



# Inequality through the lens of spatial disaggregation of the Human Development Index

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Beyond GDP Sprint 2023 5<sup>th</sup> Meeting: Mapping Distributional Frameworks

14 September 2023



**Part I:**

**Insights from 30 years of advancing metrics beyond GDP  
at the Human Development Report Office**

**Who? What? How?**

# HUMAN DEVELOPMENT INDEX

DIMENSIONS

Long and healthy life

Knowledge

A decent standard of living

INDICATORS

Life expectancy at birth

Mean years of schooling

Expected years of schooling

GNI per capita (PPP US \$)

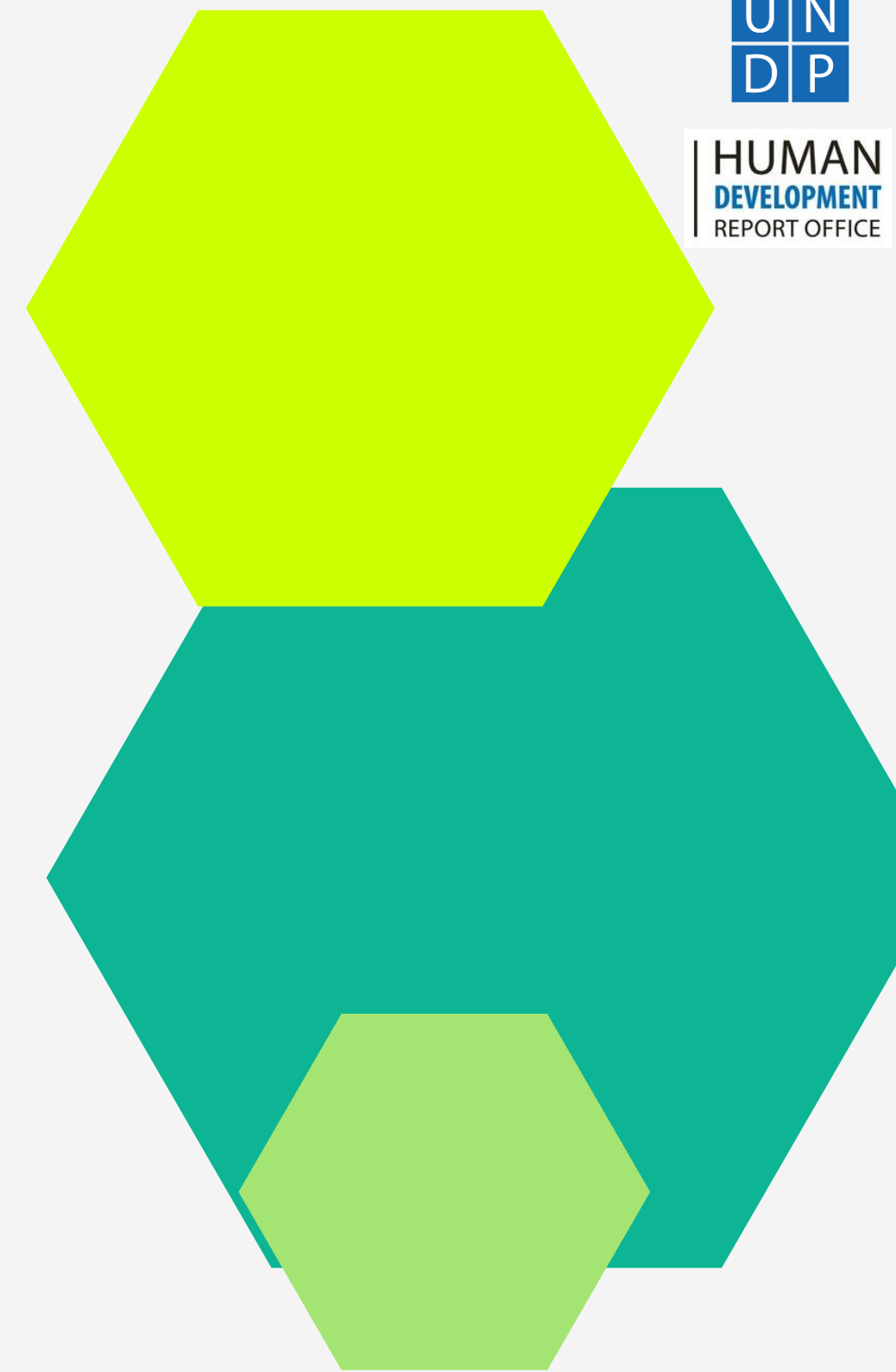
DIMENSION INDEX

Life expectancy index

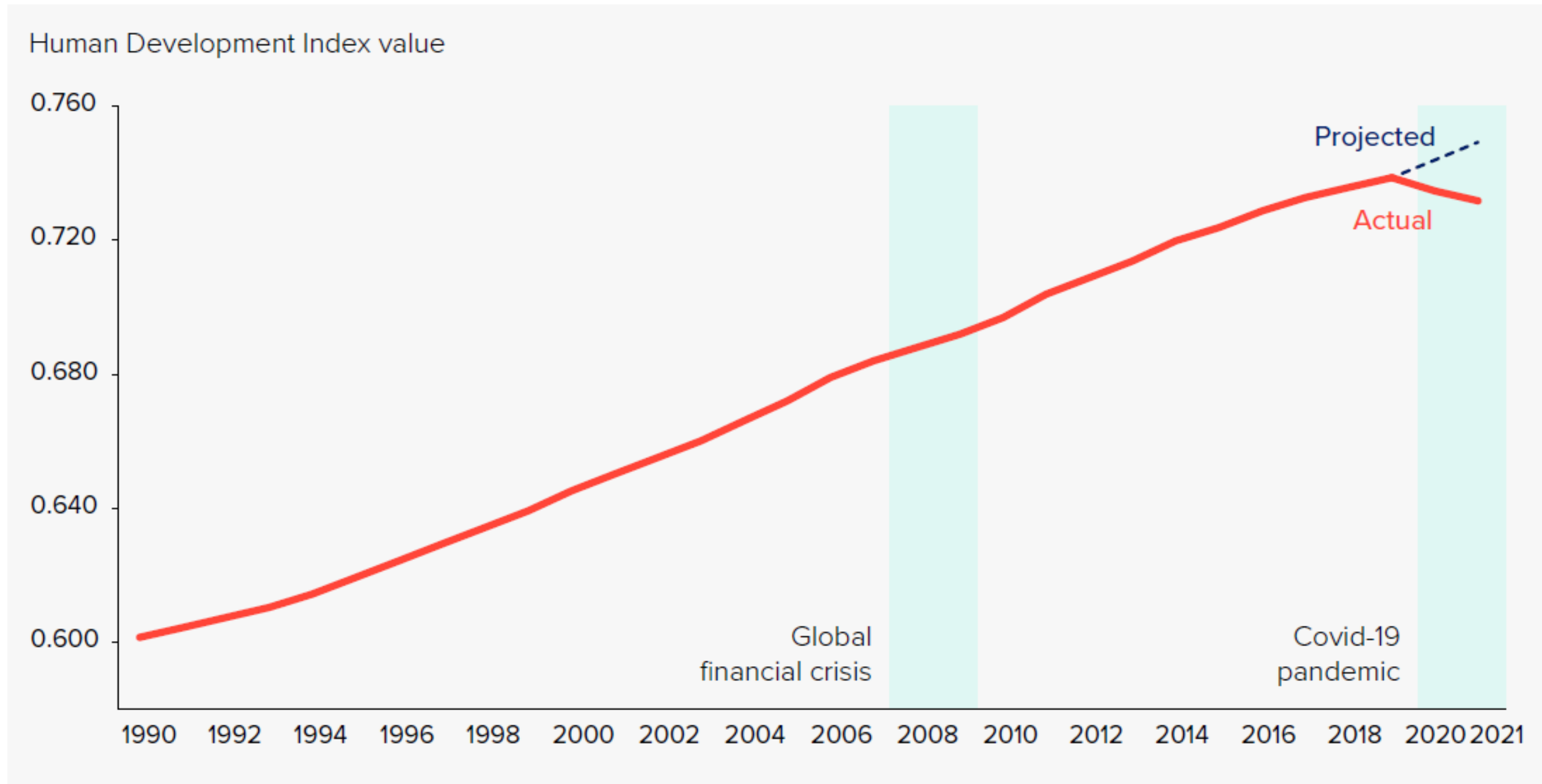
