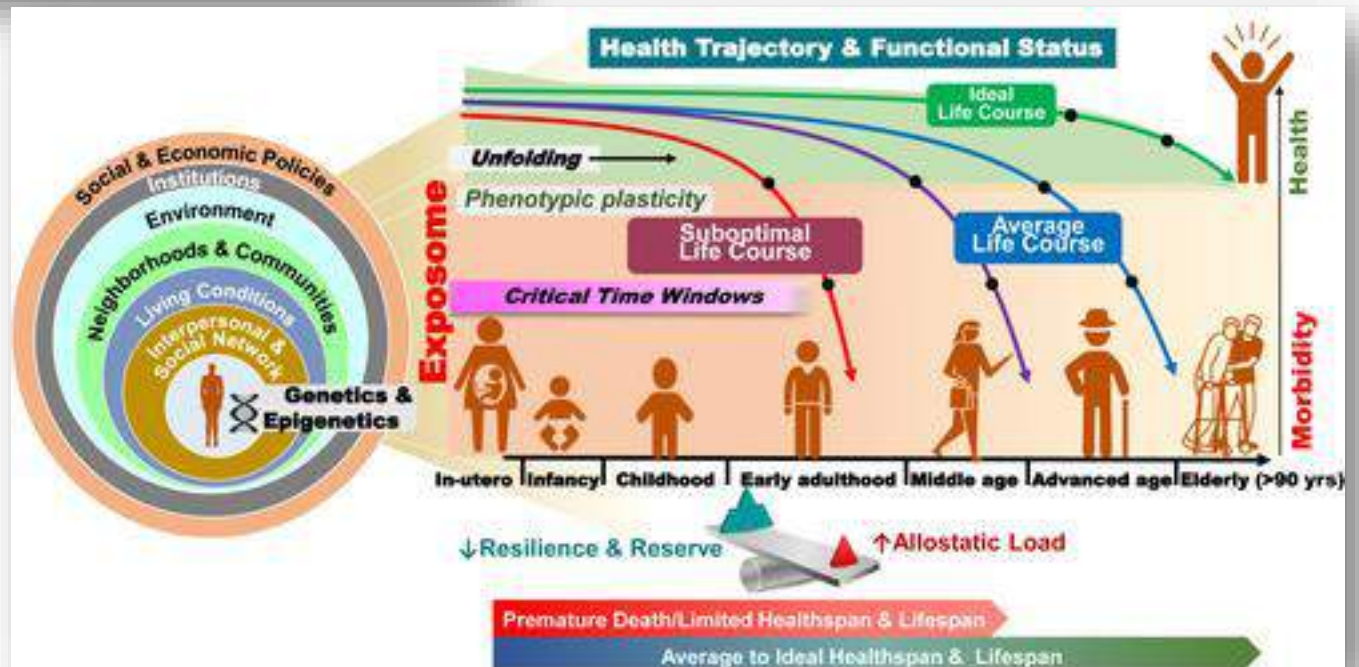


Increasing levels of acculturation, urbanization and affluence





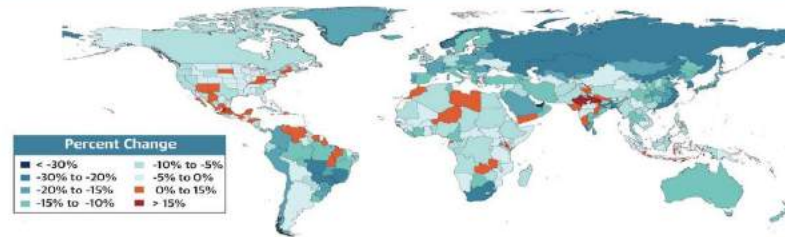
J Am Coll Cardiol 2020; 76:2708-2711



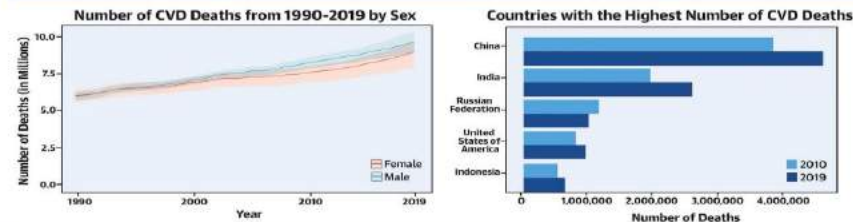


CENTRAL ILLUSTRATION: Cardiovascular Disease Burden Across Time, Location, Cause, and Risk Factor

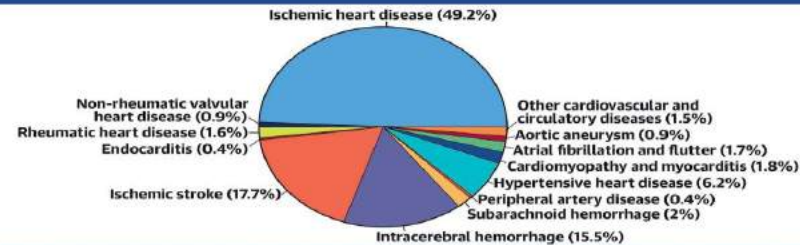
Percent Change in Age-Standardized CVD Death Rate from 2010-2019



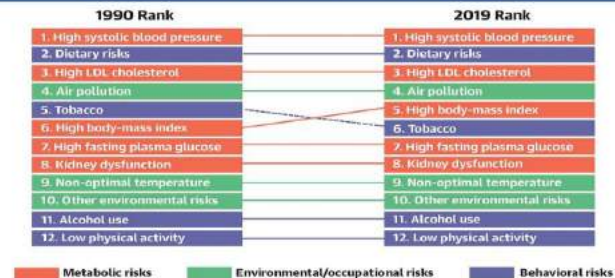
Number of CVD Deaths



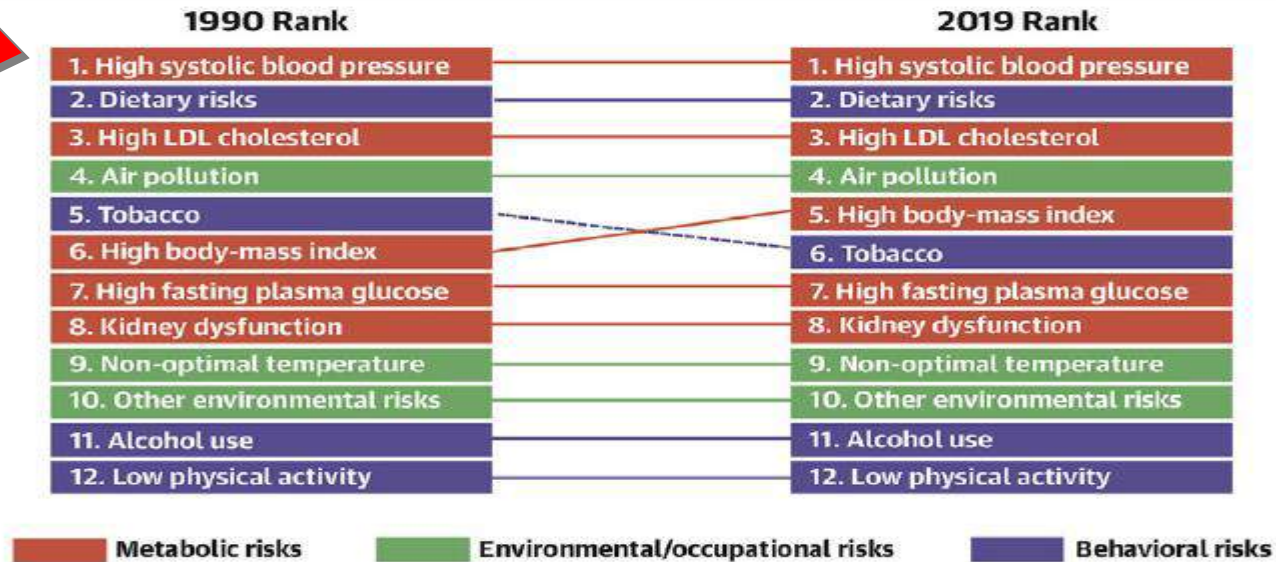
Proportion of CVD Deaths by Cause (2019)



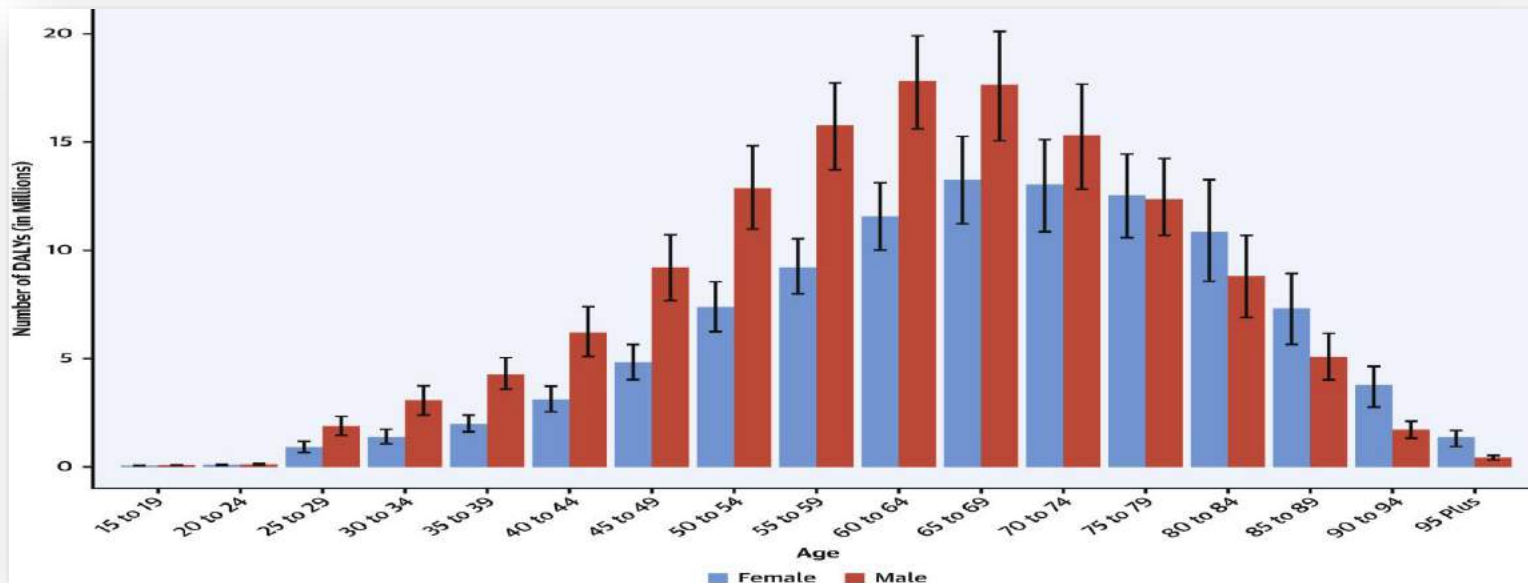
CVD Burden Attributable to Modifiable Risk Factors



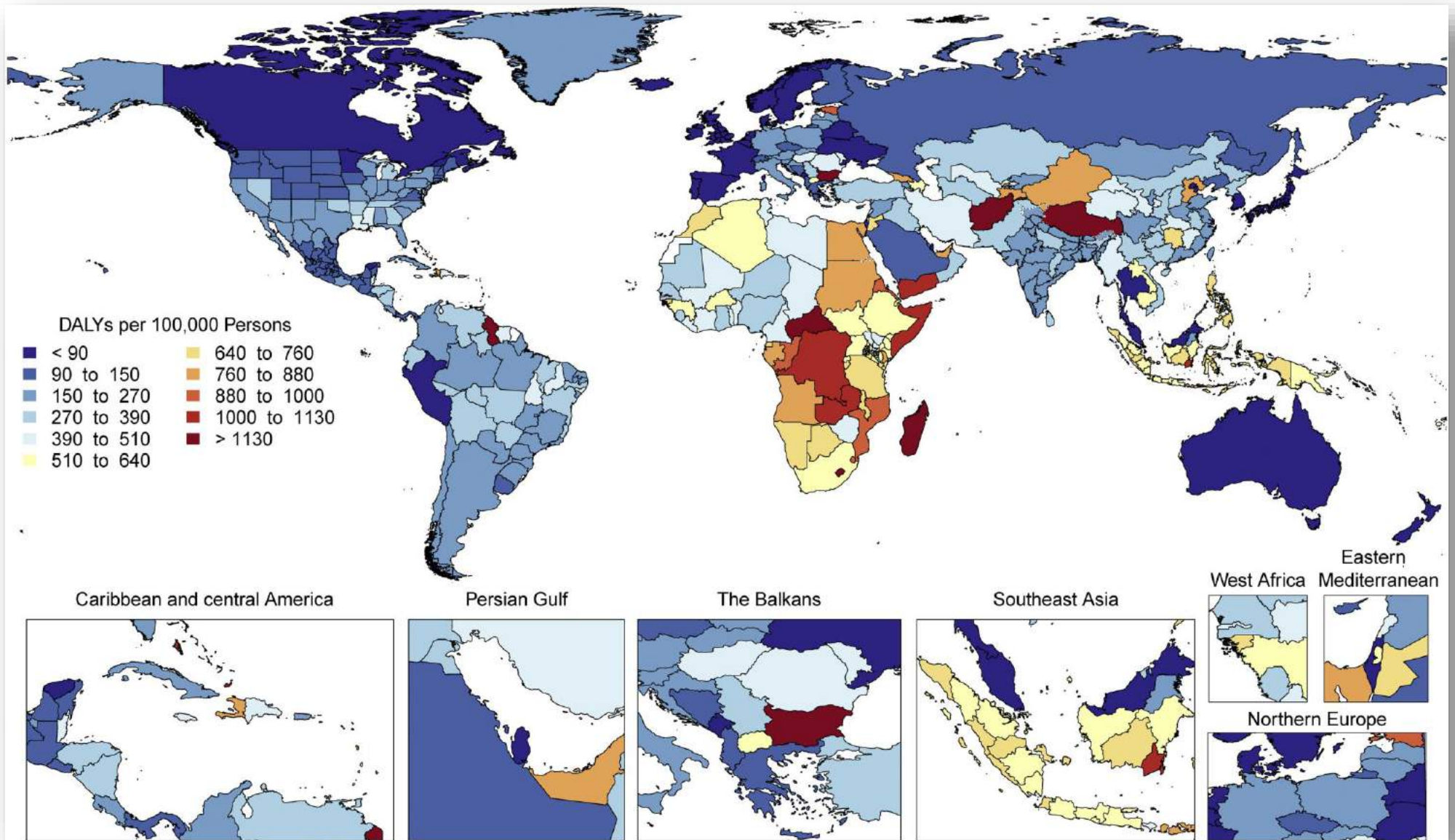
CVD Burden Attributable to Modifiable Risk Factors



