

Exaggerated population ageing and understated fertility decline
- Addressing the need for valid demographic indicators

Vegard Skirbekk

Professor, Columbia University, New York

PI, Center for Fertility and Health, Oslo

Global demographic change inaccurately portrayed – new metrics to address this suggested

- International agencies typically use old age dependency ratios (OADR) to measure ageing - and TFR as a proxy for fertility (e.g., UNPD, NSOs).
- OADR (typically 65+/20-64) is a less relevant measure of ageing – ageing metrics should include health and functioning.
- The OADR fails to include these dimensions - hence is not relevant to understand population ageing, nor compare it across region and time.
- Most fertility metrics only focus on children per woman (e.g., TFR or NRR). Men and women do not have the same number of children.
- Fertility metrics must also include men, and ideally both genders.

Ageing. Most alternatives to Old age Dependency Ratios (OADRs) lack data or validity

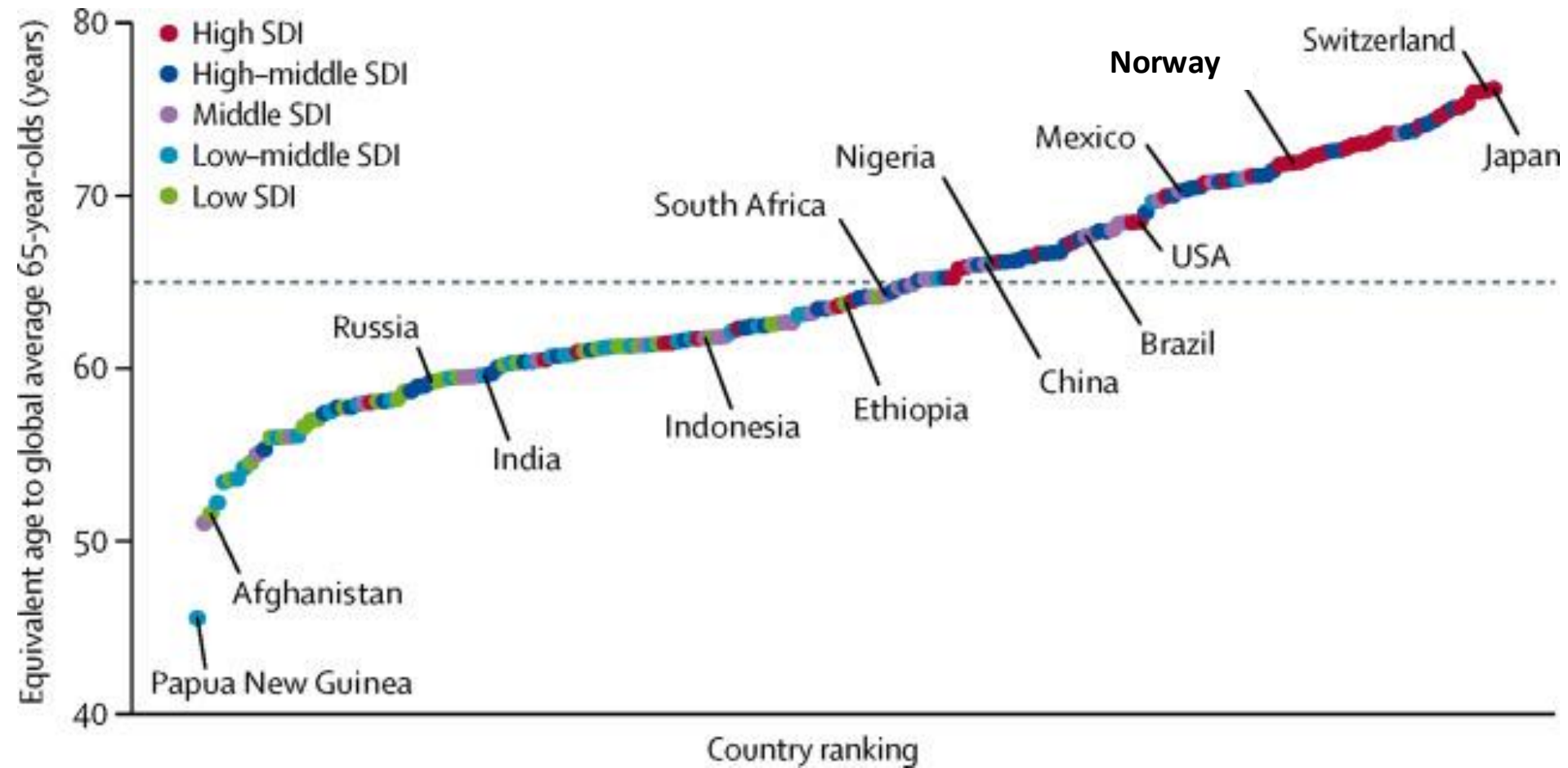
- Old age dependency ratios assumes onset of 'old age' universal and static (e.g., 65 years). Less relevant as 'old age' (health, functioning) varies by time and place
- Many alternatives suggested – yet most lack global data or validity
 - **Economic dependency** (economically inactive:active ratio). **Weak data on economic activity** (household work, informal work, job productivity variation) (Loichinger et al 2012)
 - **Functional status** (e.g., cognitive functioning, hearing, epigenetic ageing, telomere length, physical markers). **Data not globally available for any of these markers.**
 - **Remaining life years** (Ryder 1975, Sanderson and Scherbov 2010). **Less relevant as years of life could be in poor or good health and functioning**
 - **Subjective measures** (how old one feels). **Hard to compare across countries and over time – subjective ageing culturally influenced**
- **Health adjusted dependency ratios (HADR)** (Skirbekk et al. 2022). 'Old age' defined by onset of poor health – not chronological age. Valid and data available