Education index

GNI index

Human Development Index (HDI)



# A STORY OF PROGRESS - INTERRUPTED



**Note:** The period of the global financial crisis is indicative.

**Source:** Human Development Report Office calculations based on data from Barro and Lee (2018), IMF (2021c, 2022), UNDESA (2022a, 2022b), UNESCO Institute for Statistics (2022), UNSD (2022) and World Bank (2022c).

# OTHER HUMAN DEVELOPMENT METRICS

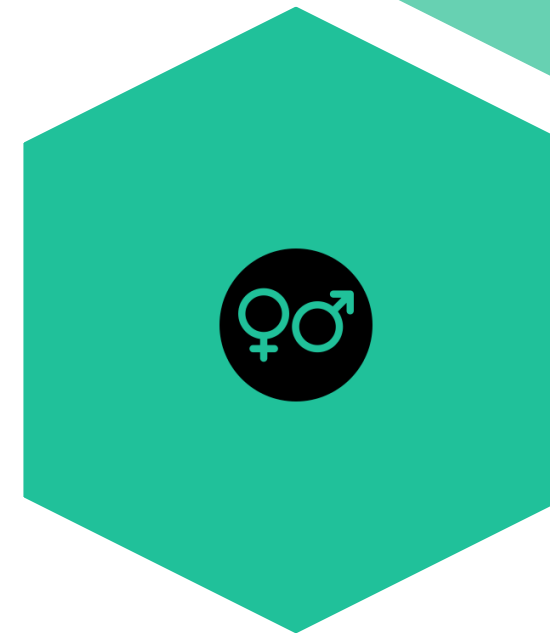
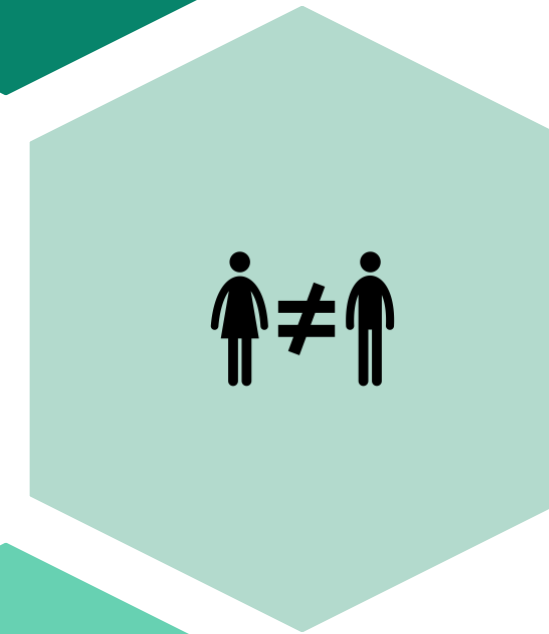


Inequality-adjusted HDI (IHDI)

adjusts the Human Development Index (HDI) for inequality.

reflects gender-based disadvantage in three dimensions—reproductive health, empowerment and the labor market

Gender Inequality Index (GII)