DALYs Due to High Systolic Blood Pressure in 2019 by Age

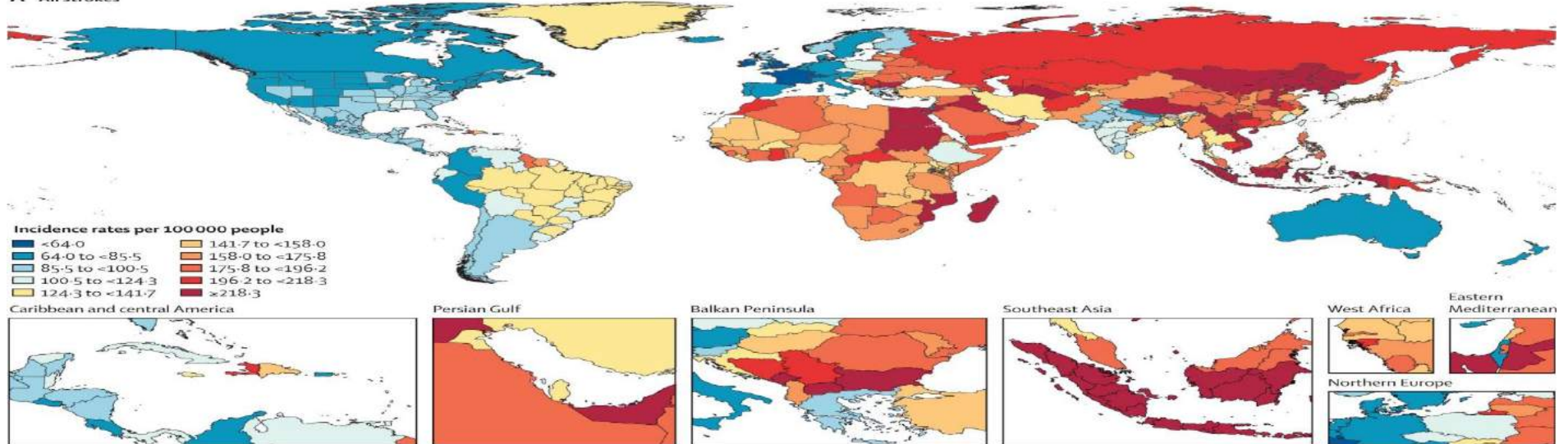


Global Map of Age-Standardized DALYs Due to Hypertensive Heart Disease in 2019

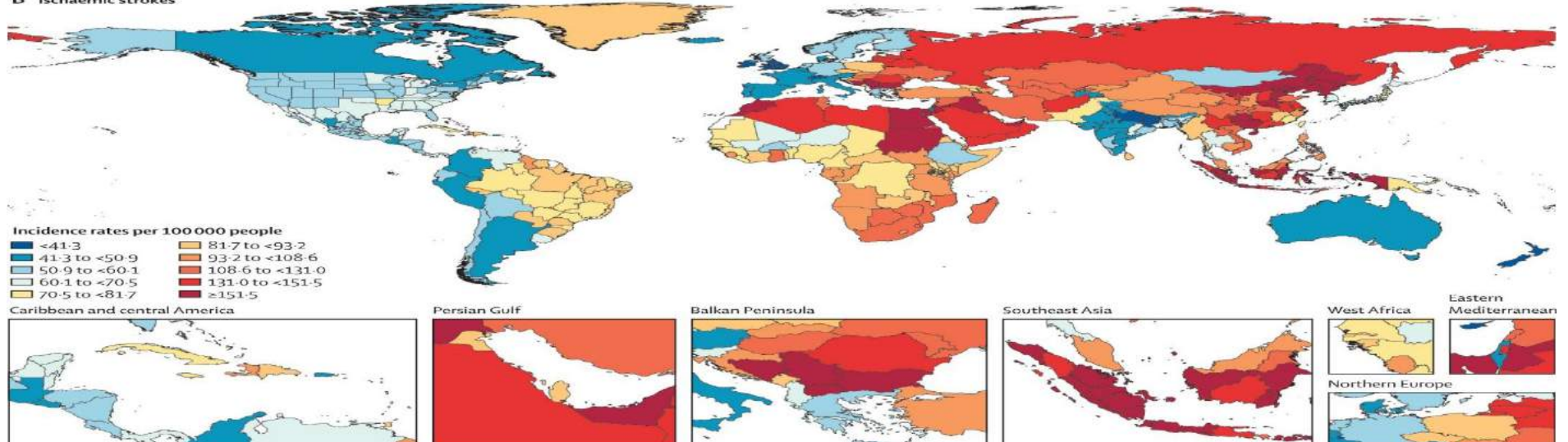


Stroke incidence rates per 100 000 people, for both sexes, 2019

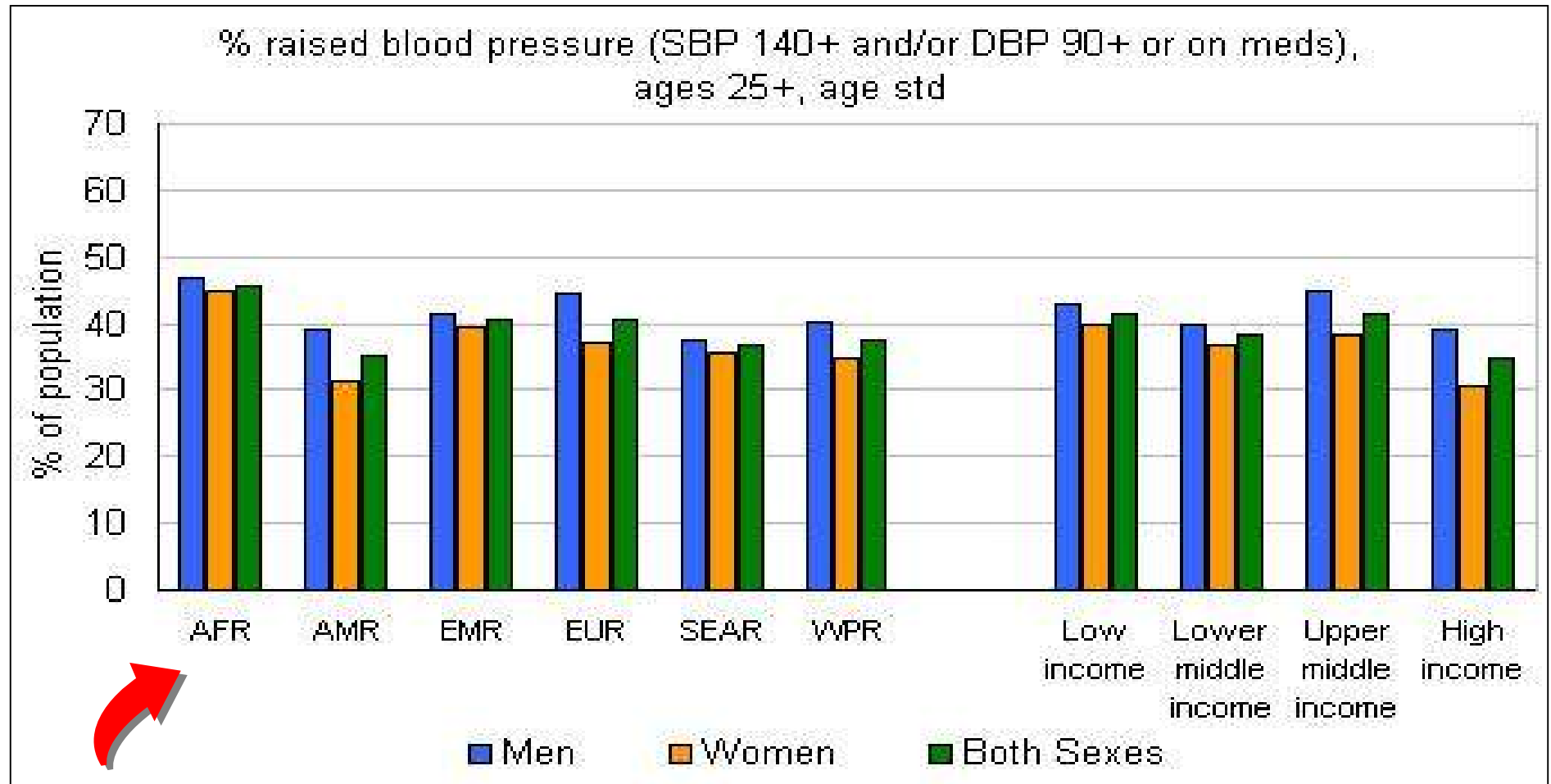
A All strokes



B Ischaemic strokes

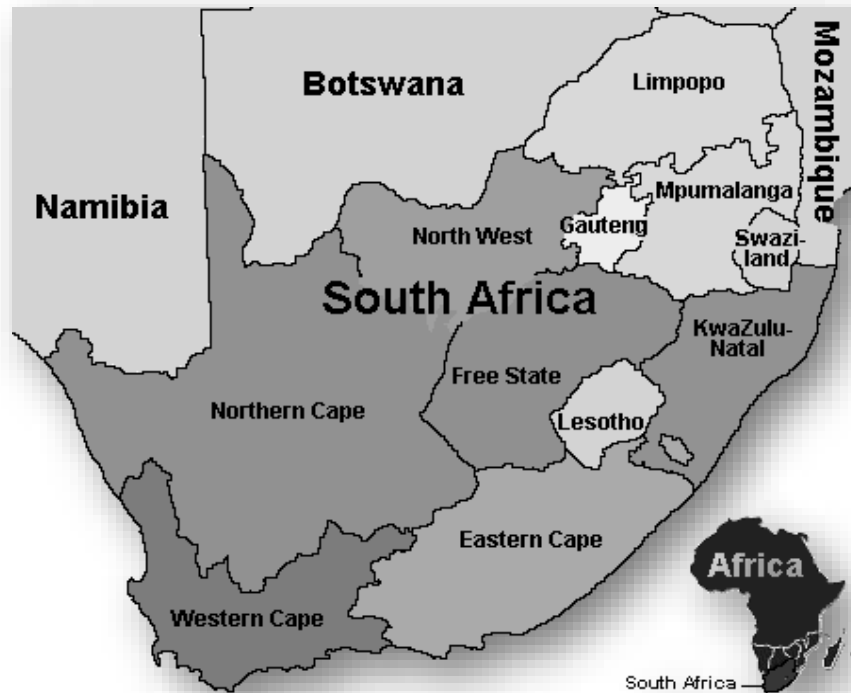


Prevalence of Hypertension in WHO regions



Geographic variation of hypertension in South Africa

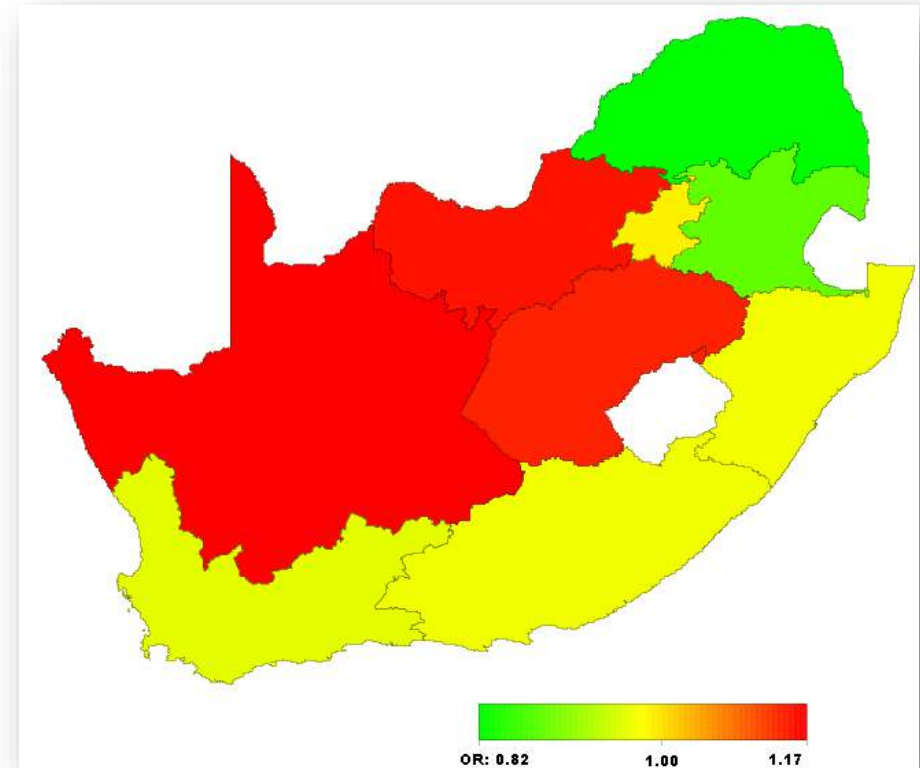
Demographic & Health Survey, N=13,596



Hypertension prevalence = 30.4%

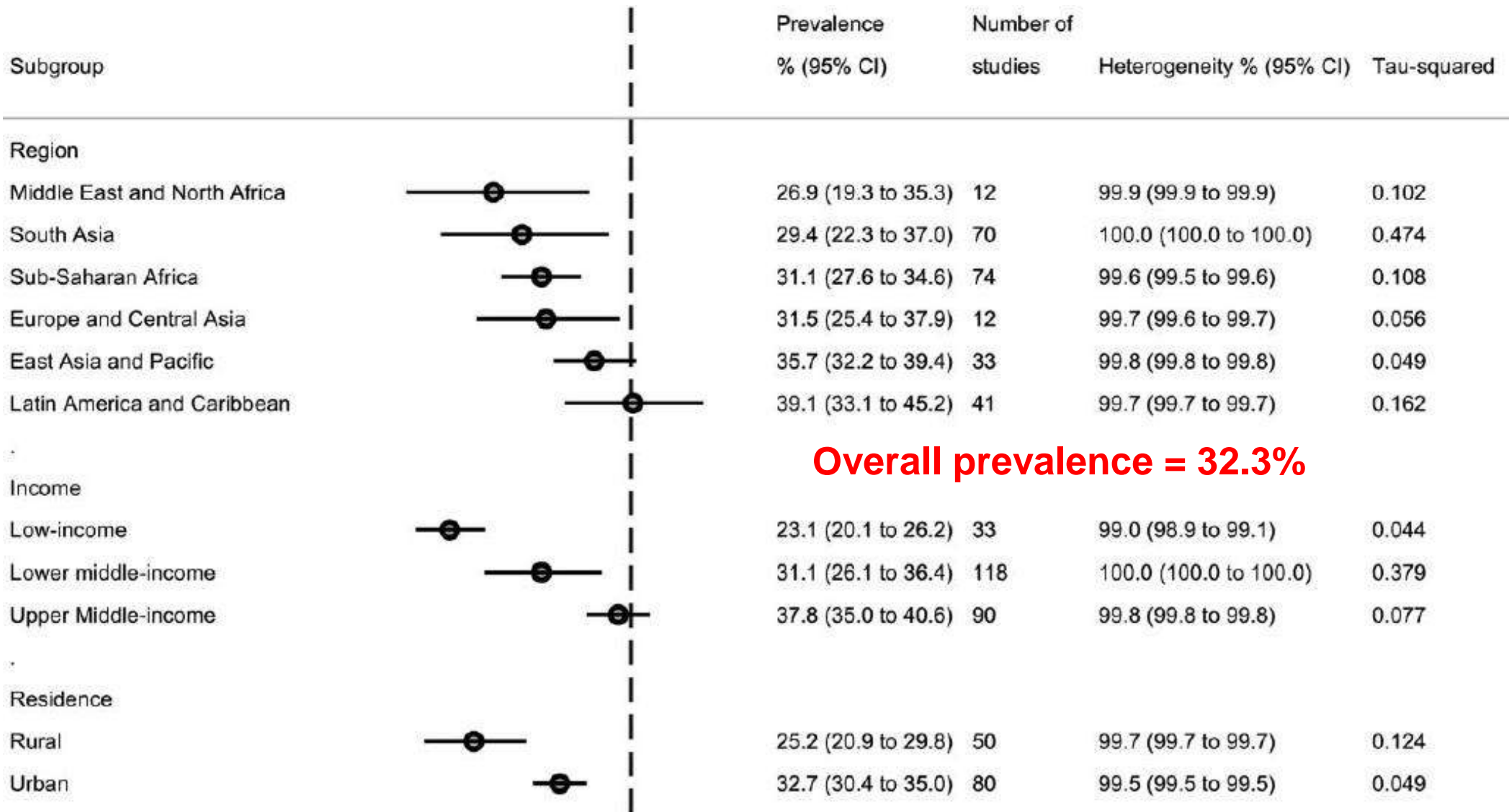
Women = 32.6%

Men = 27.4%

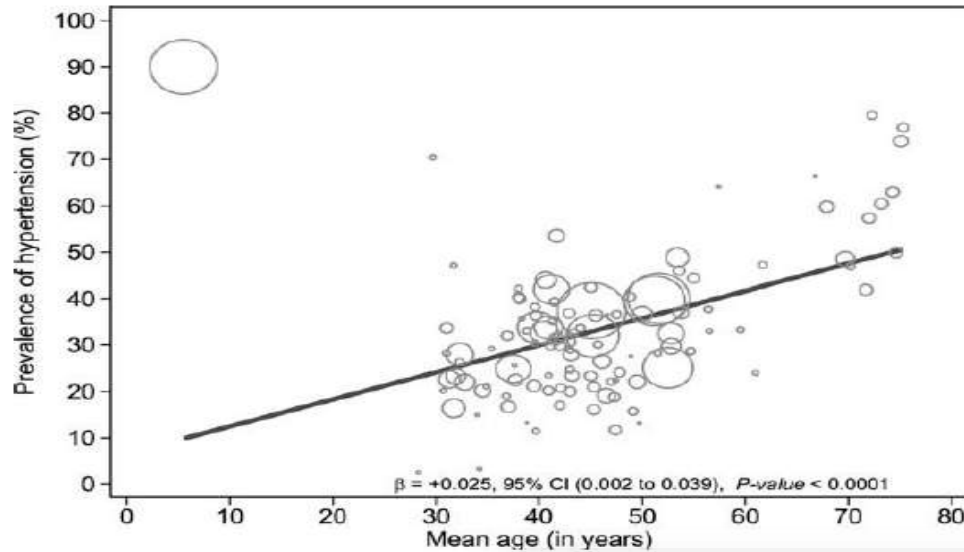


Red coloured – high risk
Green coloured – low risk

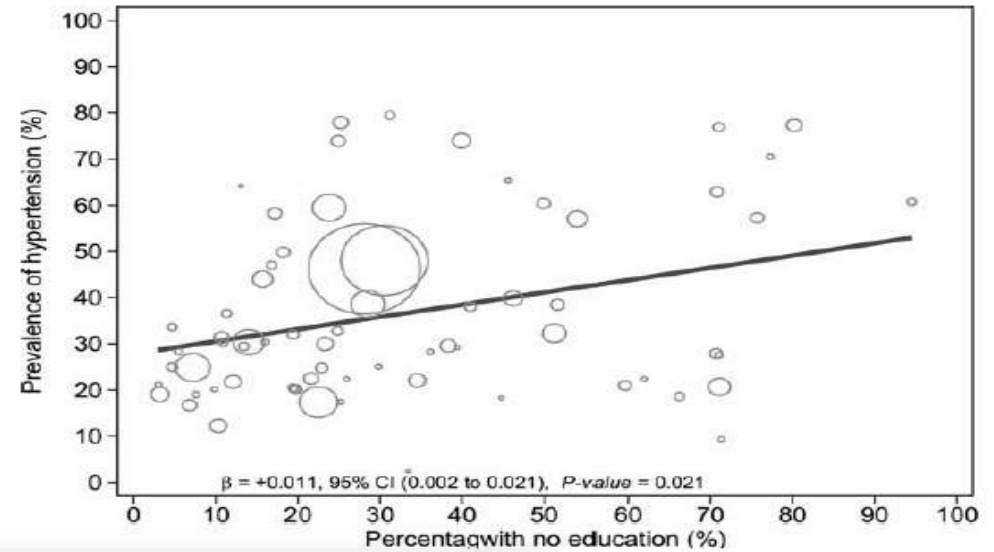
Prevalence of Hypertension in LMICs



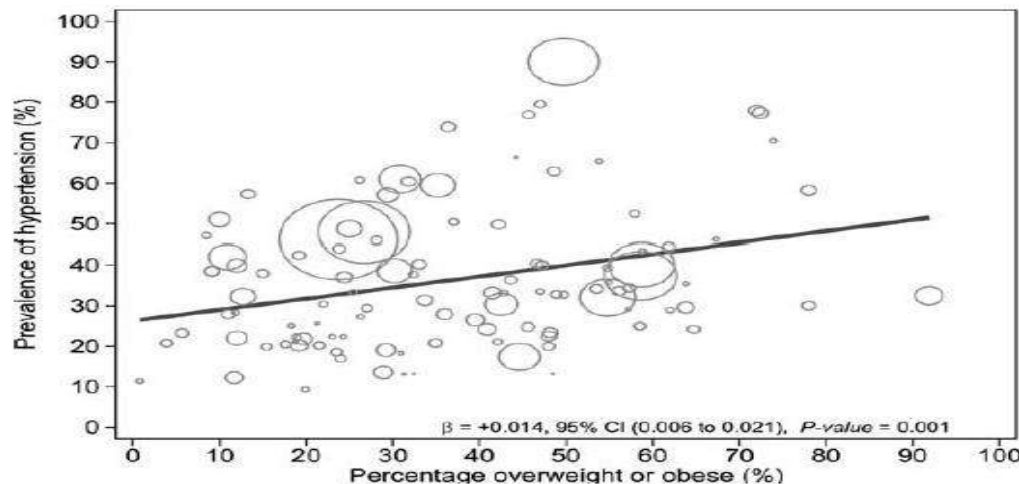
Prevalence of Hypertension in LMICs



Age



Education



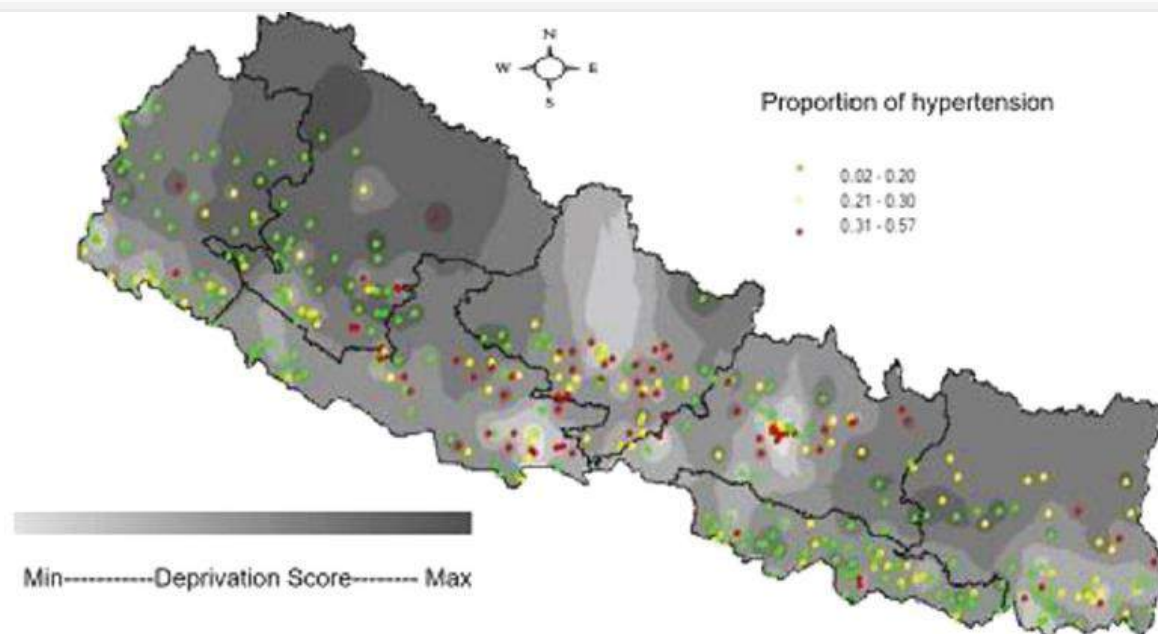
ARTICLE

Special Issue: Current evidence and perspectives for hypertension management in Asia

Does the place of residence influence your risk of being hypertensive? A study-based on Nepal Demographic and Health Survey

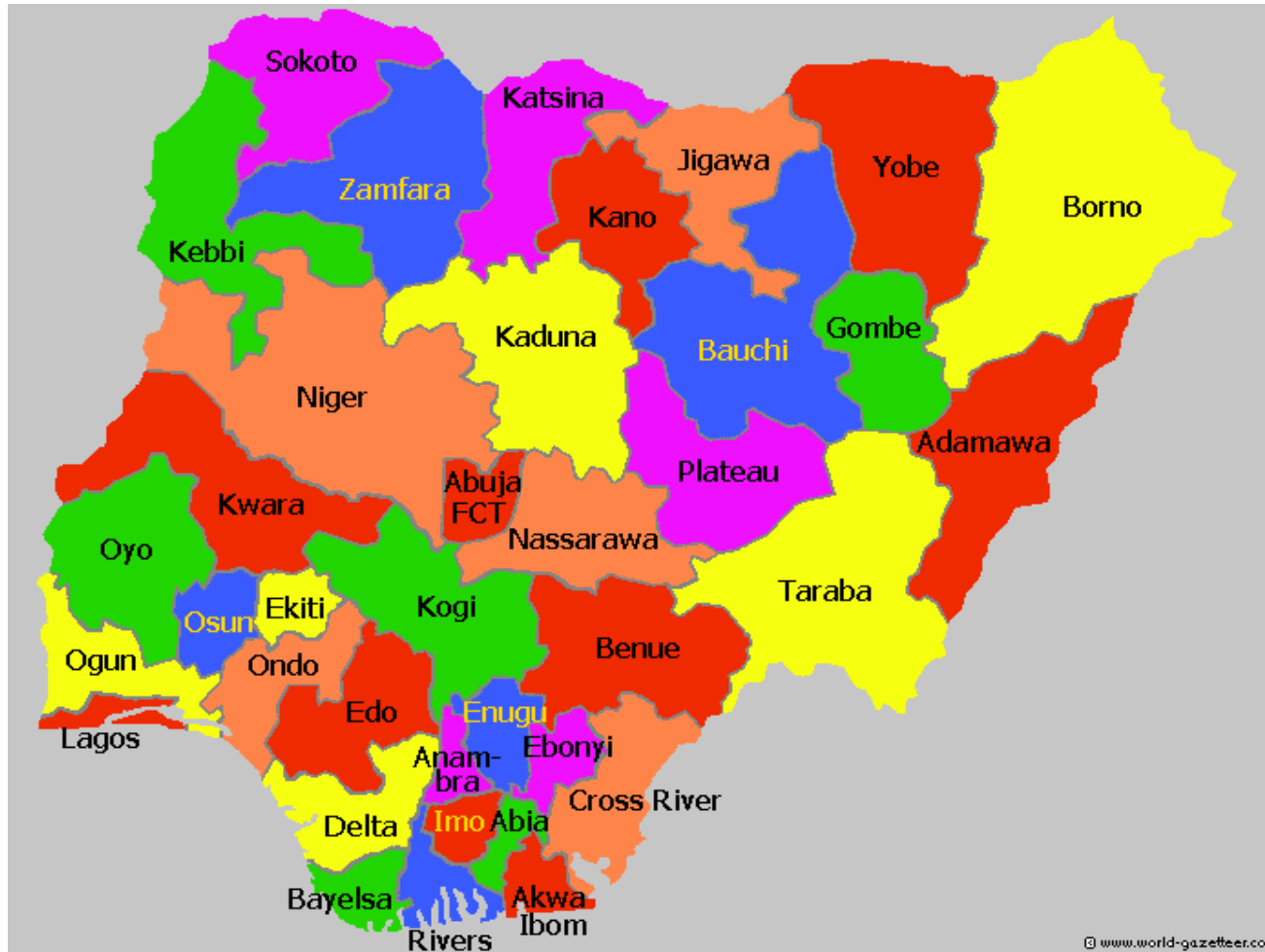
Ishor Sharma¹ · M. Karen Campbell^{1,2,3,4,5} · Yun-Hee Choi¹ · Isaac Luginaah⁶ · Jason Mulimba Were¹ · Juan-Camilo Vargas- Gonzalez¹ · Saverio Stranges^{1,7,8,9,10}