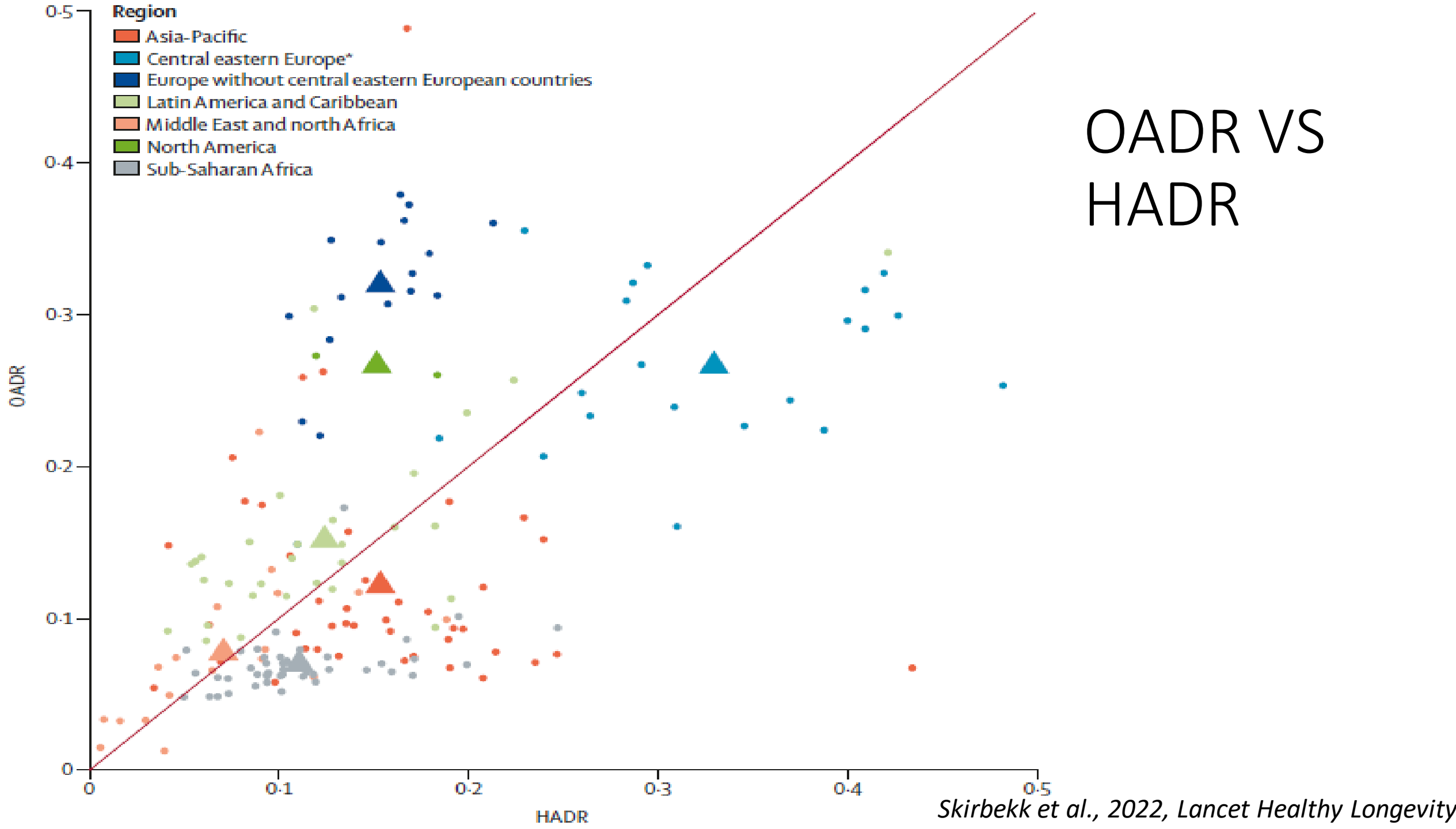
Explaining the ‘Health adjusted dependency ratio’