Gender Development Index (GDI)

measures gender inequalities in achievement in three basic dimensions of human development (health, education, income)

Multidimensional poverty index (MPI)

# Beyond GDP

## Beyond Income

## Beyond Averages

## Beyond Today

(LNOB, inequalities today)

(Sustainability, uncertainty)



**Wellbeing Achievements**  
(Health, education, nutrition, longevity...)

**Agency**  
(ability to act and reason according to commitments/values, beyond own wellbeing)

**Across People**

**Across Groups**

**Assets/Wealth**  
(what do we leave to our future selves and to future generations)

**Commitments/Values**  
(how much freedom our future selves and future generations will have to make their own choices)

HDI  
Multidimensional Poverty Index

Gender Inequality Index  
Gender Social Norms Index

Inequality adjusted HDI  
Distributed National Accounts (income and wealth inequalities)

Gender (GDI), ethnicity (latest MPI), subnational disaggregation,...

Natural Capital (SEEA)  
Dasgupta Review (links changes in total wealth and wellbeing)  
Inclusive Wealth (UNEP, World Bank)  
Human Capital Index (World Bank)  
Knowledge (science, digital assets, language,...)

Planetary Pressures-Adjusted HDI





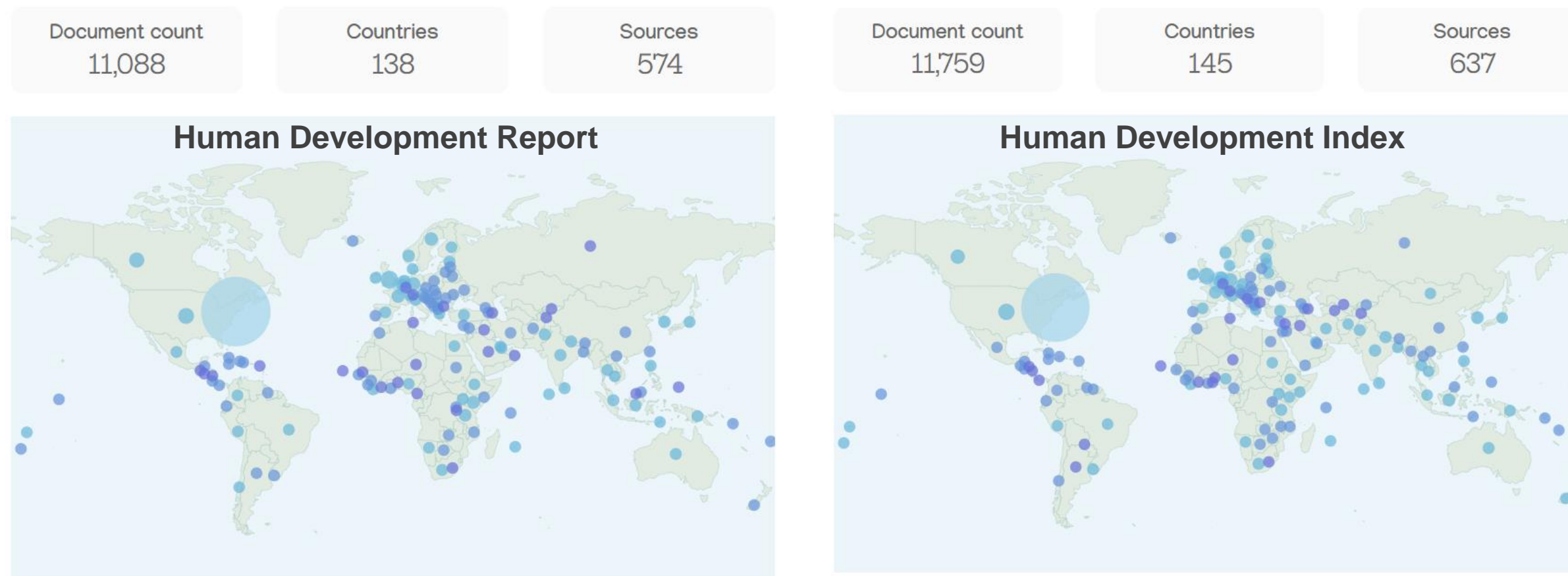
**Part II:**

**Policy impact and relevance of HDRO metrics beyond GDP**

**Demand for disaggregated HD indices and various efforts in this direction**

# IMPACT IN INFORMING POLICIES WORLDWIDE: KEY REFERENCE AND METRIC FOR GLOBAL DEVELOPMENT

- Since April 2020, Human Development Index (HDI) widely used an alternative metric in global development, with over 11,000 references from 145 countries and territories.
- HDRO public website receives over 11 million page views and over 1 million digital knowledge product downloads each year.





# IMPACT OF HDI



The President of the Republic, H.E. Issoufou Mahamadou chaired, on March 13 and 14, 2019, a meeting of the Inter-ministerial Committee for the Monitoring of the Human Development Index (HDI) in Niger, brought together the Prime Minister and Chairman of the said Committee, H.E. Brigi Rafini, the members of the Government concerned by the issue, but also the officials of the National Institute of Statistics (INS) and the technical and financial partners of Niger (UNDP, UNFPA, WHO, WB, etc.)