Fig. 1 Area level deprivation and hypertension prevalence in Nepal- NDHS-2016



Geographic Variation of Overweight/Obesity in Nigeria

2008 Demographic & Health Survey, N=29,967 women (15-49y)



Prevalence of combined
overweight and obesity = **20.9%**

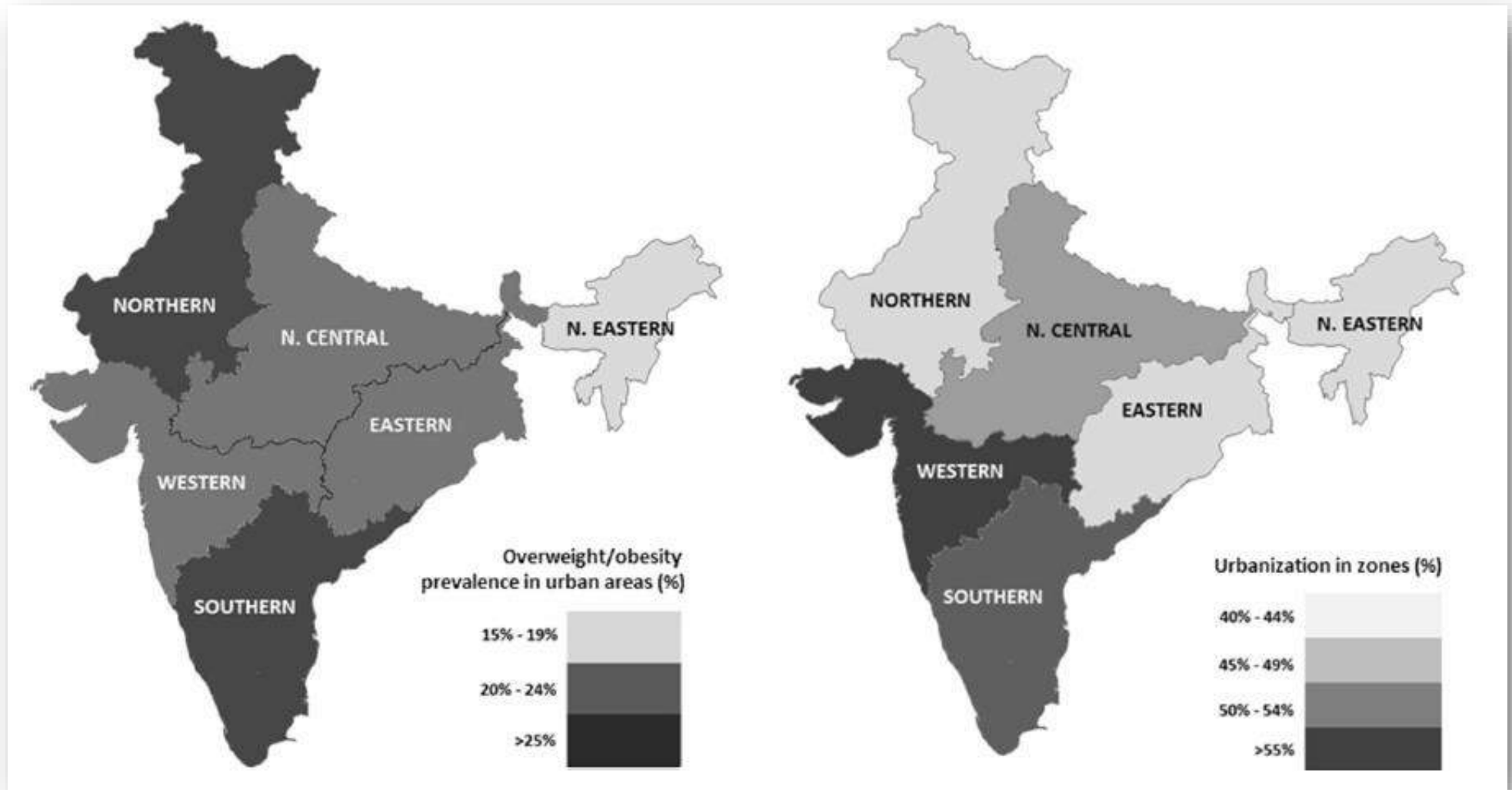


Odds Ratios of combined overweight/obesity

Variable	Overweight/Obese (N=5,836)	Normal-weight (N=18,778)	P-value	Marginal OR & 95%CI	Posterior OR & 95% CR
Mean age (SD)	31.3(6.6)	28.9(7.1)	P<0.001		
Education			P<0.001		
No education	1808(15.7)	9730(84.3)		1.00	1.00
Primary education	1369(23.2)	4543(76.8)		1.15(1.03, 1.28)	1.17(1.04, 1.32)
Secondary education	2009(34.1)	3881(65.9)		1.43(1.27, 1.62)	1.49(1.32, 1.73)
Higher education	650(51.0)	624(49.0)		1.64(1.37, 1.96)	1.68(1.38, 2.00)
Place of residence			P<0.001		
Rural	3336(18.8)	14413(81.2)		1.00	1.00
Urban	2500(36.4)	4365(63.6)		1.24(1.14, 1.35)	1.24(1.14, 1.36)
Religion			P<0.001		
Catholic	724(31.5)	1577(68.5)		1.00	1.00
Other Christian	2604(30.1)	6045(69.9)		0.77(0.68, 0.88)	0.77(0.68, 0.89)
Islam	2372(18.2)	10662(81.8)		0.73(0.62, 0.86)	0.74(0.63, 0.91)
Traditionalist	88(19.6)	360(80.4)		0.73(0.55, 0.97)	0.75(0.58, 0.97)
Other	14(38.9)	22(61.1)		1.39 (0.68, 2.83)	1.49 (0.68, 2.79)
Wealth Index			P<0.001		
Poorest	718(12.0)	5279(88.0)		1.00	1.00
Richest	1709(47.5)	1891(52.5)		3.55(3.03, 4.15)	3.45(2.98, 4.05)
Ethnicity			P<0.001		
Ekoi	67(16.7)	334(83.3)		1.00	1.00
Igala	99(31.5)	215(68.5)		8.15(4.52, 14.7)	7.47(3.98, 12.3)
Igbo	1091(39.0)	1708(61.0)		7.03(4.22, 11.7)	6.41(4.19, 10.4)
State of residence			P<0.001		
Yobe	87(10.5)	741(89.5)		1.00	1.00
Osun	82(19.3)	343(80.7)		0.64(0.44, 0.95)	0.48(0.36, 0.61)
Cross River	133(24.2)	417(75.8)		4.49(2.80, 7.19)	2.32(1.62, 3.40)
Lagos	357(50.2)	354(49.8)		1.68(1.23, 2.30)	1.14(0.94, 1.37)

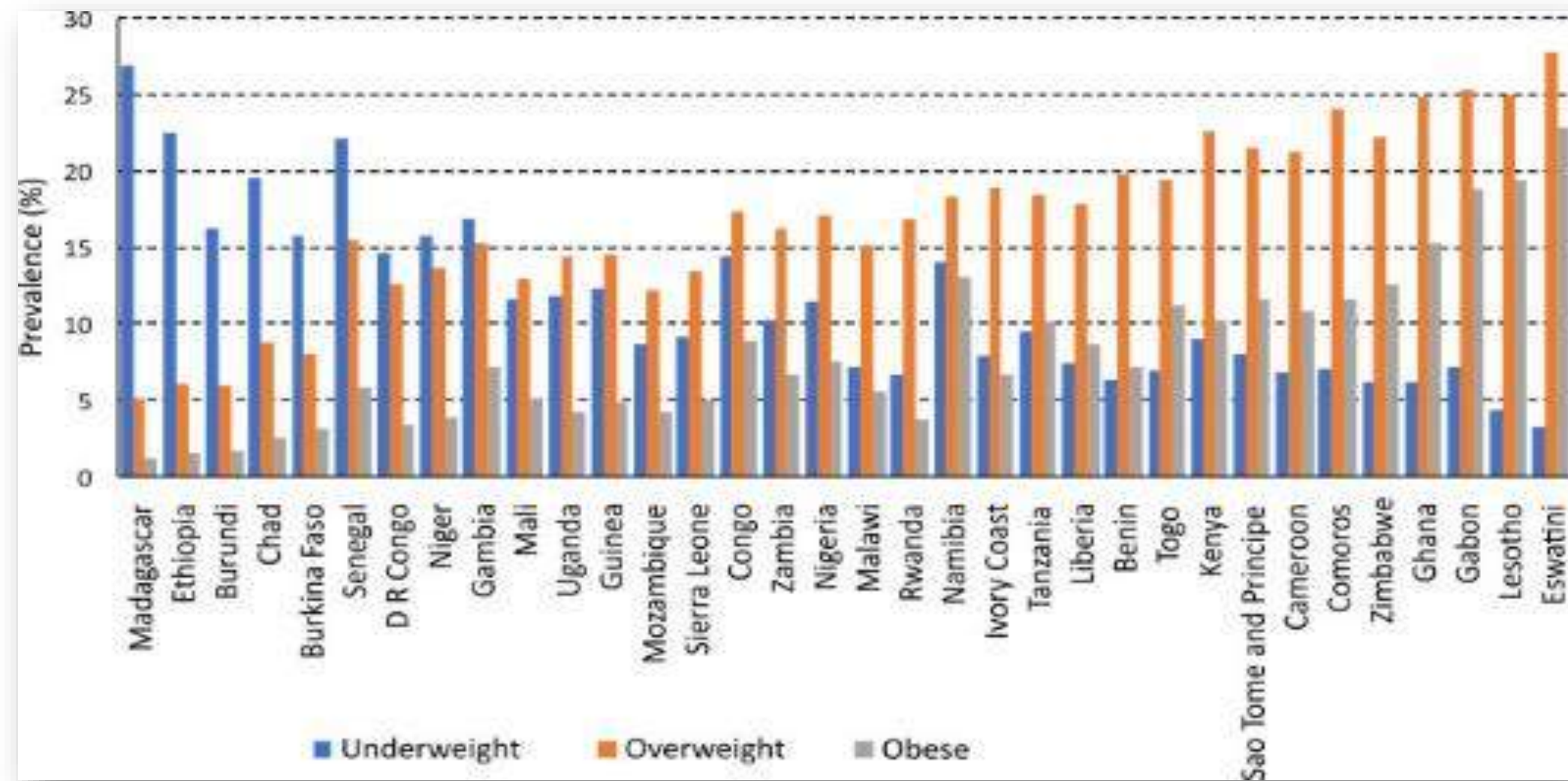
Urbanization & Geographic Variation of Overweight/Obesity in India

2005-2006 Demographic & Health Survey (DHS)



Urban areas consistently associated with a higher risk of overweight/obesity across all zones

Fertility as a key predictor of the double burden of malnutrition among women of child-bearing age in sub-Saharan Africa

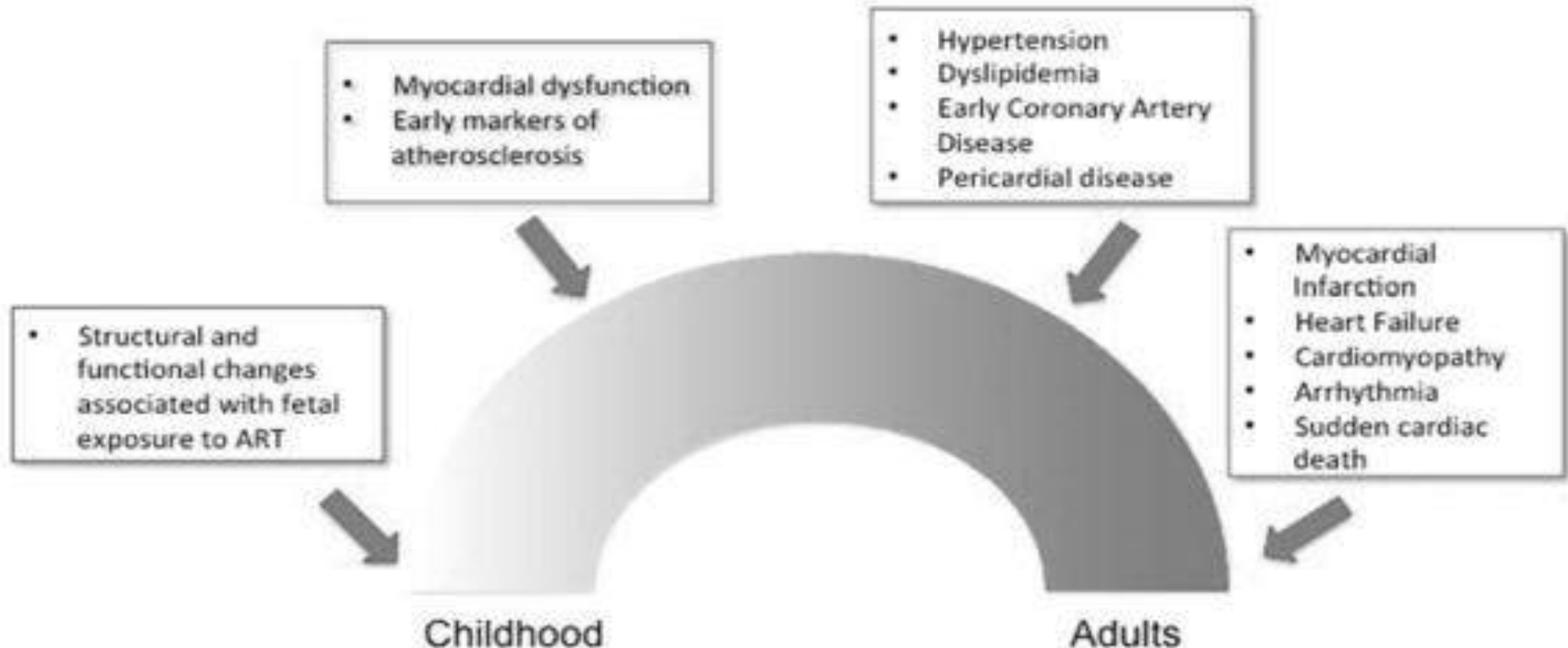


Features of cardiovascular disease in low-income and middle-income countries (LMICs) in adults and children living with HIV

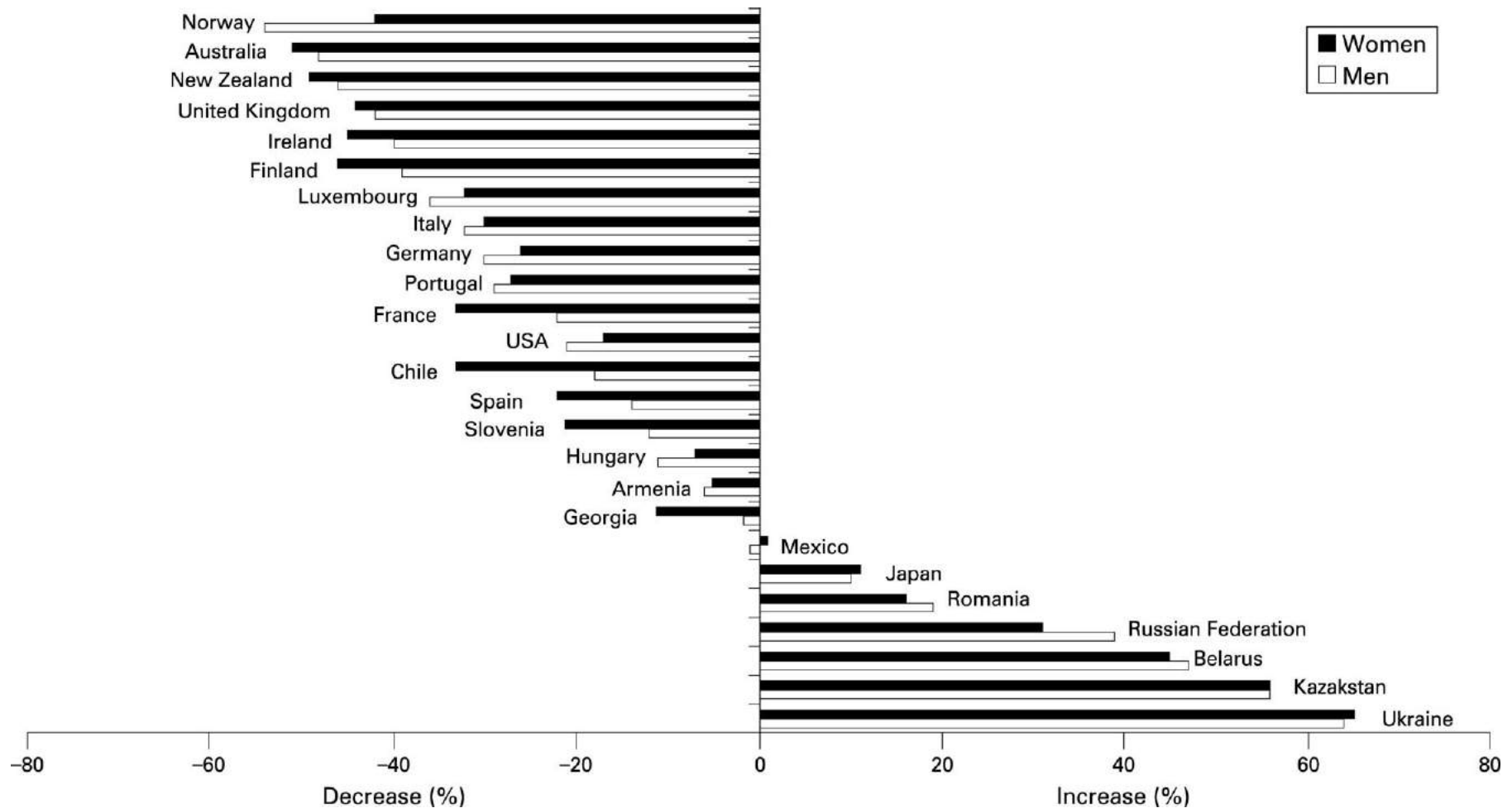
McCrary, Andrew; Nduka, Chidozie; Stranges, Saverio; Bloomfield, Gerald