- The old age dependency ratio (65+/20-64) **rigidly assumes** “dependence” occurs from age 65
- The **Health Adjusted Dependency Ratio (HADR)**, assumes “dependence” **depends on health condition rather than only age**
- The Health-Adjusted Dependency Ratio (HADR): the numerator consists of those in ill-health (with worse health than a global 65 year old), while the denominator includes healthier adults (better health than a global 65 year old)

$$HADR(t) = \frac{DP(t)}{SP(t)} = \frac{\int_{E(t)}^{\omega} P(x,t) dx}{\int_S^{E(t)} P(x,t) dx}$$

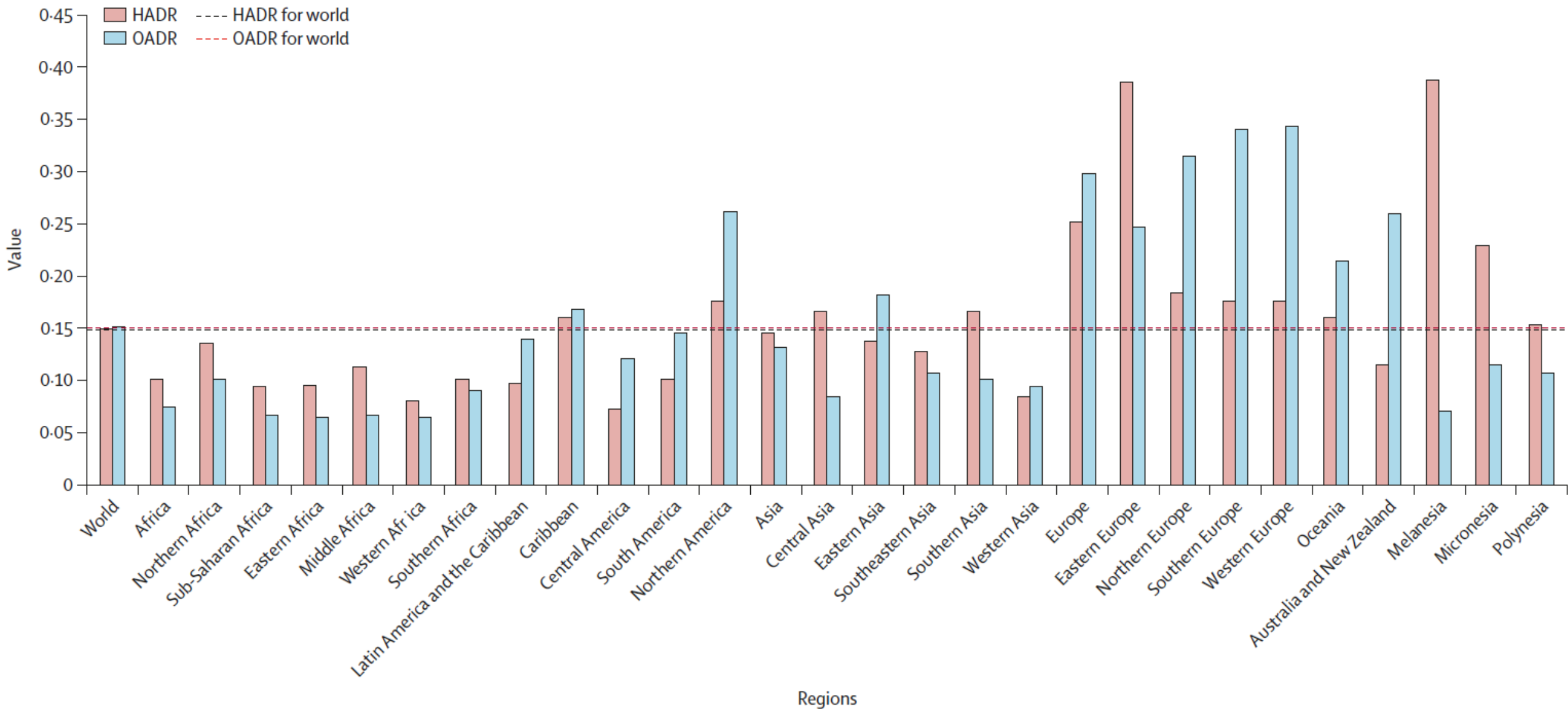
Health and ageing – the average health differs by nation