<b>Population</b>	
• 2022 estimate	▲ 333,287,557 <sup>[11]</sup>
• 2020 census	331,449,281 <sup>[d][12]</sup> (3rd)
• Density	87/sq mi (33.6/km <sup>2</sup> ) (185th)
<b>GDP (PPP)</b>	2023 estimate
• Total	▲ \$26.855 trillion <sup>[13]</sup> (2nd)
• Per capita	▲ \$80,035 <sup>[13]</sup> (8th)
<b>GDP (nominal)</b>	2023 estimate
• Total	▲ \$26.855 trillion <sup>[13]</sup> (1st)
• Per capita	▲ \$80,035 <sup>[13]</sup> (7th)
<b>Gini (2020)</b>	▲ 39.4 <sup>[e][14]</sup> medium
<b>HDI (2021)</b>	▲ 0.921 <sup>[15]</sup> very high · 21st
<b>Currency</b>	U.S. dollar (\$) (USD)
<b>Time zone</b>	UTC-4 to -12, +10, +11
• Summer (DST)	UTC-4 to -10 <sup>[f]</sup>
<b>Date format</b>	mm/dd/yyyy <sup>[g]</sup>

10 September 2018

## Sovereigns and ESG

Is there value in virtue?

- ▶ We develop a model to score countries according to their main ESG attributes
- ▶ The model has a strong correlation with sovereign CDS spreads...
- ▶ ...and appears to predict long-term performance

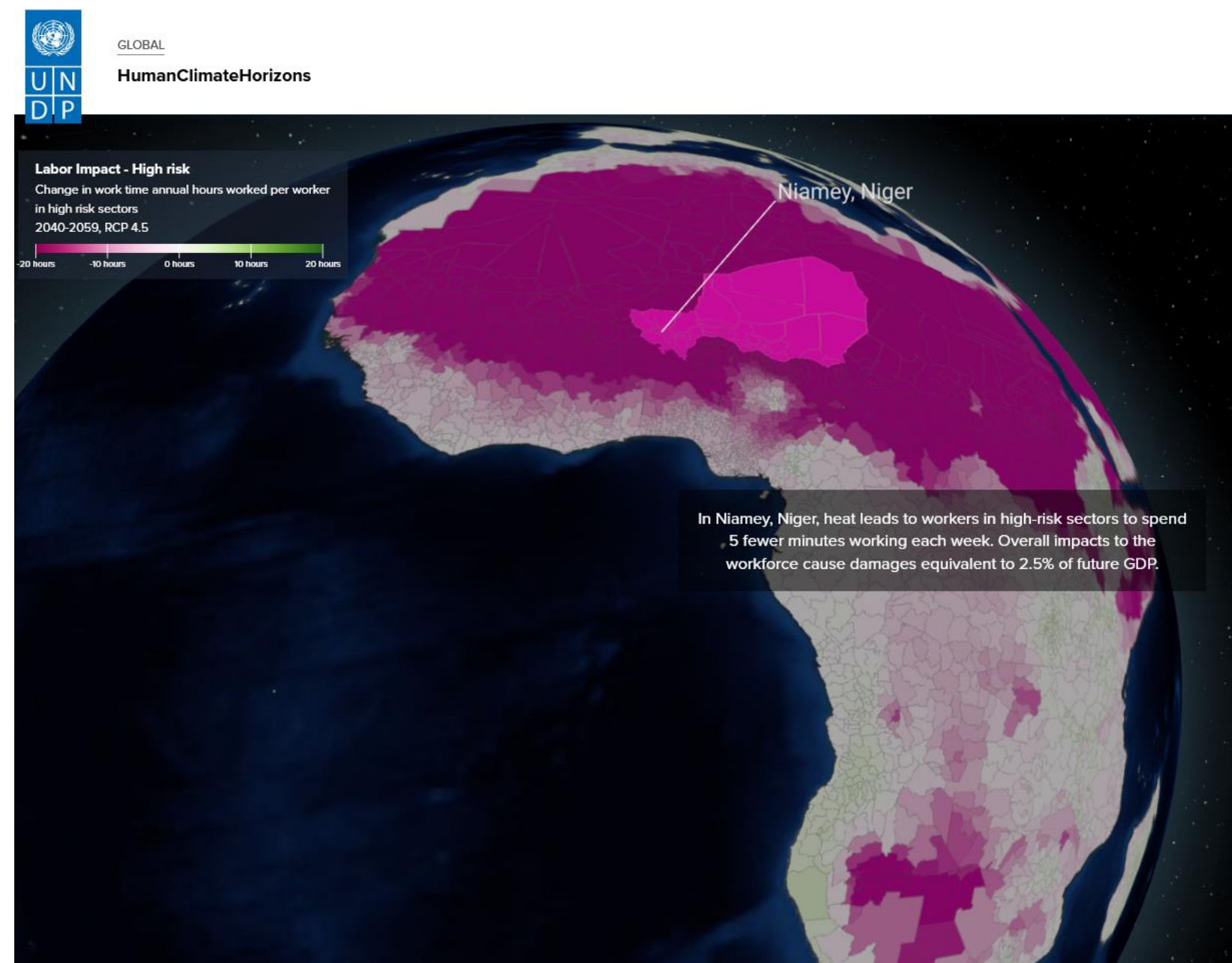
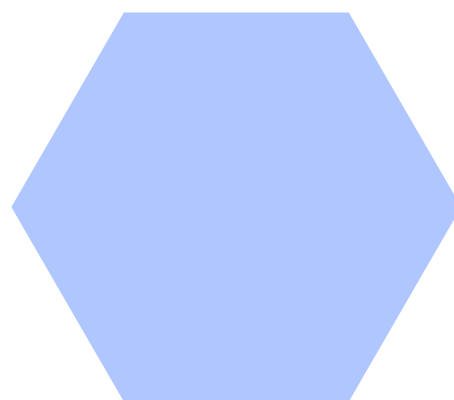
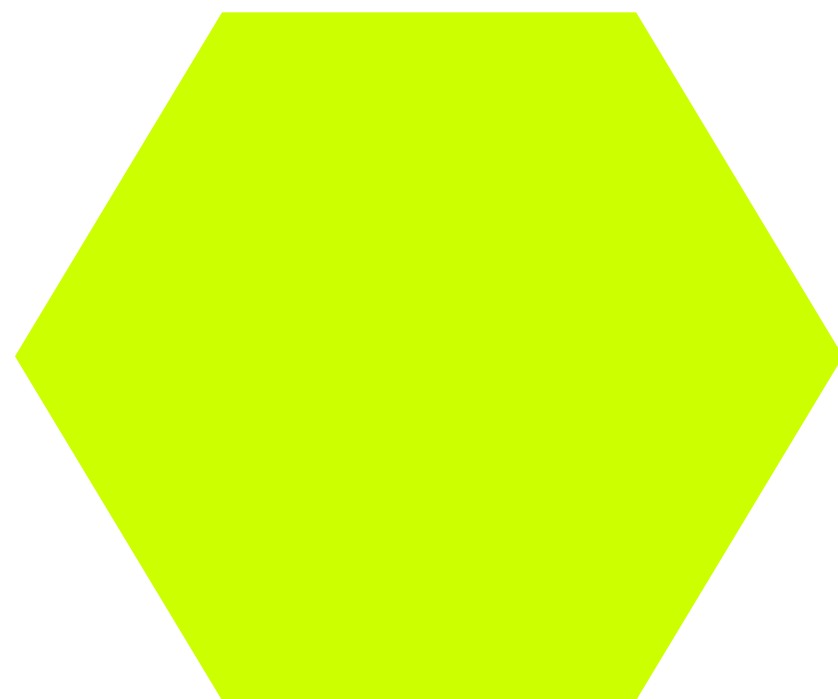
### Social