Current Opinion in HIV & AIDS. 2017;12(6):579-584

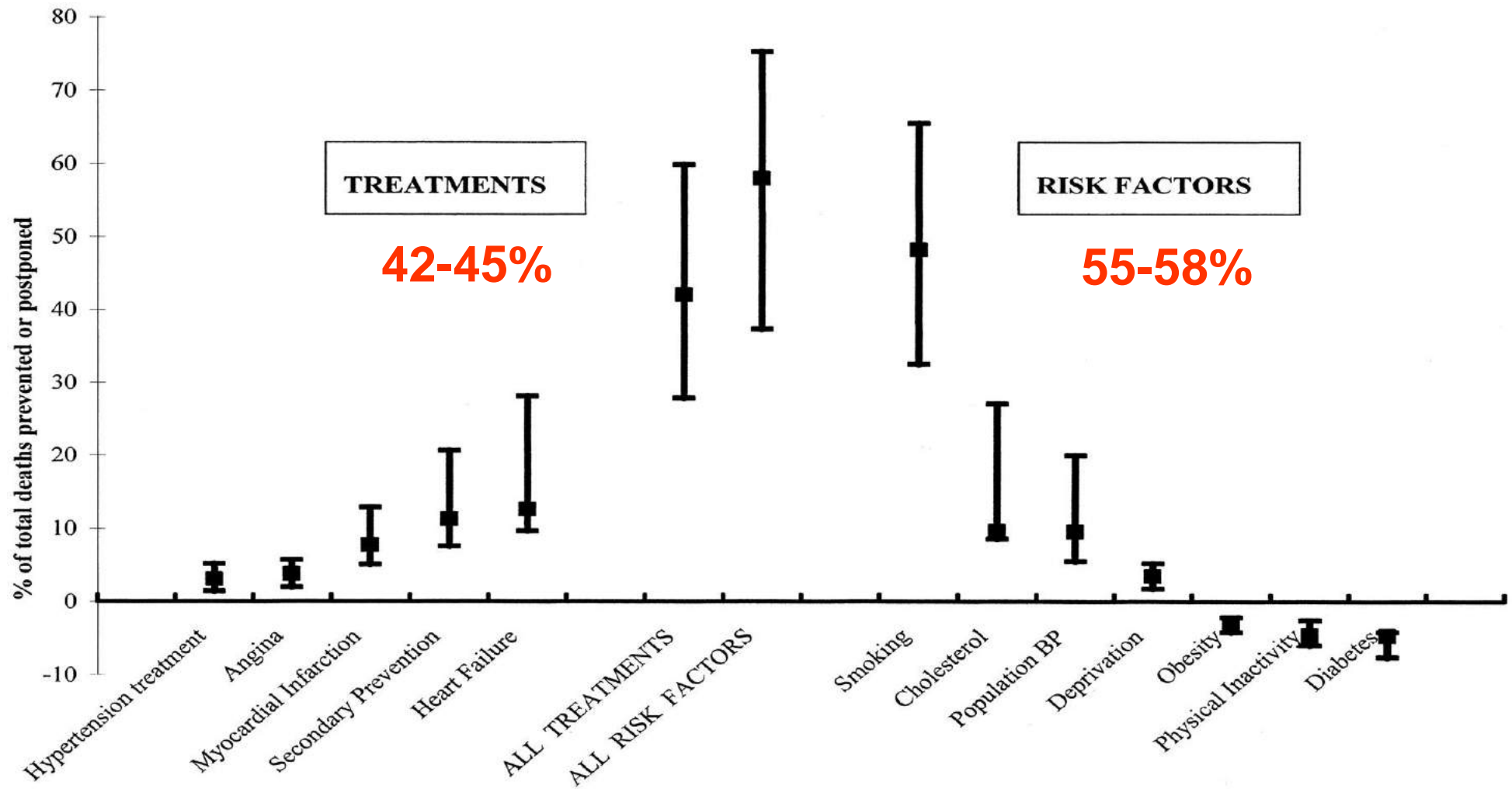
CVD risk shortens healthy life-expectancy for PLHIV beginning with in utero



Changes in coronary heart disease mortality, in men and women aged 35–74, between 1990 and 2000



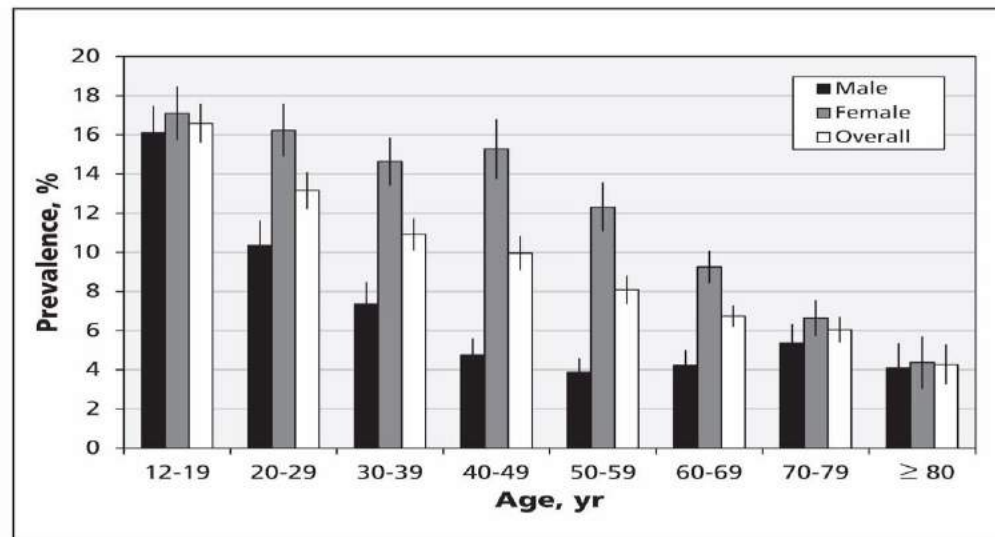
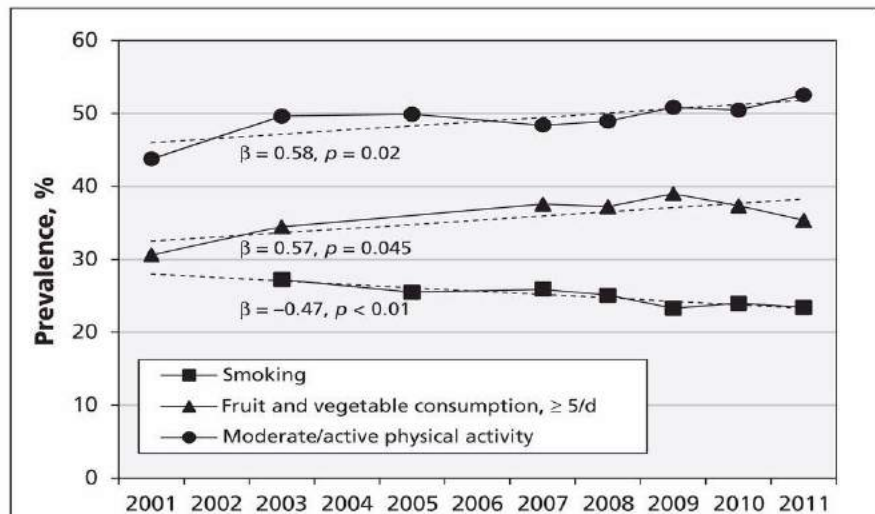
Explaining declining trends in CVD mortality in Western Countries



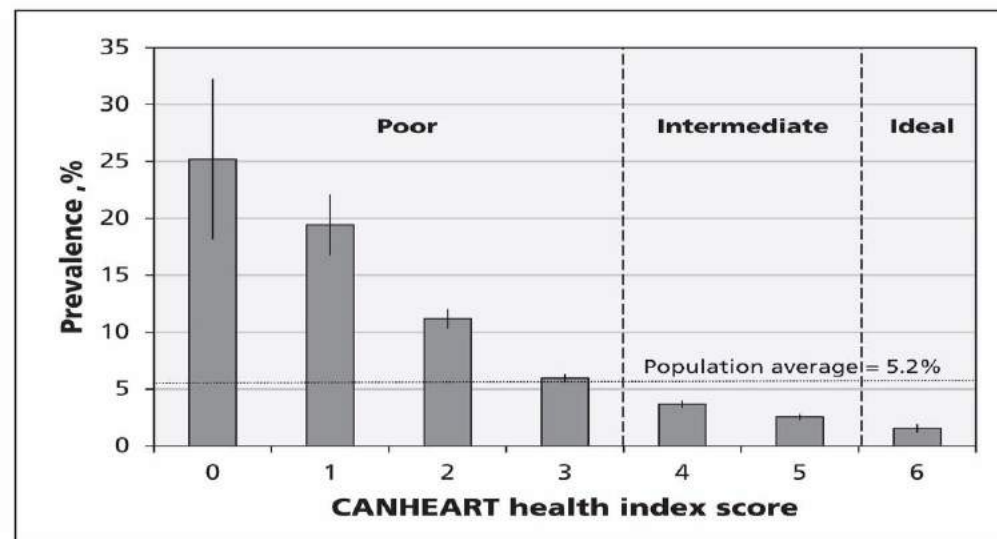
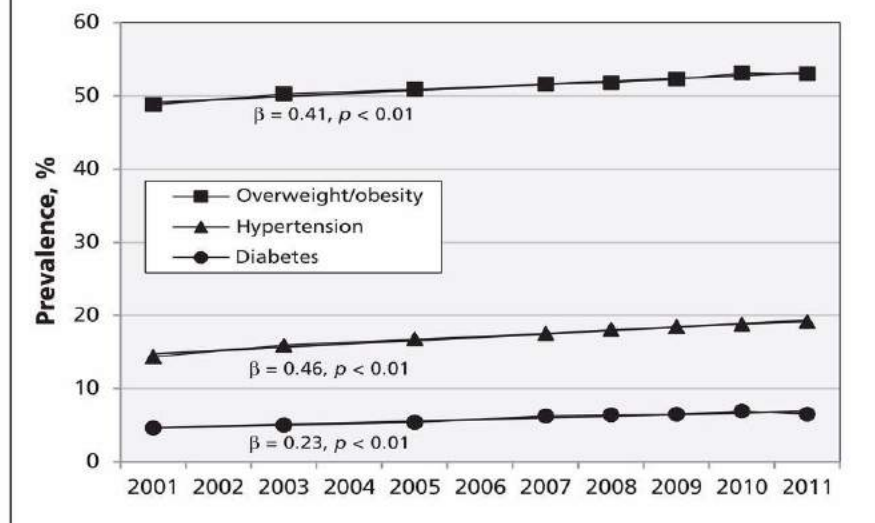


Cardiovascular Health of the Canadian Population

Canadian Community Health Survey 2003–2011








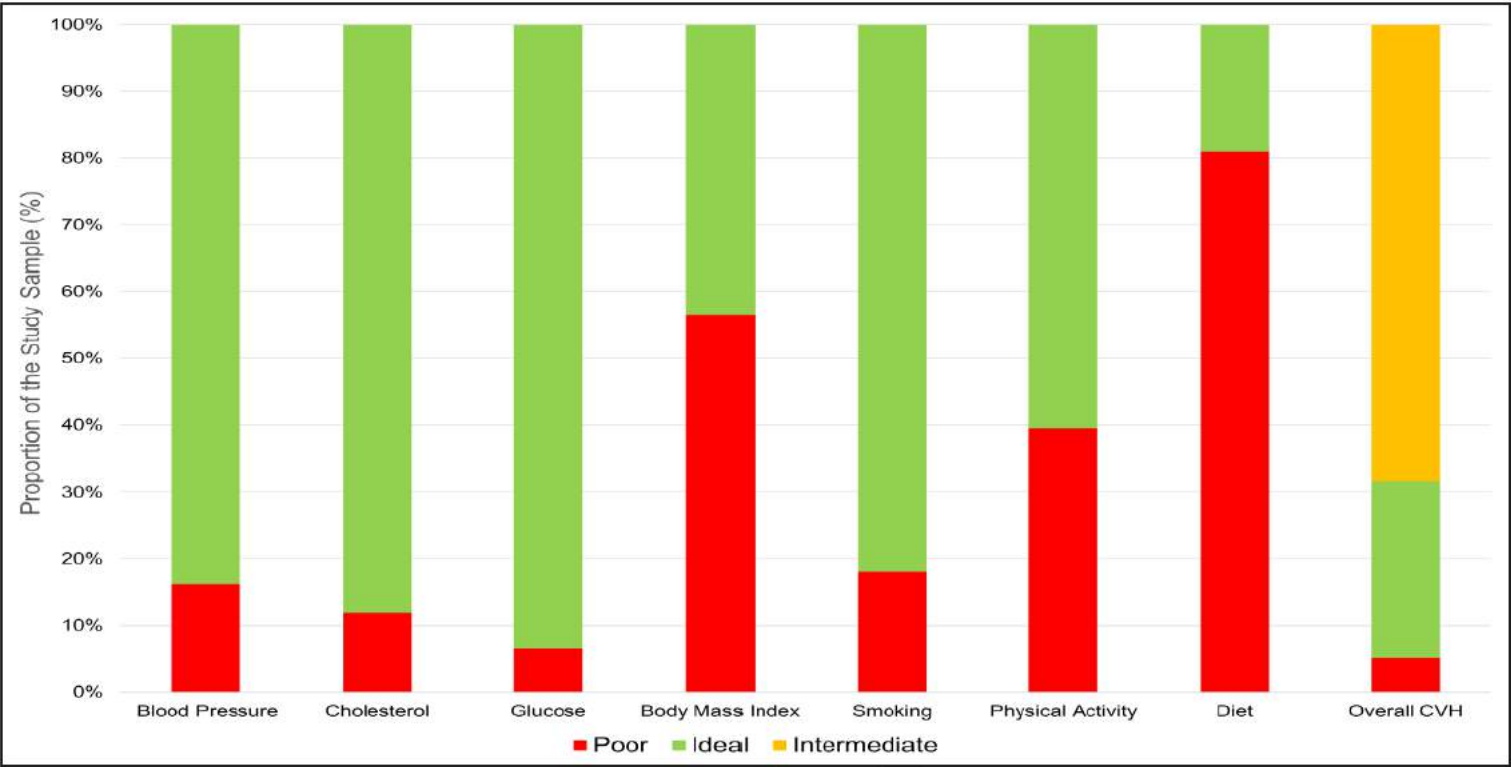
Fewer than 1 in 10 Canadian adults and 1 in 5 Canadian youth are in ideal cardiovascular health



ORIGINAL RESEARCH

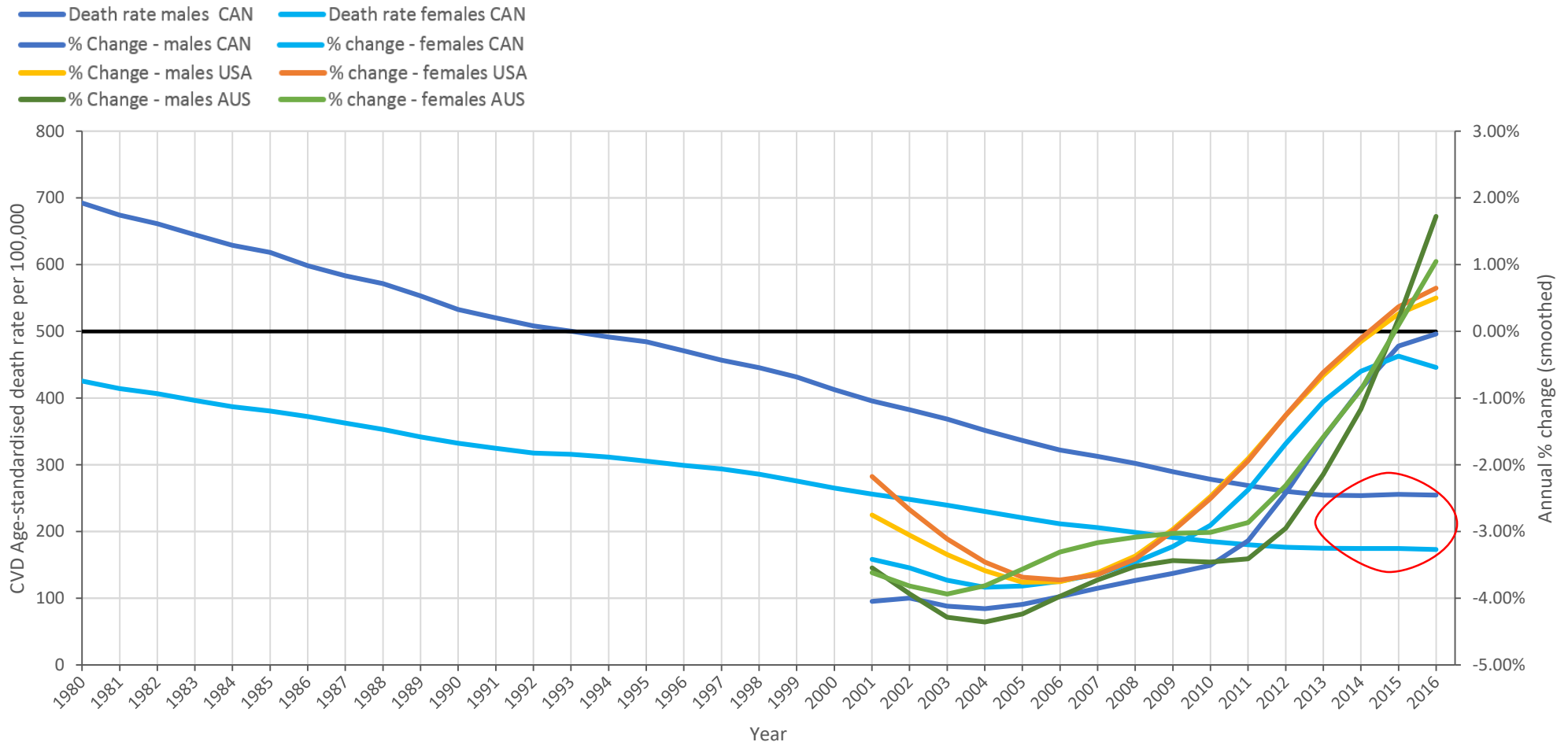
Influence of the Social Environment on Ideal Cardiovascular Health

Sarah S. Singh , MD, PhD, MPH; Saverio Stranges , MD, PhD; Piotr Wilk , PhD; Anthony S. L. Tang , MD; Stephanie J. Frisbee , PhD, MSc



End of the long-term decline in CVD mortality?