Health-adjusted dependency ratio (HADR) and old-age dependency ratio (OADR) by world region.

Higher values indicate higher ageing burden.



In sum, one may consider alternatives such as the HADR rather than the OADR

- Accounting for health, we find that the chronologically oldest countries are often relatively younger.
- No “young” or “old” world.
- Compared to the OADR, the HADR finds higher dependency in S-Asia, E-Europe, Africa and lower dependency in E-Asia, W-Europe, Americas
- The HADR was recently introduced and is being more used now - e.g. in a new ADBI/World Bank project 2023-2027

Fertility should be measured for both genders

- Childbearing metrics commonly only include women
- As the sex ratio at birth and in typical reproductive ages is not 1:1, typically higher, TFRw is a weak proxy for «two sex TFR» and male fertility
 - TFR, NRR, CEB, other measures of reproduction typically reported are all based on number of children per *woman*
 - Statistically problematic as populations' sex ratios vary across regions and change over time
 - Childbearing equally important for men (e.g., health, lifestyles, wellbeing)
 - Using only TFRw fails to emphasize gender equality

Skewed sex ratios -> TFR is misleading for men and for both sexes

- The higher the sex ratios (more men than women) -> the lower the number of children per man on average (Keilman et al. 2014).
-> Higher sex ratios also means fewer children born per man (and per adult of both genders).
- The two-sex total fertility rate, 2STFR, may offer an alternative. It is defined as the geometric mean of the total fertility rates for women and men, or $2STFR = \sqrt{TFR_w \cdot TFR_m}$.