#### Measure 2: Human Development Index (HDI)

This is compiled by the United Nations Development Programme and looks at the development of a country, combining (1) a long healthy life, (2) being knowledgeable and (3) having a good standard of living. Combining measures of these comes up with an aggregate score. In our dataset, Norway has the highest HDI score with Senegal the lowest.

**Why:** This is a broad measure of development which is important from a social point of view and can have implications on a government's ability to meet its obligations.

<https://horizons.hdr.undp.org/>

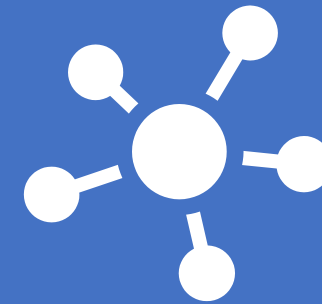


# ADVANCING HUMAN DEVELOPMENT IN THE ANTHROPOCENE: A NEW GENERATION OF MEASUREMENTS



Beyond income

by providing people-centered measurements of how living in Anthropocene will impact our health, well-being, and our livelihoods.



Beyond averages

by providing highly-disaggregated estimates, while continuing advancements in composite indices.



Beyond today

by providing short-medium and long term climate risk projections under different policy scenarios.



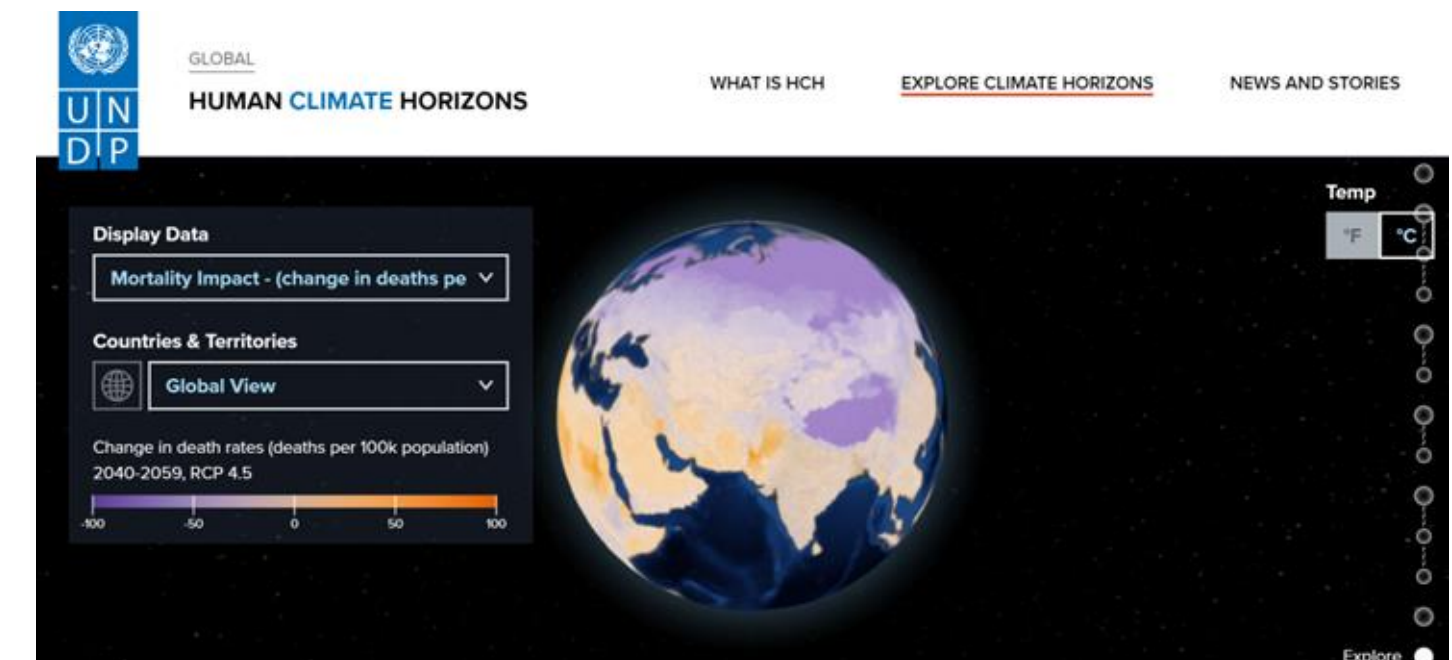
# WHAT IS HUMAN CLIMATE HORIZONS PLATFORM?