Cardiovascular disease death rates, Canada, 1980-2016

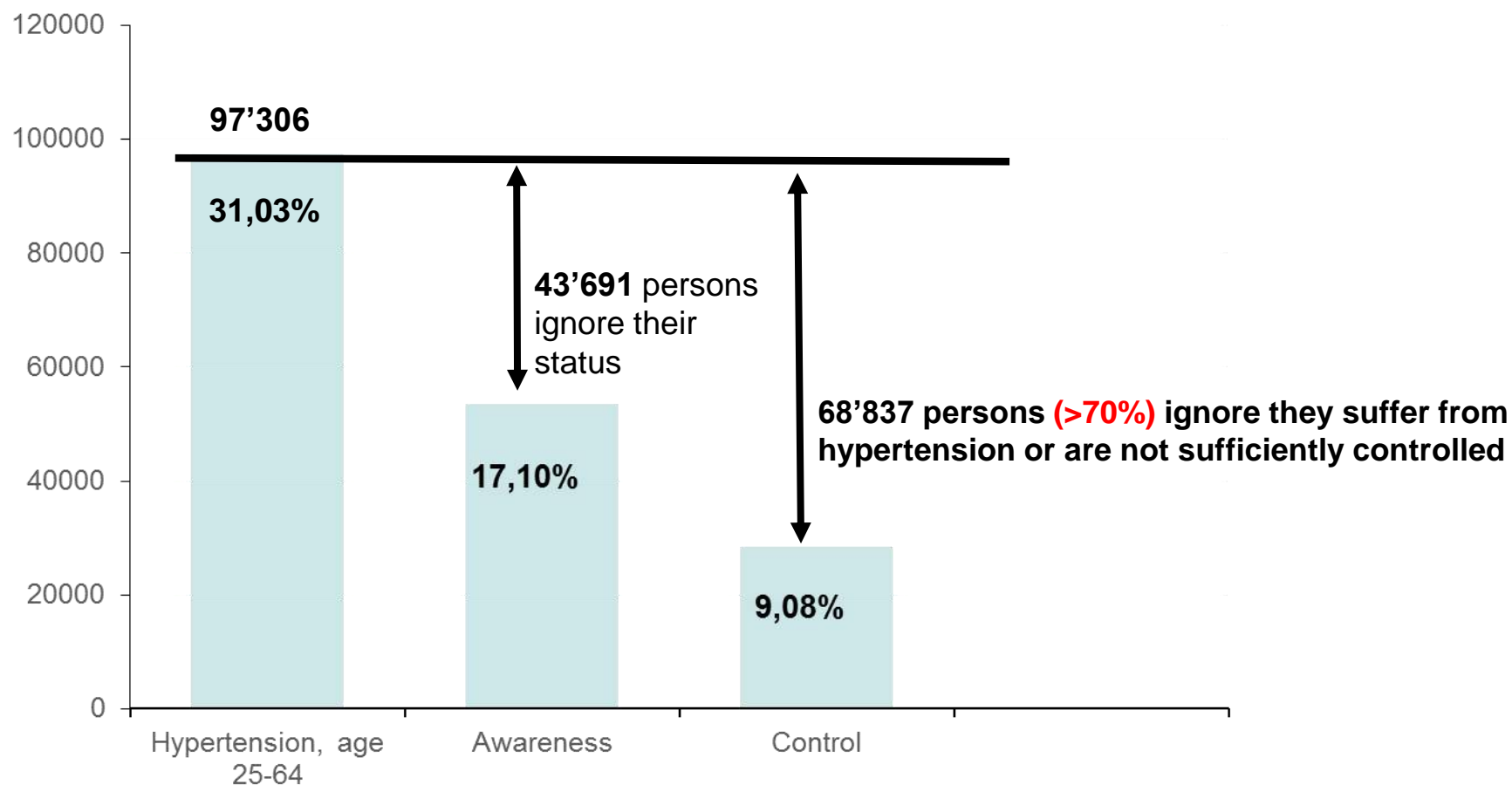


Global Burden of Disease Study, 2017-18

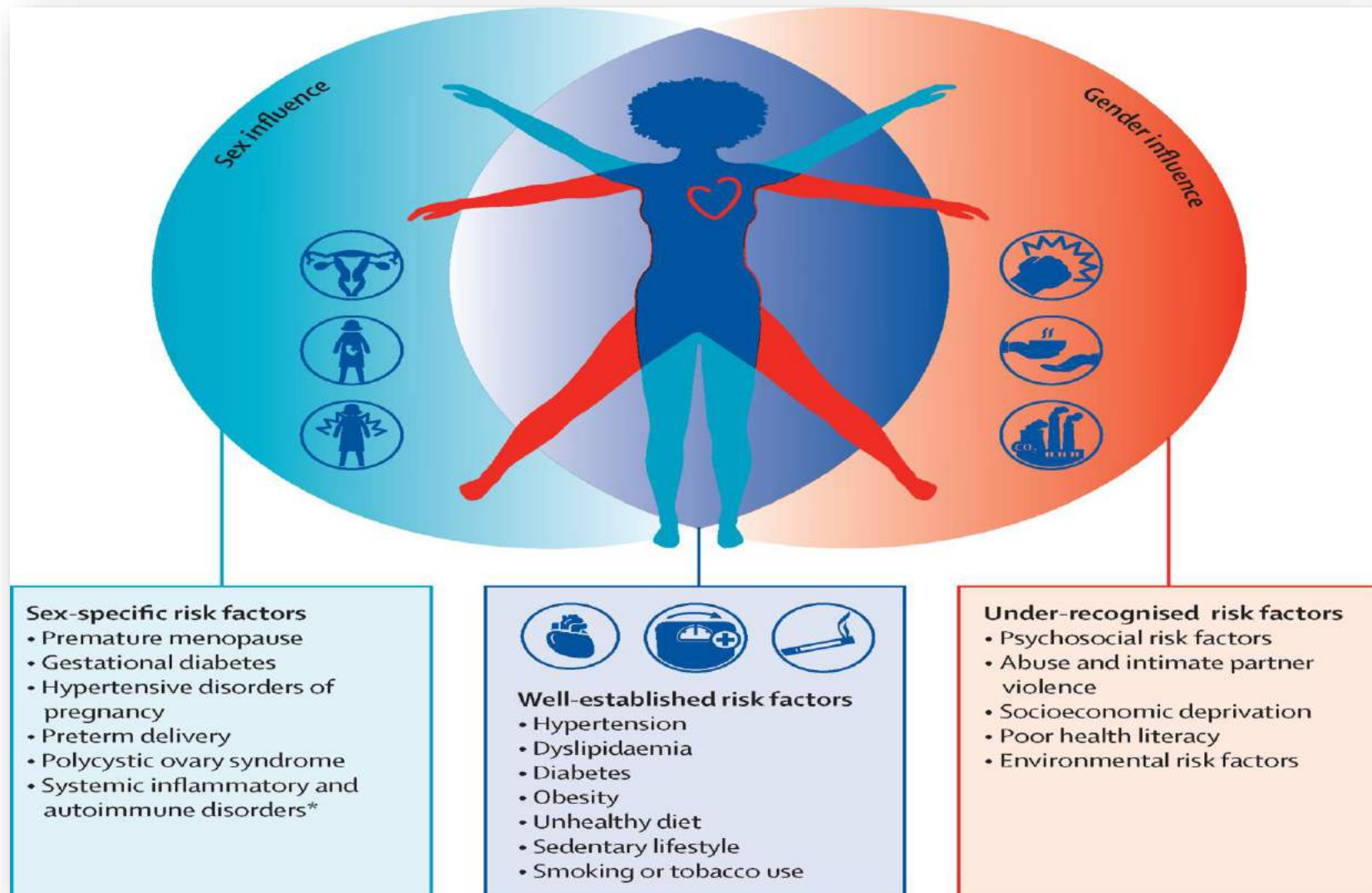


Hypertension Burden in Luxembourg

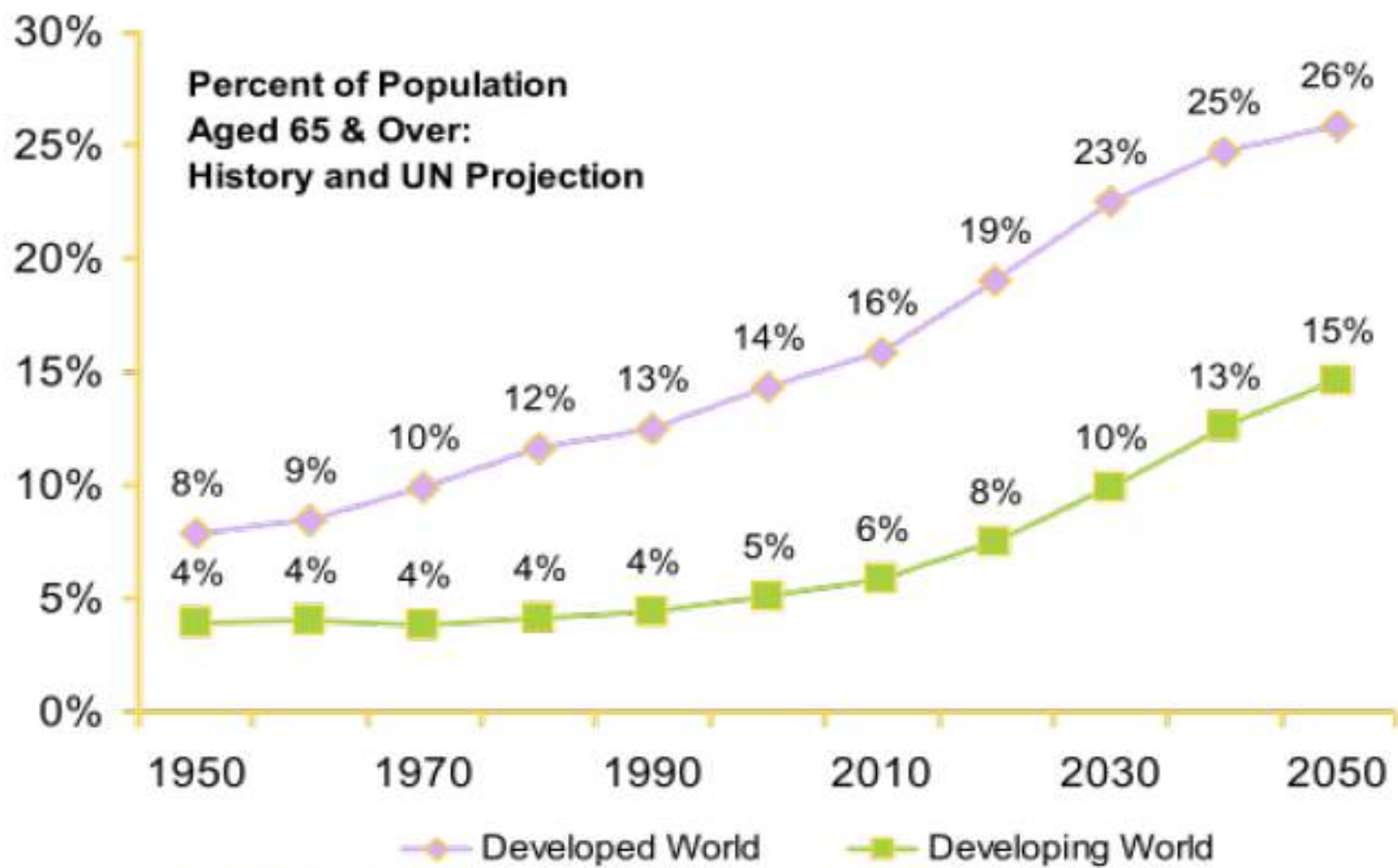
European Health Examination Survey (2013-15, age 25-64)



Cardiovascular disease prevention in women: a rapidly evolving scenario



Trends in Global Aging

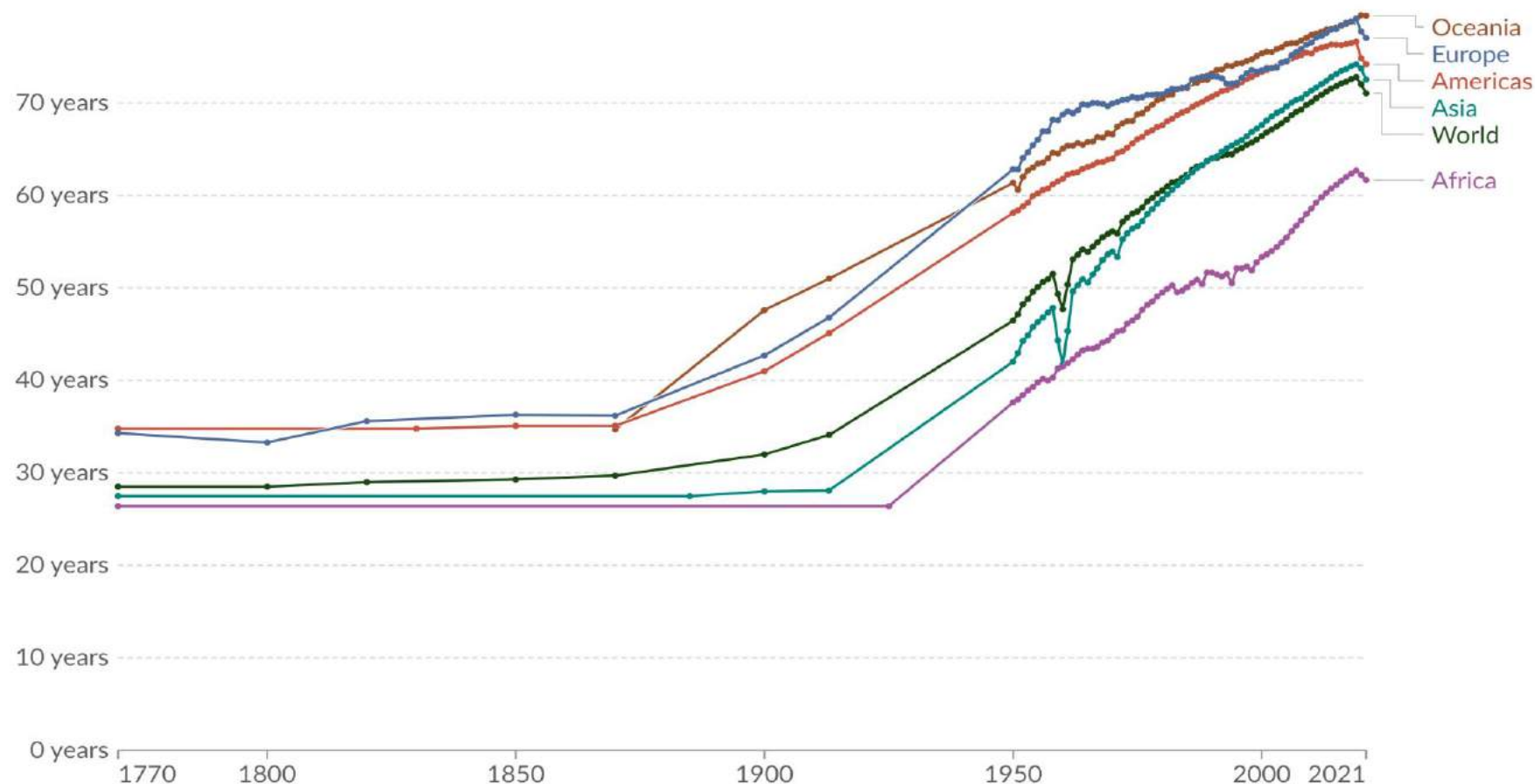


Source: UN (2005)

Life expectancy

The period life expectancy¹ at birth, in a given year.

Our World
in Data



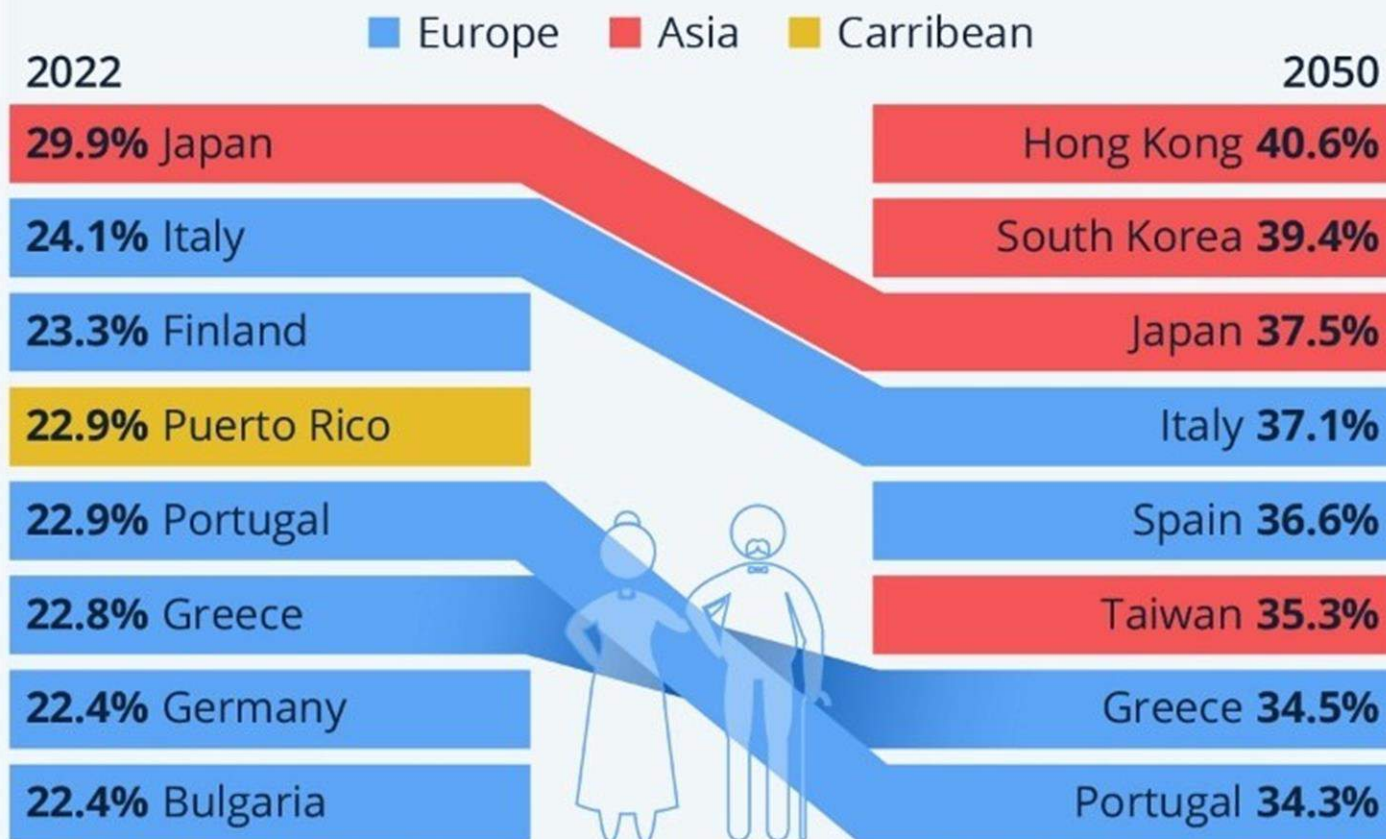
Data source: UN WPP (2022); HMD (2023); Zijdeman et al. (2015); Riley (2005)

OurWorldInData.org/life-expectancy | CC BY

1. Period life expectancy: Period life expectancy is a metric that summarizes death rates across all age groups in one particular year. For a given year, it represents the average lifespan for a hypothetical group of people, if they experienced the same age-specific death rates throughout their whole lives as the age-specific death rates seen in that particular year. Learn more in our article: "Life expectancy" – What does this actually mean?

The World's Oldest Populations

Countries/territories with the highest share of people aged 65 and older*



* only includes countries/territories with a population of more than 1 million people

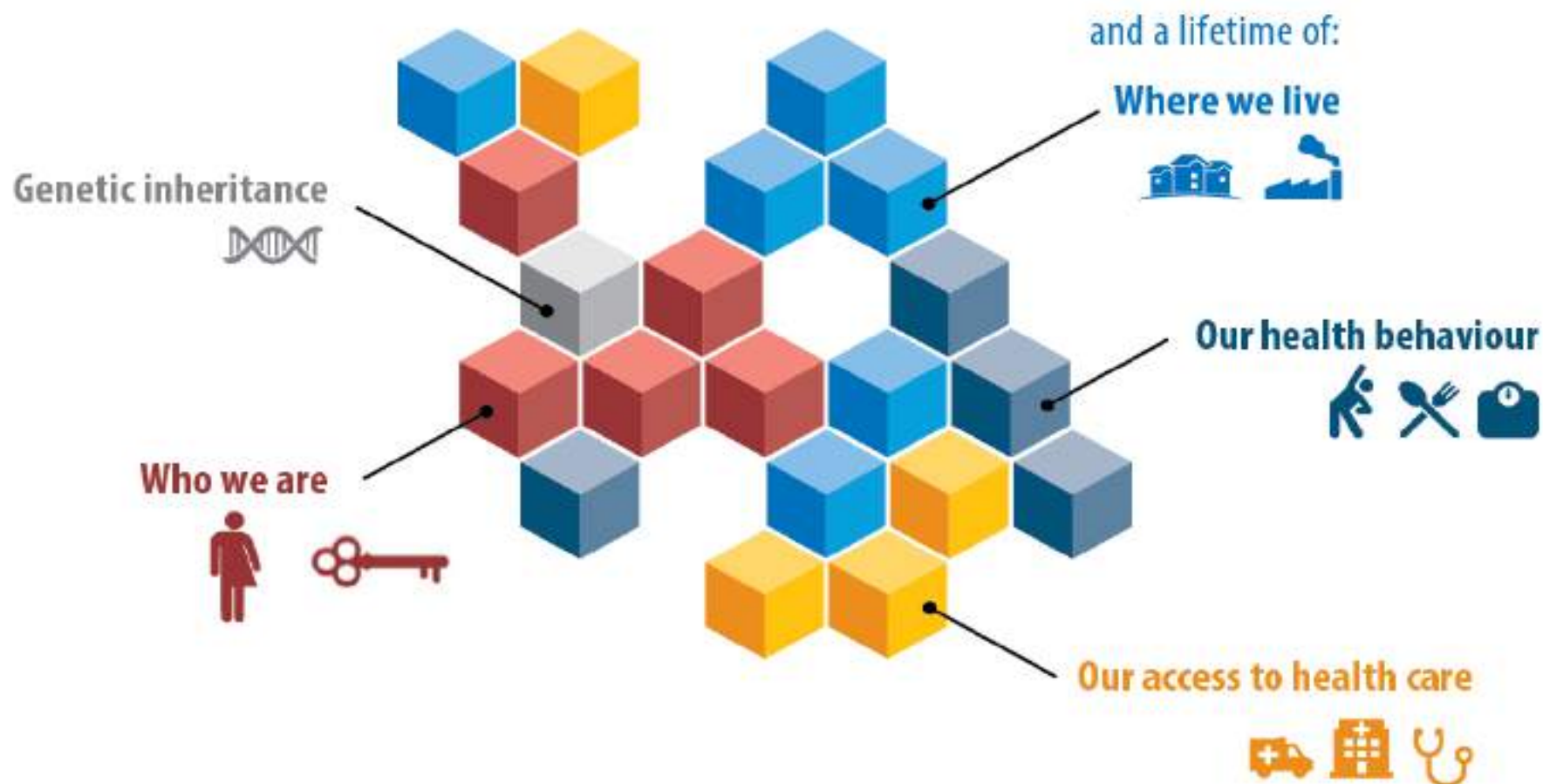
Source: United Nations Population Division

There is no “typical” older person

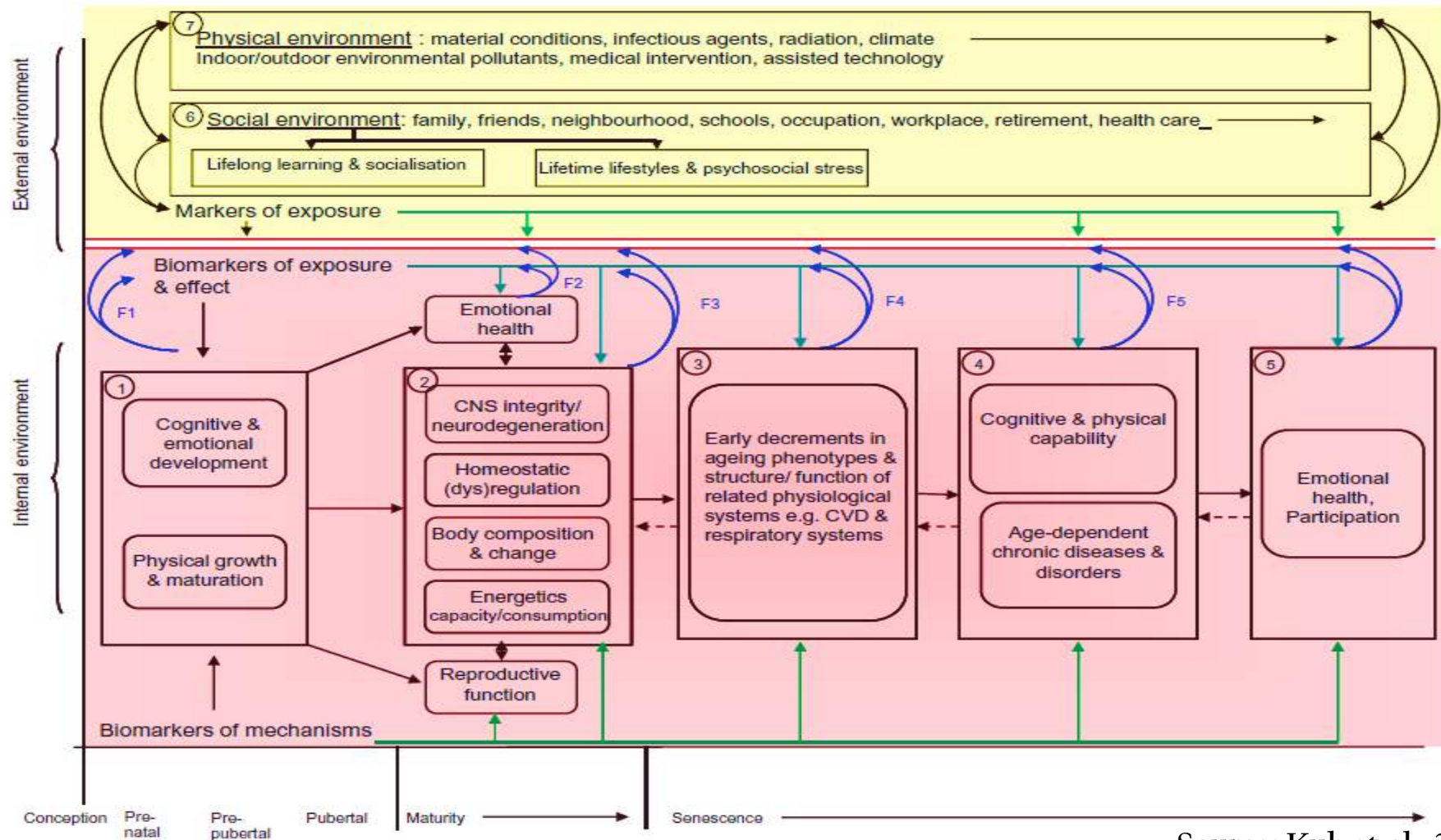


Health and Functional Abilities in older age are not random

What makes us age differently?