Sex ratio imbalances large

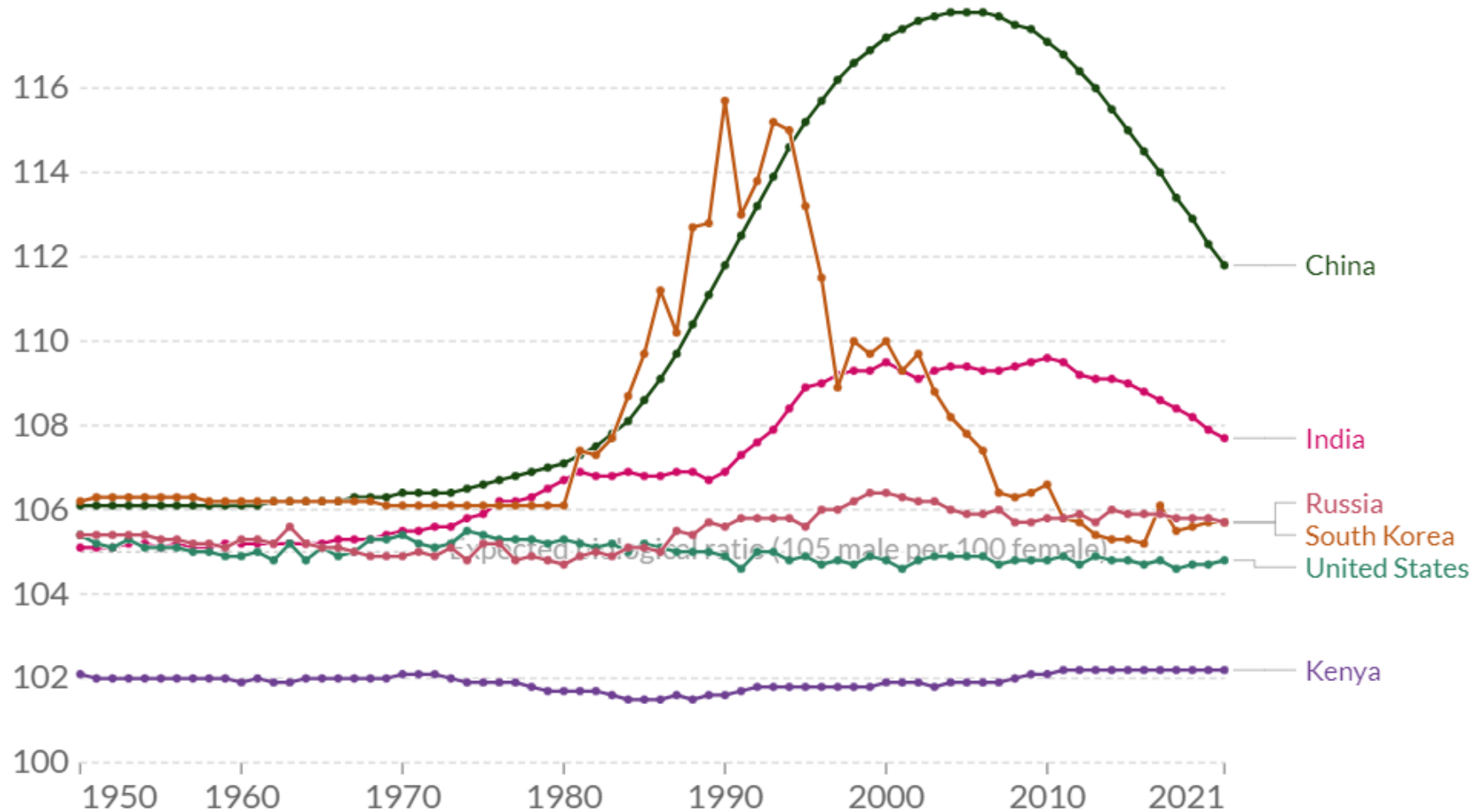
- Sex ratios differ globally (more boys than girls born, higher male mortality)
- Sex ratios differ by region (more girls born in some regions).
- Sex selective abortion increased SR at birth (several countries)
- Childlessness higher among men compared to women (e.g., Norway)
- Regional sex ratios differ due to mobility – e.g., men may migrate more internationally, women may urbanize more in richer countries

Sex ratio at birth, 1950 to 2021

The sex ratio at birth is measured as the number of newborn boys for every 100 newborn girls.

[+ Add country or region](#)

All together ▾



Relevance of using two sex fertility measures

- Assume reproductive age SRs are close to 1.2 (males per female).
- Assume there are 2 children born per woman (TFRw).
 - This means male fertility (TFRm) would be **1.67** children for every man.
 - Both gender fertility (2STFR) would be **1.82** children.
- Assume there would be 1 child born per woman (TFRw).
 - This means male fertility (TFRm) would be **0.83** children for every man.
 - Both gender fertility (2STFR) would be **0.90** children.
- As SRs are often between 1 and 1.2 (and rising for population of reproductive age in some countries), TFRm and 2STFR would be lower than TFRw – current regional and global fertility levels are likely to be overstated

In sum

- Ageing is fairly equally distributed across the world – ageing in East-Asia, Americas, W-Europe likely exaggerated (as discussions are based on OADR metric). Better measures are needed.
- Fertility, when measured for both genders (e.g., 2STFR), is lower than what TFRw suggests as there are more men than women of reproductive age. This phenomenon is particularly important in low fertility countries such as South Korea or China.