## The Human Climate Horizons (HCH) provides:

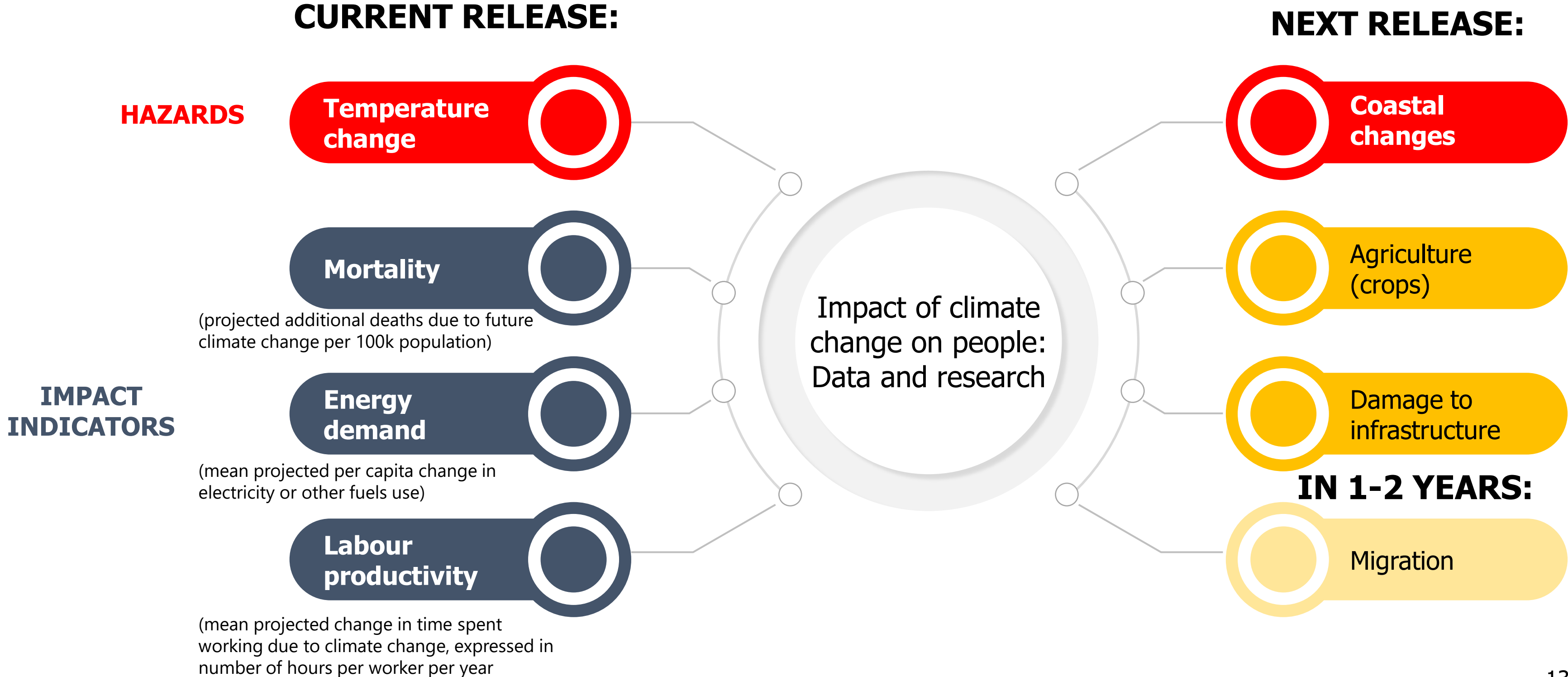
- Partnership product between UNDP/HDRO and CIL
- Comprehensive, peer-reviewed climate risk data
- Offers projected impacts of climate change at both global and hyperlocal levels - Covers over 24,000 regions and cities globally
- Provides information for two emission scenarios and time horizons up to the end of the **21st century**
- Available to everyone as an open digital public good

## HCH is a powerful tool that can help:

- Identify where people are most at risk and impacts.
- Compare impact at a country level or and between countries and inform decision-making and highlight where local and collective responses are most needed
- Illustrate how the impact of present choices can shape human development over the century.