Integrated Life-Course Model of Ageing



Source: Kuh et al., 2014

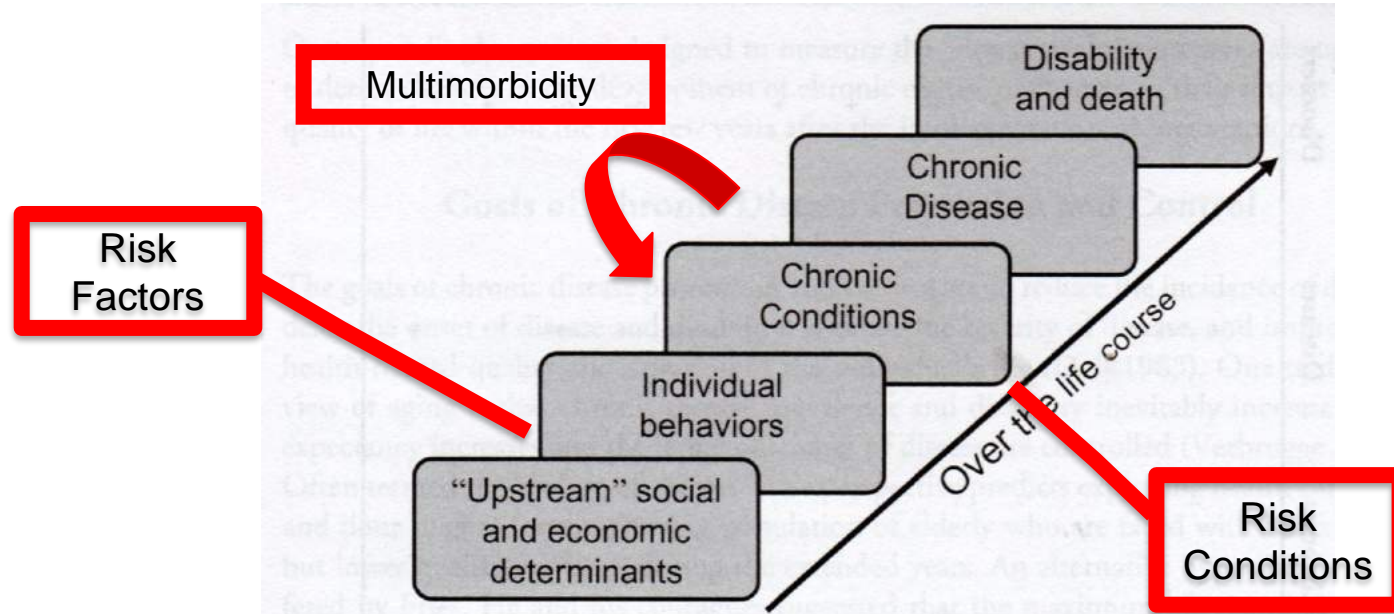
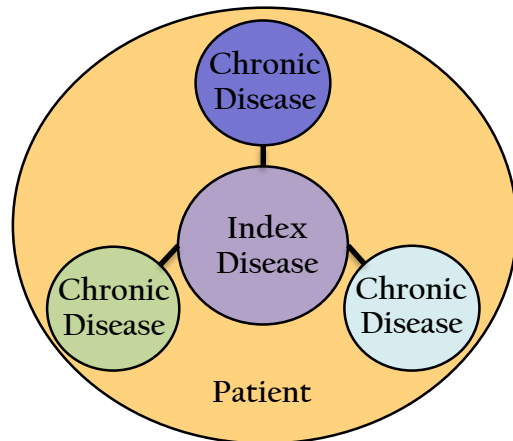


Figure 1.1. The Chronic Disease Continuum.

Chronic Disease Continuum

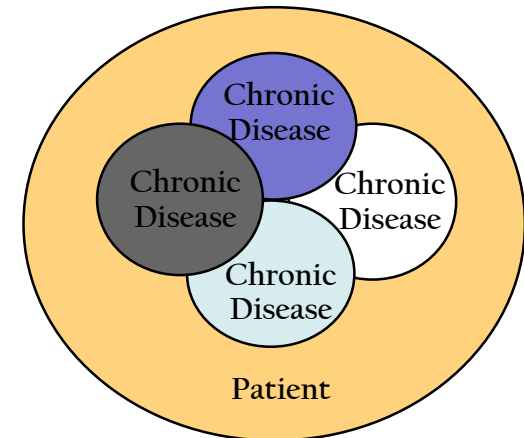
Multimorbidity vs. Comorbidity

- Co-Morbidity = Index disease holds priority over any other co-occurring chronic diseases within an individual
 - Focus on a central disease that is of primary interest
 - Facilitates specialist and disease-centered approach
- Multi-Morbidity = Coexistence of multiple diseases within the same individual (typically defined as 2+ or 3+ chronic diseases)
 - One disease is not necessarily more central than the others
 - Facilitates more holistic and patient-centered approach



Co-Morbidity
vs.
Multi-Morbidity

Source: Boyd and Fortin, 2010





ELSEVIER



Journal of Clinical Epidemiology 105 (2019) 142–146

Journal of
Clinical
Epidemiology

COMMENTARY

Multimorbidity and comorbidity revisited: refining the concepts for international health research

Kathryn Nicholson^{a,b,*}, Tatjana T. Makovski^{c,d,e}, Lauren E. Griffith^b, Parminder Raina^b,
Saverio Stranges^{a,c,f}, Marjan van den Akker^{d,g}



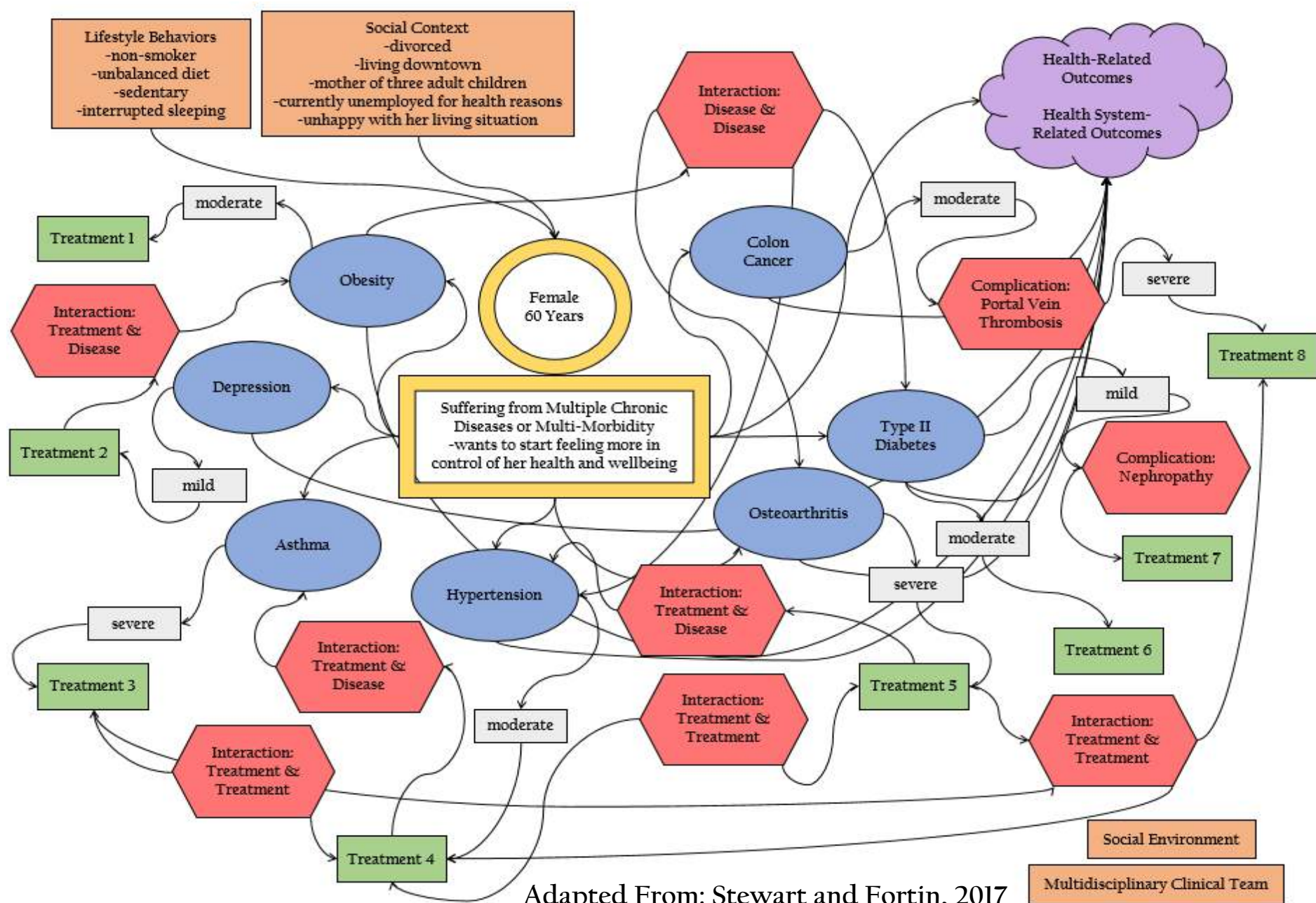
Multimorbidity Definition

Public Health Definition

- Alzheimer's Disease
- Anxiety or Mood Disorder
- Arthritis
- Asthma
- Cancer
- Chronic Obstructive Pulmonary Disease
- Diabetes
- Heart Disease
- Stroke

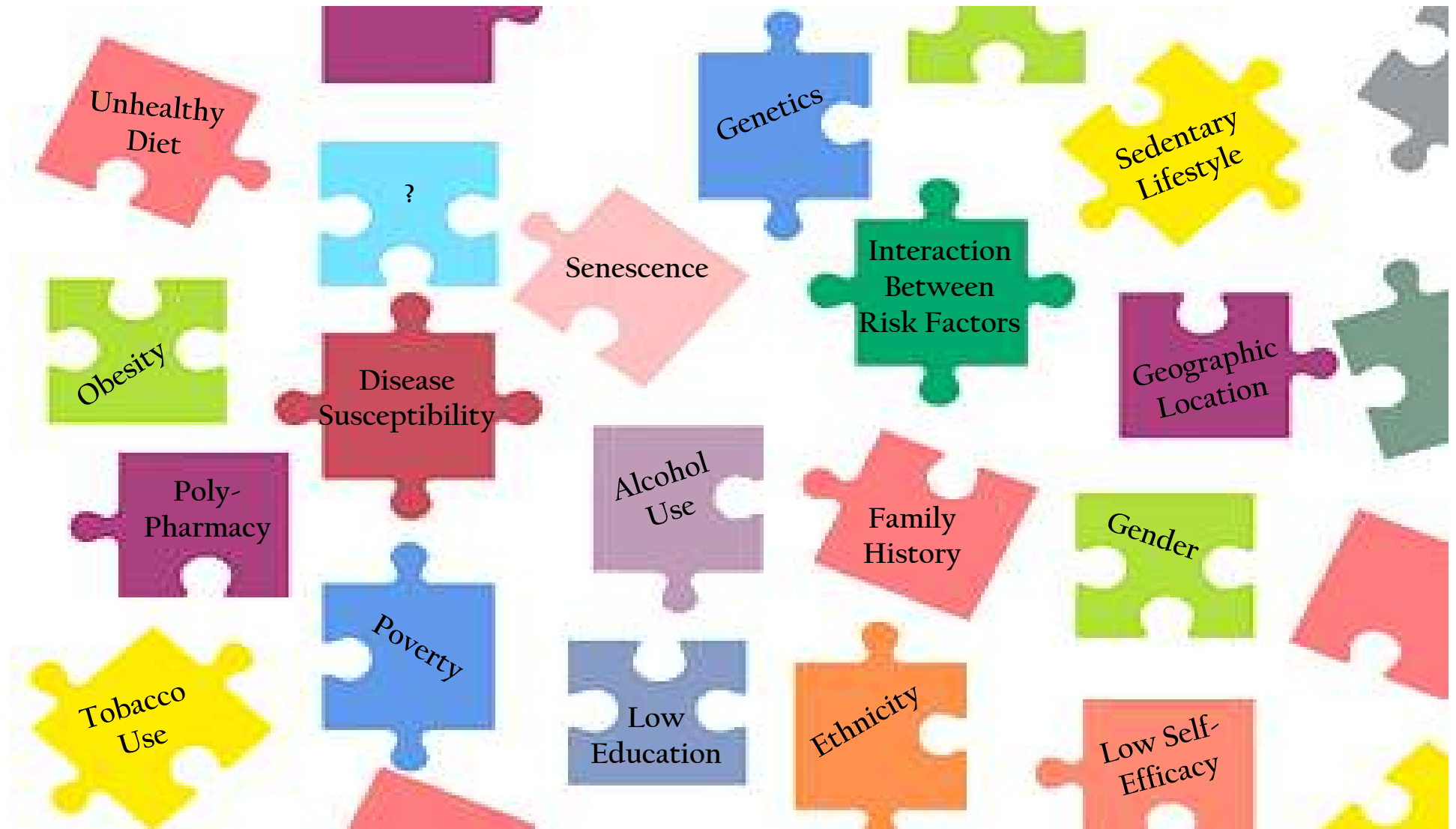
Primary Care Definition

- Anxiety or Depression
- Cancer
- Cardiovascular Disease
- Chronic Obstructive Pulmonary Disease or Asthma
- Colon Problem
- Diabetes
- Heart Failure
- Hypertension
- Kidney Disease or Failure
- Musculoskeletal Problem
- Obesity
- Osteoarthritis or Rheumatoid Arthritis
- Osteoporosis
- Stomach Problem
- Stroke or Transient Ischemic Attack
- Thyroid Problem
- Urinary Problem



Adapted From: Stewart and Fortin, 2017

Potential Drivers for Multi-Morbidity





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Review

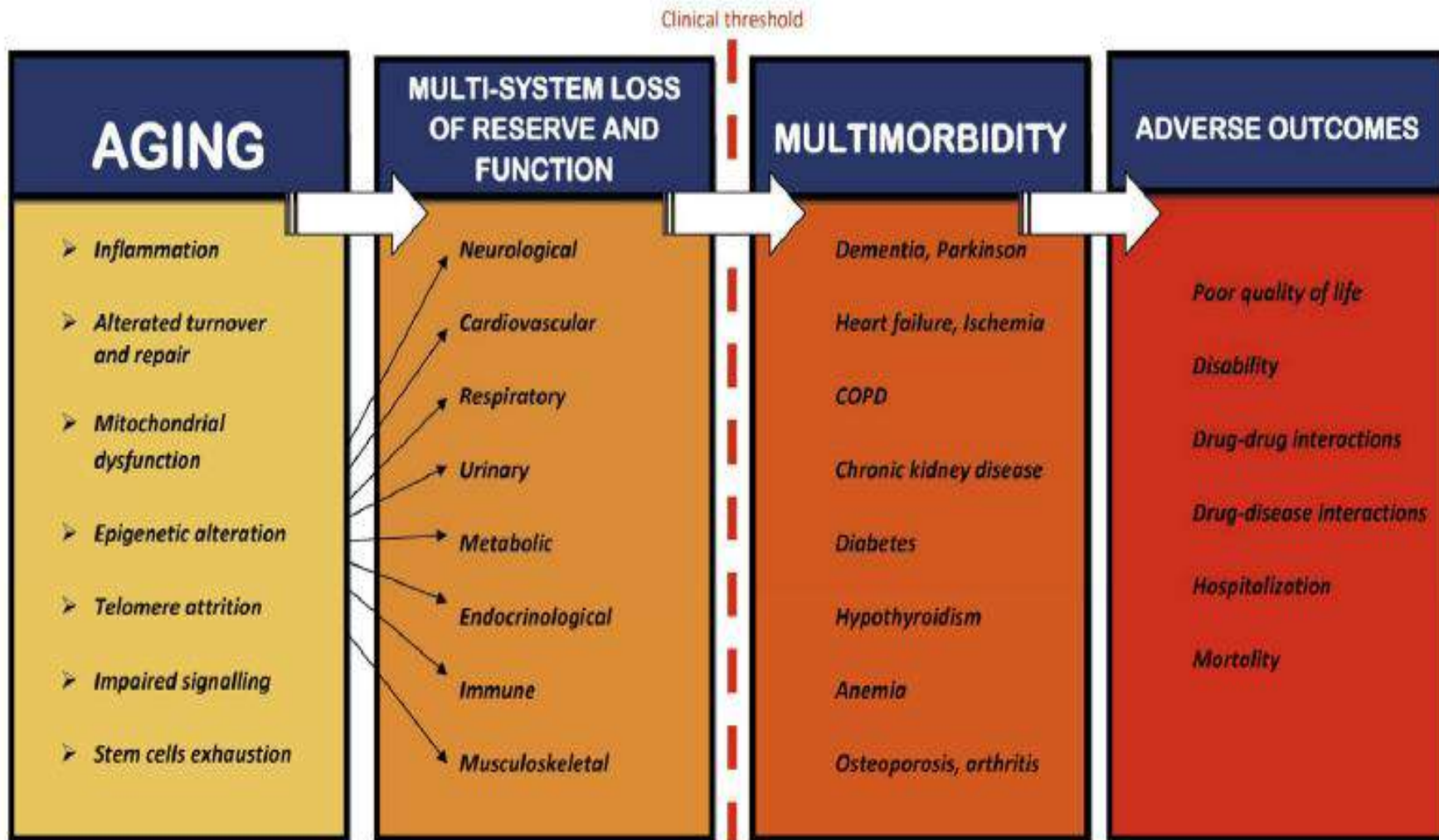
Multimorbidity and quality of life: Systematic literature review and meta-analysis



Tatjana T. Makovski^{a,b,c,*}, Susanne Schmitz^a, Maurice P. Zeegers^c, Saverio Stranges^{a,d,e},
Marjan van den Akker^{b,f,g}



From the era of “single chronic disease medicine” to the era of “multimorbidity medicine”