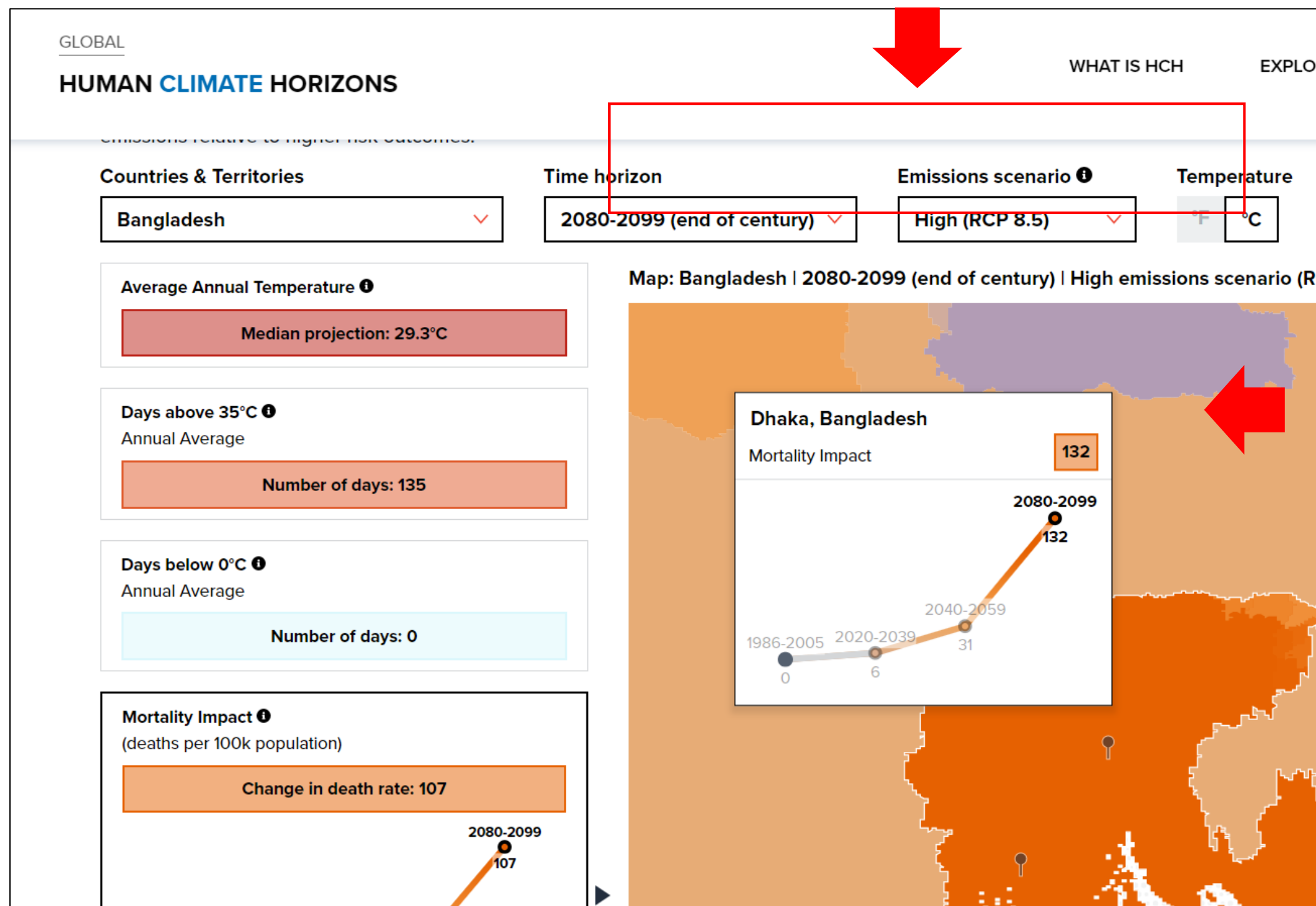
# WHICH CLIMATE RISKS AND IMPACTS ARE COVERED?





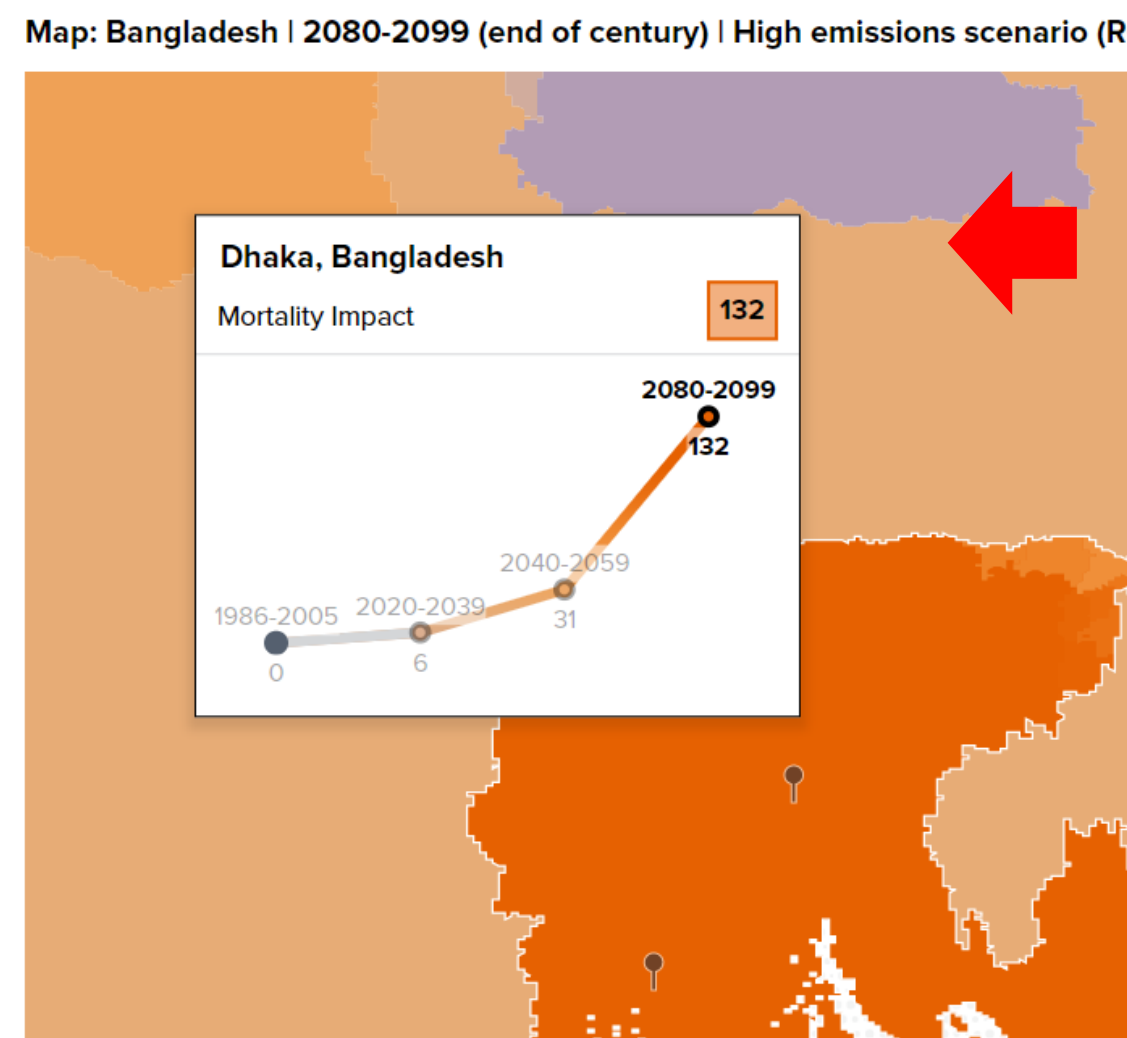
# BANGLADESH: PROJECTED MORTALITY IMPACTS AT SUBNATIONAL LEVEL (CITY OF DHAKA EXAMPLE)