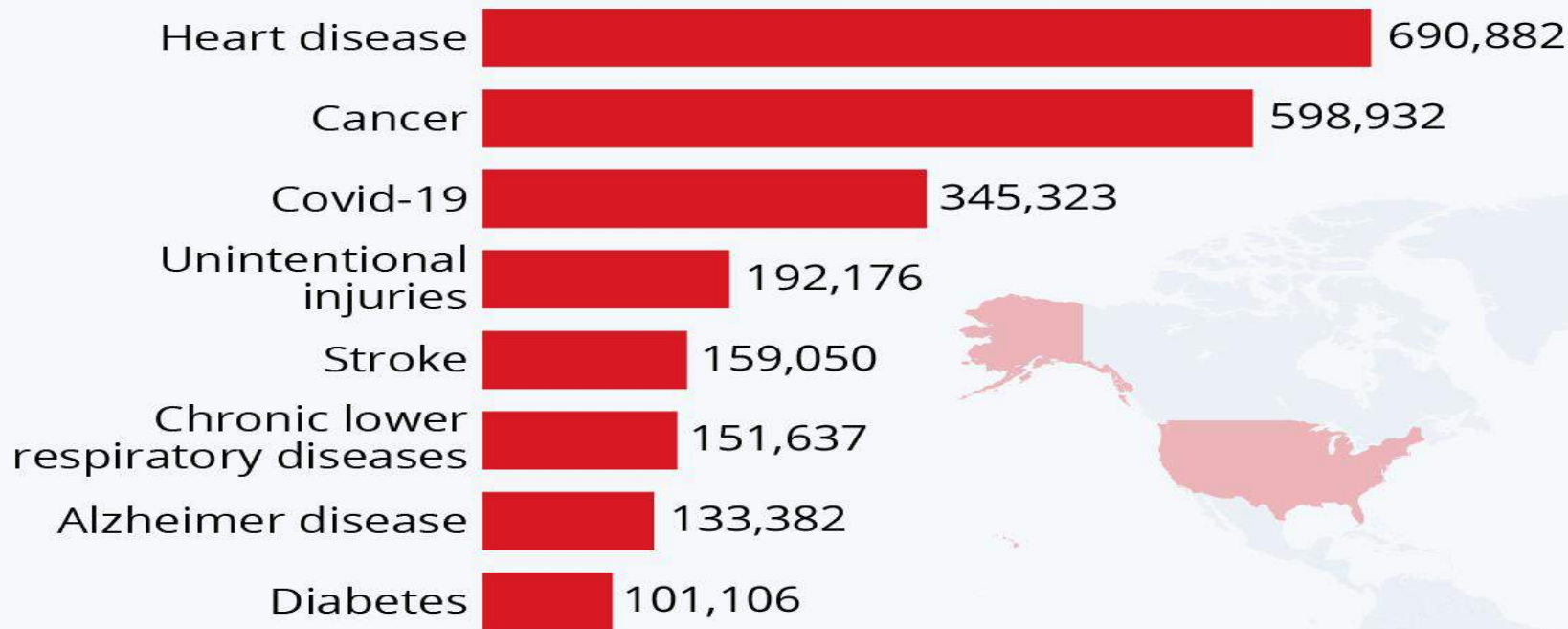
The Importance of Multimorbidity & Aging



Source: OECD, 2011; WHO, 2015; Academy of Medical Sciences, 2018

Covid-19 Was America's Third Leading Cause Of Death In 2020

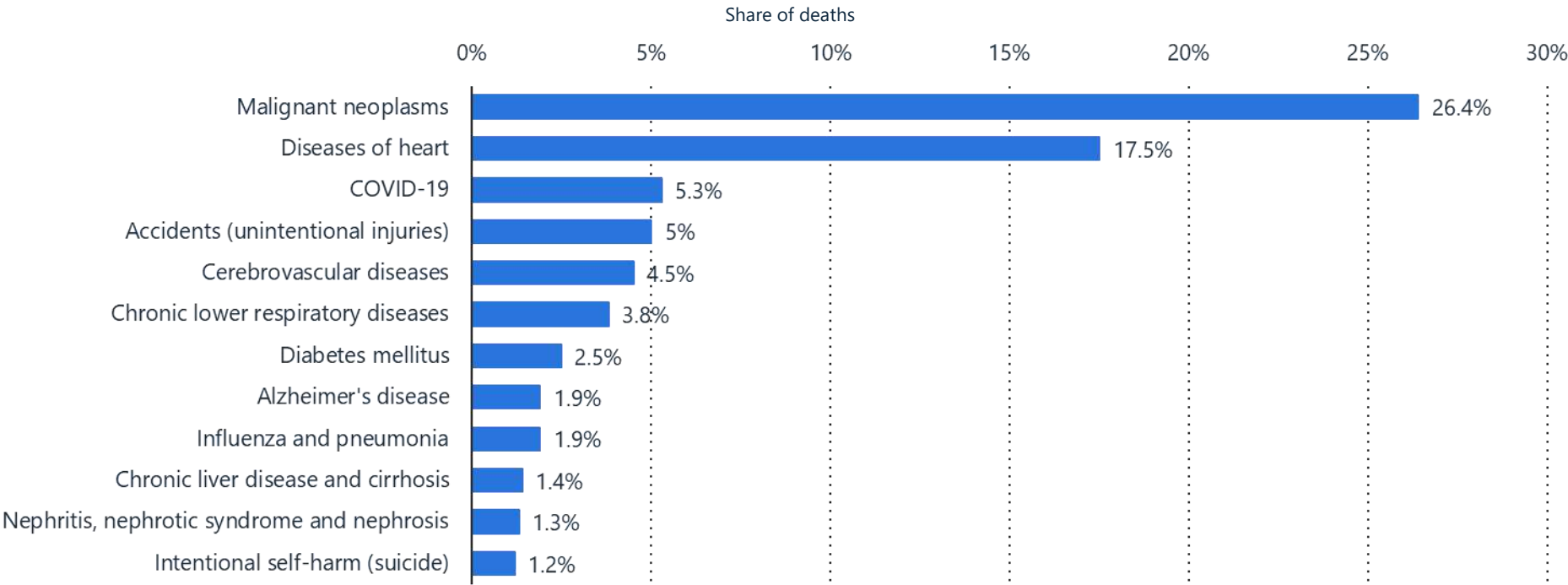
Number of deaths for all leading causes of death in the U.S. in 2020



Source: Centers for Disease Control and Prevention

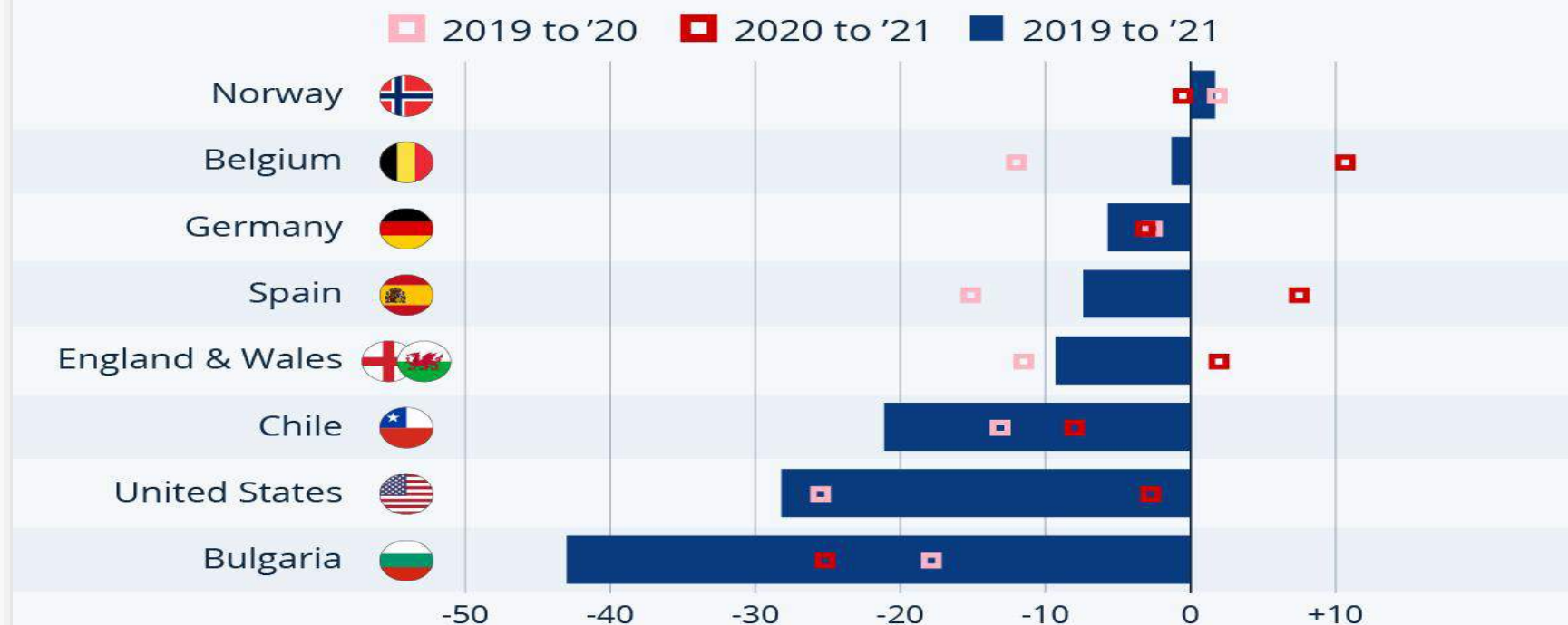


Distribution of the leading causes of death in Canada in 2020



Covid-19 Cut Life Expectancy Short Around the World

Change in life expectancy in selected countries between 2019 and 2021 (in months)



Source: Schöley et al. Life expectancy changes since Covid-19. Nature Human Behaviour. 2022





COVID-19 Pandemic: What Can the West Learn From the East?

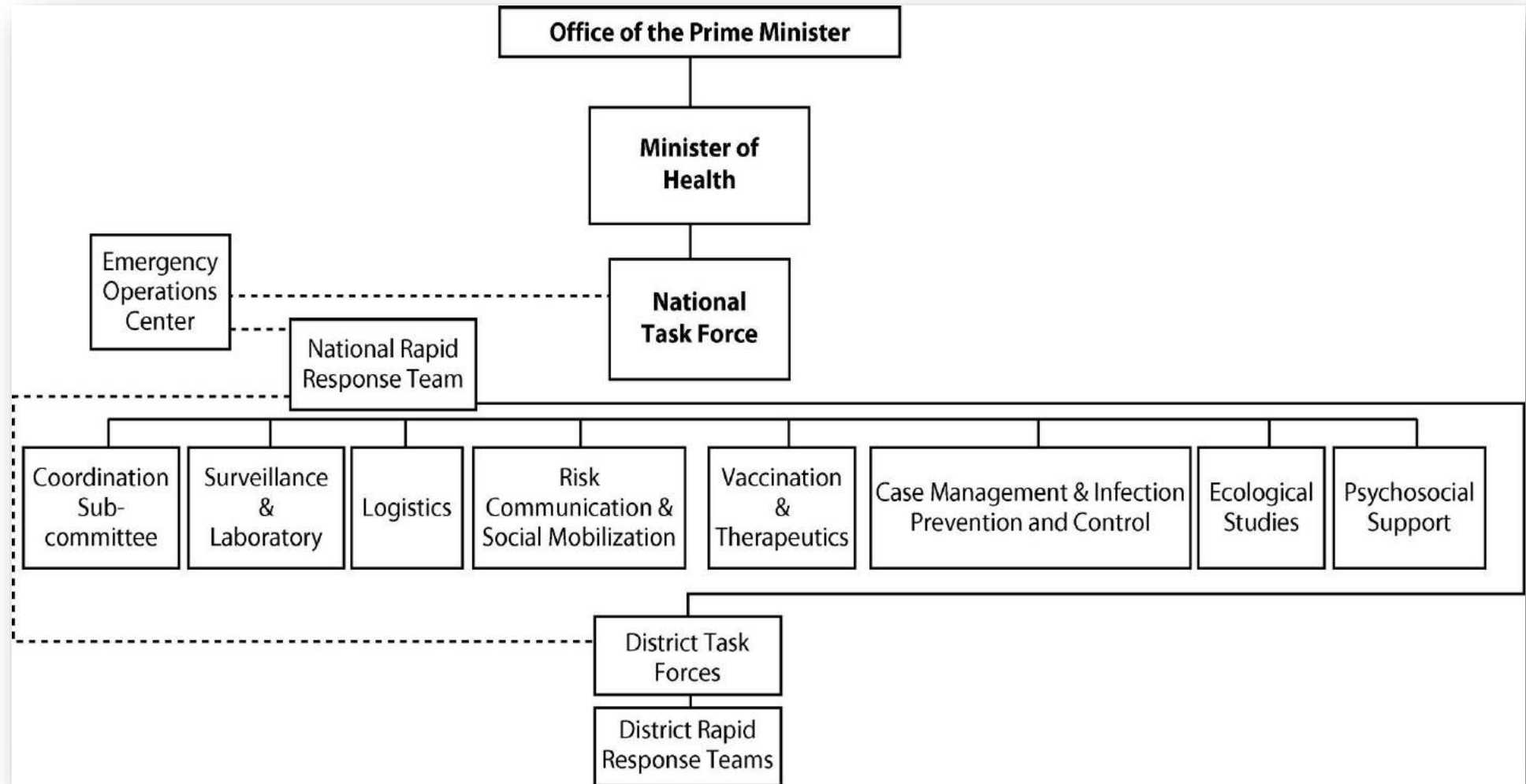


Mostafa Shokoohi^{1,2}, Mehdi Osooli³, Saverio Stranges^{4,5,6*}

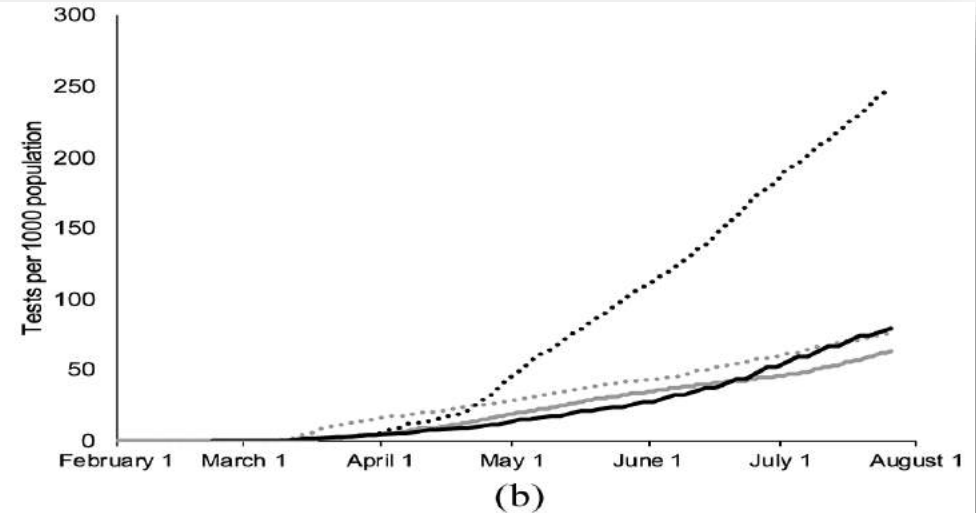
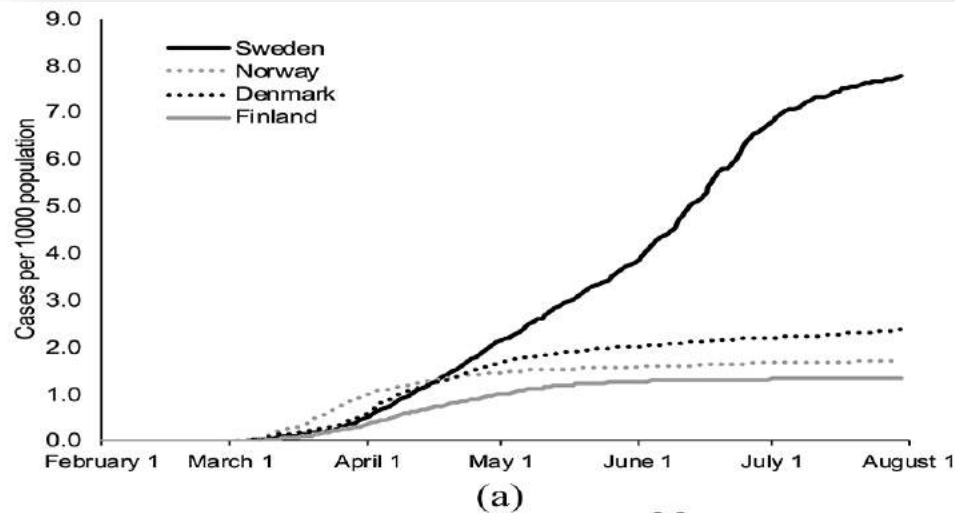
- Differences in public health approaches could largely explain substantial variations in epidemiological indicators between Western and Eastern countries (e.g. Asia, etc.).
- COVID-19 revealed vulnerabilities of most western countries' healthcare systems in their response to the ongoing public health crisis.
- The lack of rapid and timely *community-centered* approaches and weak public health infrastructures resulted in a high number of cases/deaths in many western countries.
- People may be less compliant with public health recommendations than in the East...



Uganda as a Role Model for Pandemic Containment in Africa

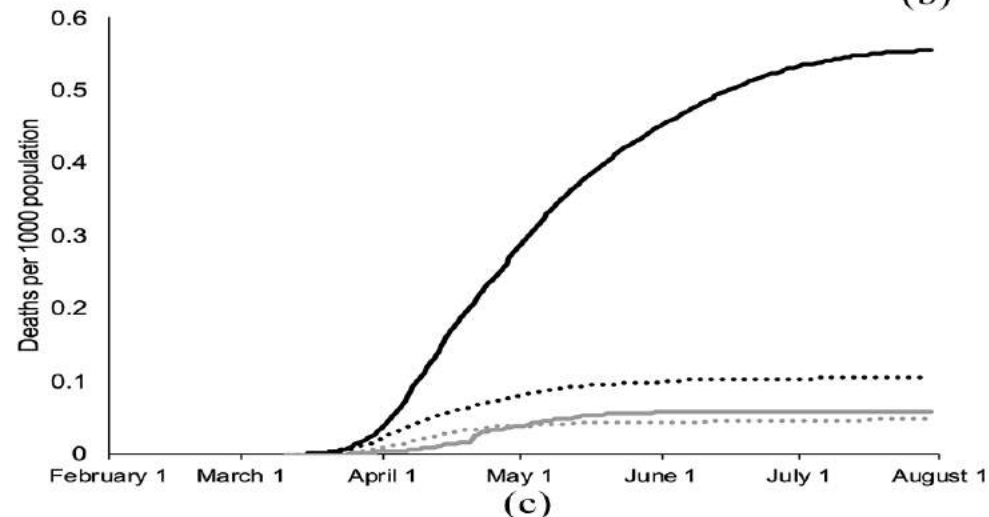


A comparison of COVID-19 epidemiological indicators in Sweden, Norway, Denmark, and Finland



MORTALITY (Jan 28/2021)


1,137 x 1M (Sweden)
357 x 1M (Denmark)
120 x 1M (Finland)
102 x 1M (Norway)



COMMENTARY

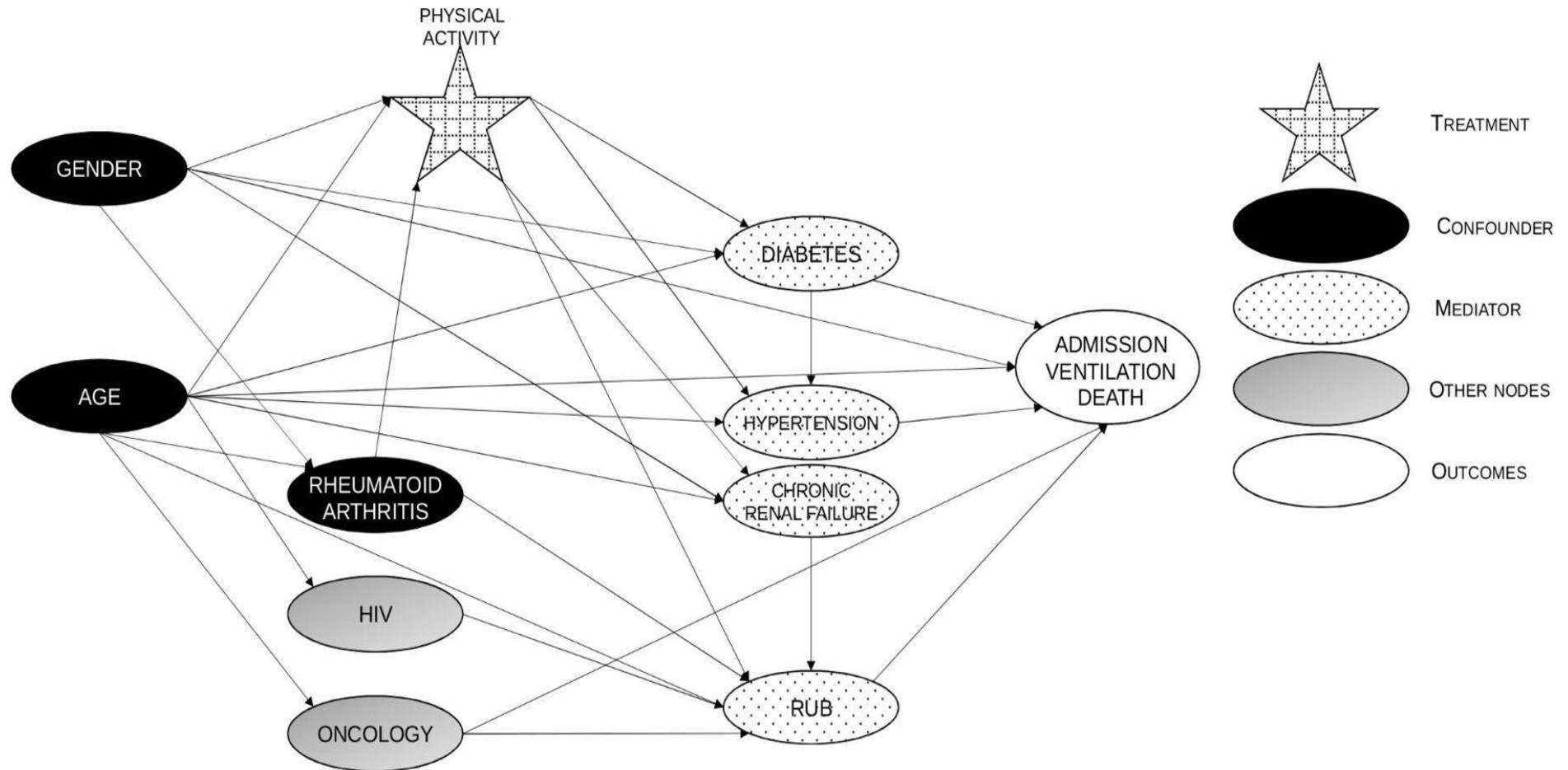


Excess mortality from COVID-19: a commentary on the Italian experience

Paolo Pasquariello¹ · Saverio Stranges^{2,3,4} 



Small steps, strong shield: directly measured, moderate physical activity in 65,361 adults is associated with significant protective effects from severe COVID-19 outcomes

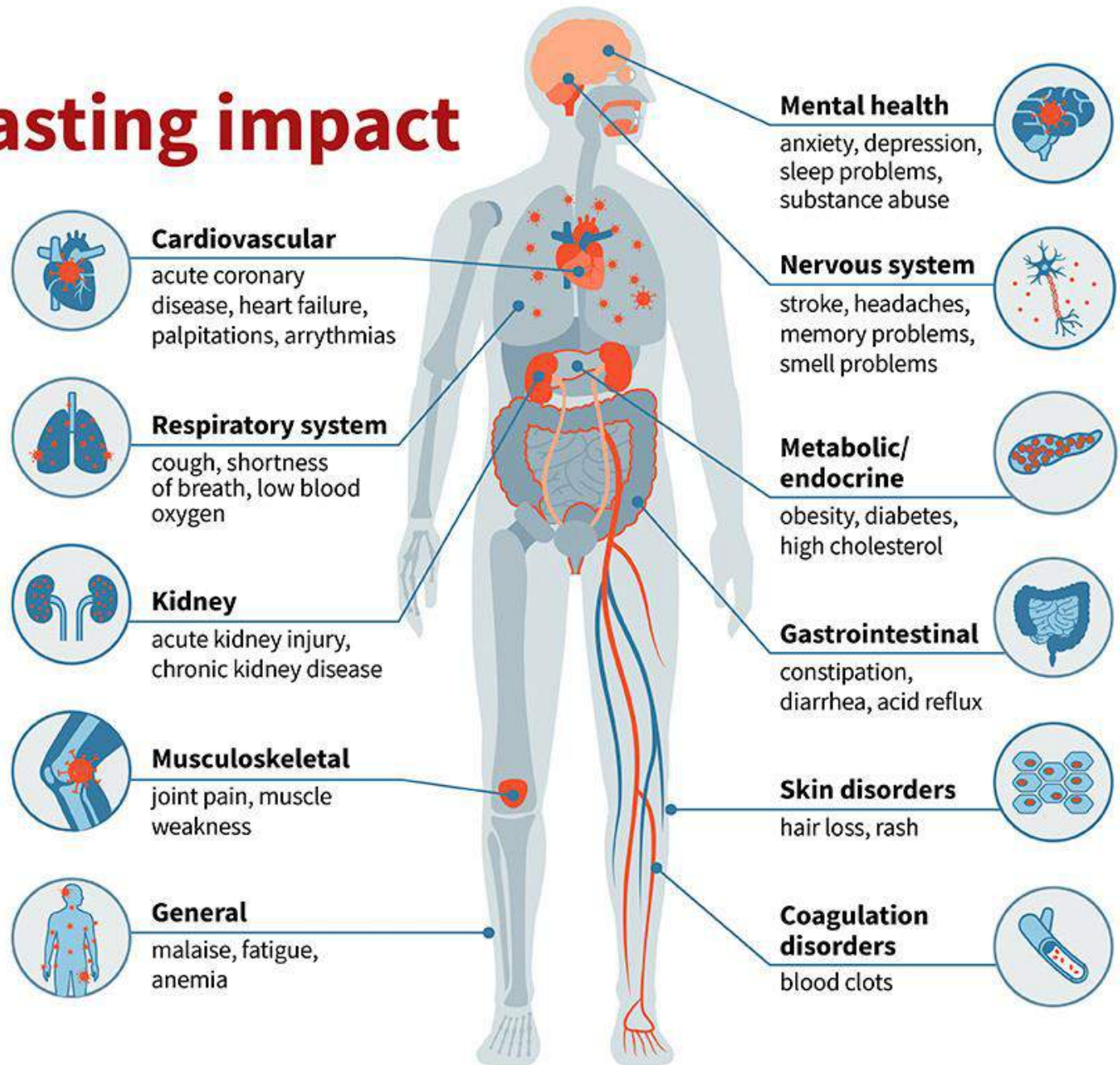


COVID-19: Lasting impact

Even those survivors with mild initial cases can have wide-ranging health issues for six months or more.

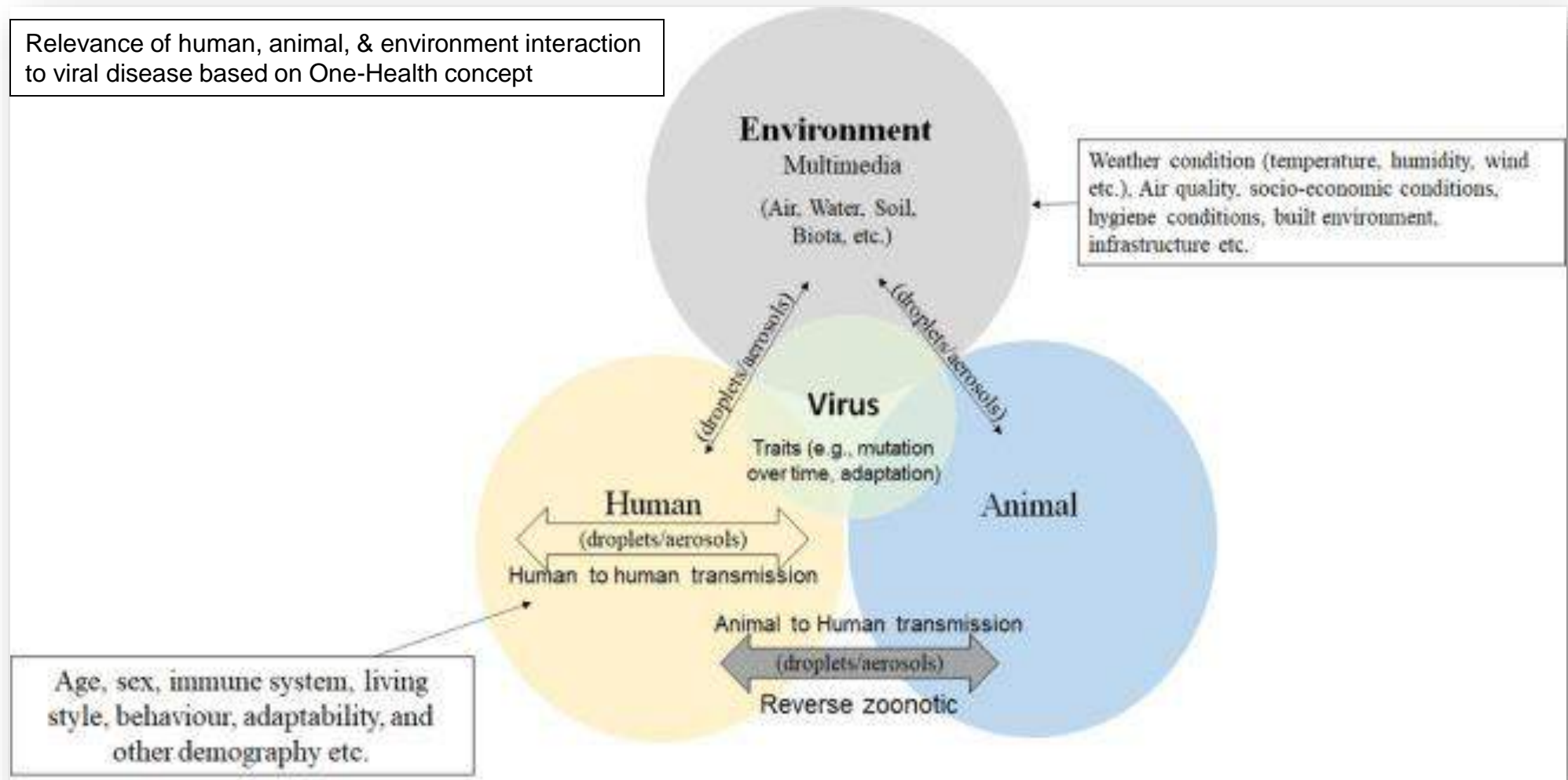
WashU researchers link many diseases with COVID-19, signaling long-term complications for patients and a massive health burden for years to come.

The World Health Organization has defined Long COVID as a condition that occurs in those with probable or confirmed COVID-19 infection where symptoms last for at least two months from the onset of the infection (2022)



COVID-19 & One-Health concept

Relevance of human, animal, & environment interaction to viral disease based on One-Health concept





Global Vaccine Equity to End the COVID-19 Pandemic: A Canadian Perspective and Call to Action

Michael Clarke^{1*}, Shehzad Ali^{1,2,3}, Michael Silverman^{2,4} and Saverio Stranges^{2,5,6,7}

Canadian Journal of Public Health

<https://doi.org/10.17269/s41997-022-00706-9>

SPECIAL SECTION ON COVID-19: LETTER TO THE EDITOR

COVID-19 vaccine inequity and Big Pharma: time to rethink our love affair?

Shehzad Ali^{1,2,3,4,5}  • Ayesha Jacob⁶ • Saverio Stranges^{1,7,8}

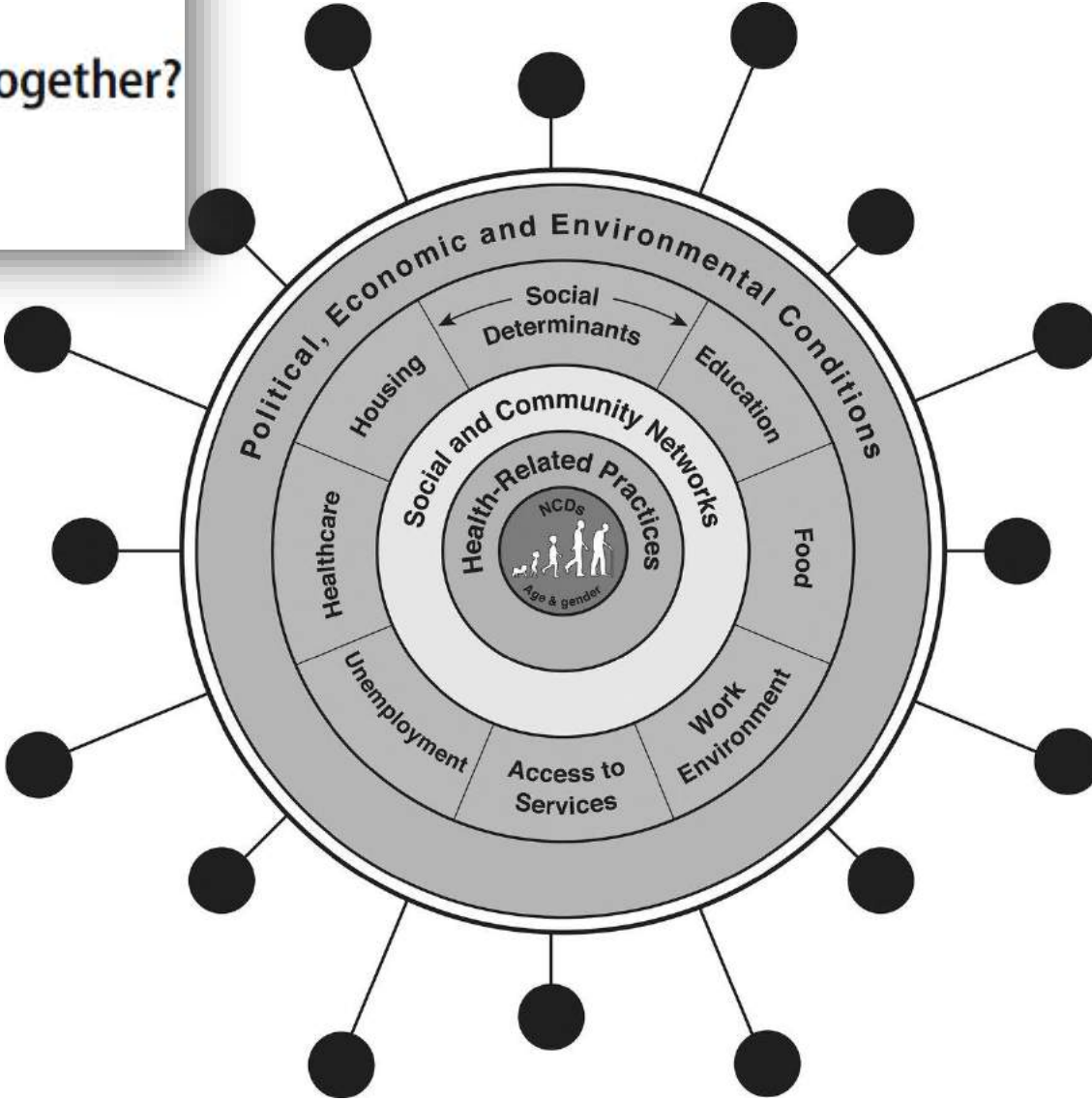
SPECIAL SECTION ON COVID-19: LETTER TO THE EDITOR

COVID-19 and inequality: are we all in this together?

Shehzad Ali^{1,2} • Miqdad Asaria³ • Saverio Stranges^{1,4,5}

The syndemic of COVID-19,
non-communicable diseases (NCDs)
and social determinants of health
(from Singer, Dahlgren, and Whitehead)

J Epidemiol Community Health 2020;74:964-968



Harms of public health interventions against covid-19 must not be ignored

The harmful consequences of public health choices should be explicitly considered and transparently reported to limit their damage, say **Itai Bavli and colleagues**

Itai Bavli,^{1, 2} Brent Sutton,³ Sandro Galea⁴

BMJ. 2020


Canadian Journal of Public Health (2020) 111:462–465

<https://doi.org/10.17269/s41997-020-00396-1>

SPECIAL SECTION ON COVID-19: COMMENTARY



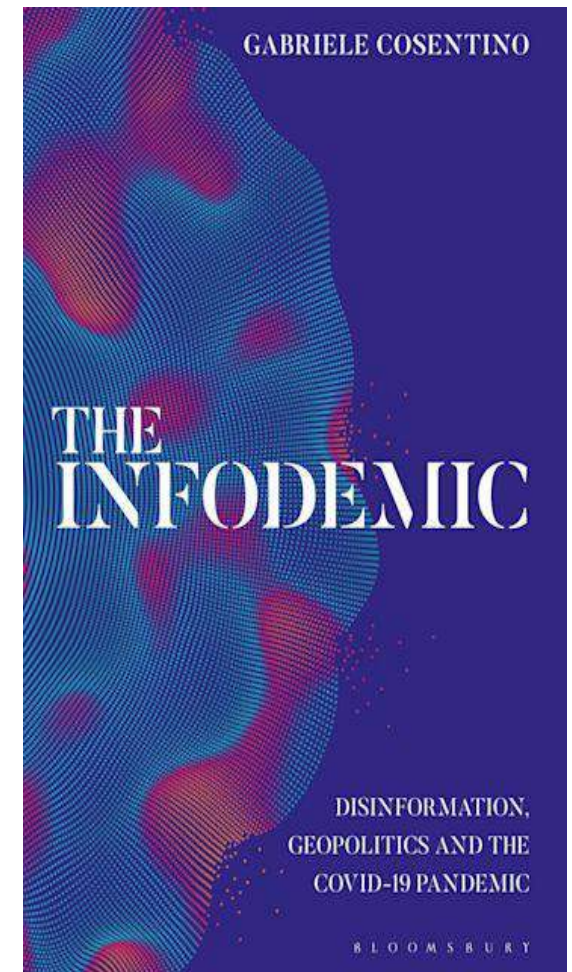
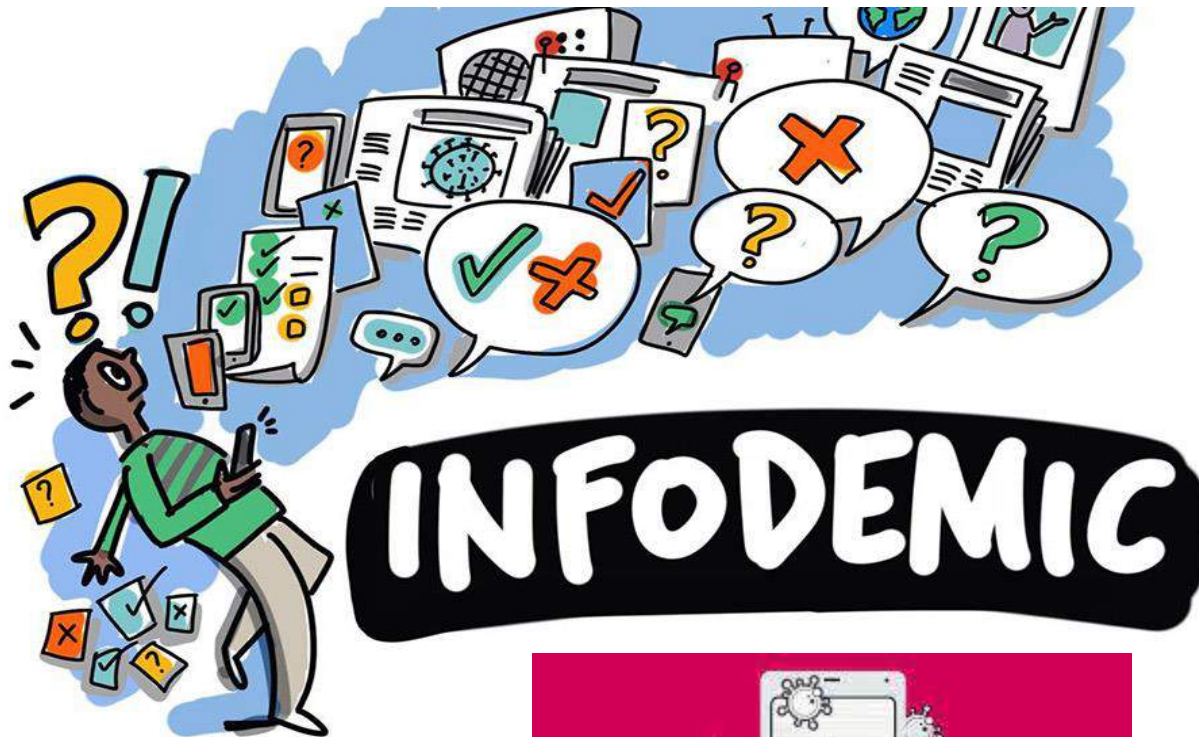
Ethics of COVID-19-related school closures

Michael Silverman^{1,2}  • Robert Sibbald³ • Saverio Stranges^{2,4,5}



Infodemics and health misinformation: a systematic review of reviews

Israel Júnior Borges do Nascimento,^a Ana Beatriz Pizarro,^b Jussara M Almeida,^c Natasha Azzopardi-Muscat,^d Marcos André Gonçalves,^c Maria Björklund^e & David Novillo-Ortiz^d



Lessons Learned from the Pandemic



- ✓ Health care systems in Western countries are primarily designed to manage chronic disease (need for larger investments in epidemic preparedness)
- ✓ Public health responses play a crucial role in the mitigation of COVID burden
- ✓ Capitalize on new data and technology to facilitate proactive case identification as done in some Asian countries (S Korea, Taiwan, Japan, etc.)
- ✓ Communication with the public is crucial to offset misinformation & fake news
- ✓ International partnerships and share of data have been lacking
- ✓ Side-effects of restrictive measures such lockdowns (low SES, children, etc.)
- ✓ ***The pandemic has been widening health disparities around the world***