People in developing parts of the world are more vulnerable to the risk of death associated with increased heat



**Example:** in Dhaka, under a scenario of very high emissions, **an additional 132 people in every 100,000 could die** each year by 2100 compared to a future with no climate change.

This figure is **double Bangladesh's death rate from all cancers each year** and **9 times greater than the rate of road traffic fatalities.**




### Mortality impact unit:


Number of additional deaths due to climate change per 100k population

# MALAYSIA: PROJECTED MORTALITY IMPACTS AT SUBNATIONAL LEVEL (KOTA SETAR DISTRICT EXAMPLE)


## Countries & Territories

Malaysia 

## Time horizon

2080-2099 (end of century) 

## Emissions scenario

High (RCP 8.5) 

## Temperature

°F  °C

### Average Annual Temperature

Median projection: 29.7°C

### Days above 35°C

Annual Average

Number of days: 119

### Days below 0°C

Annual Average

Number of days: 0

### Mortality Impact

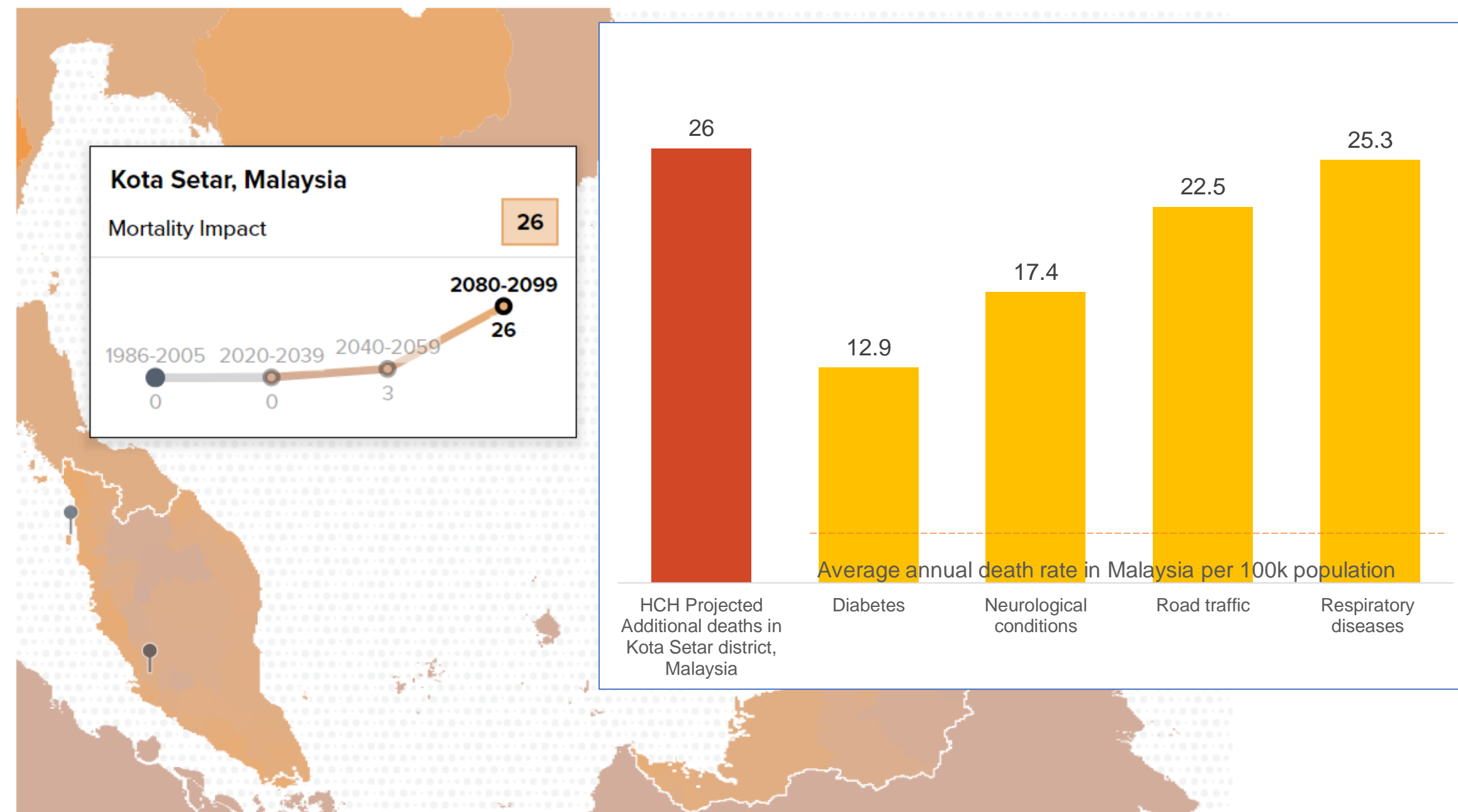
(deaths per 100k population)

Change in death rate: 1



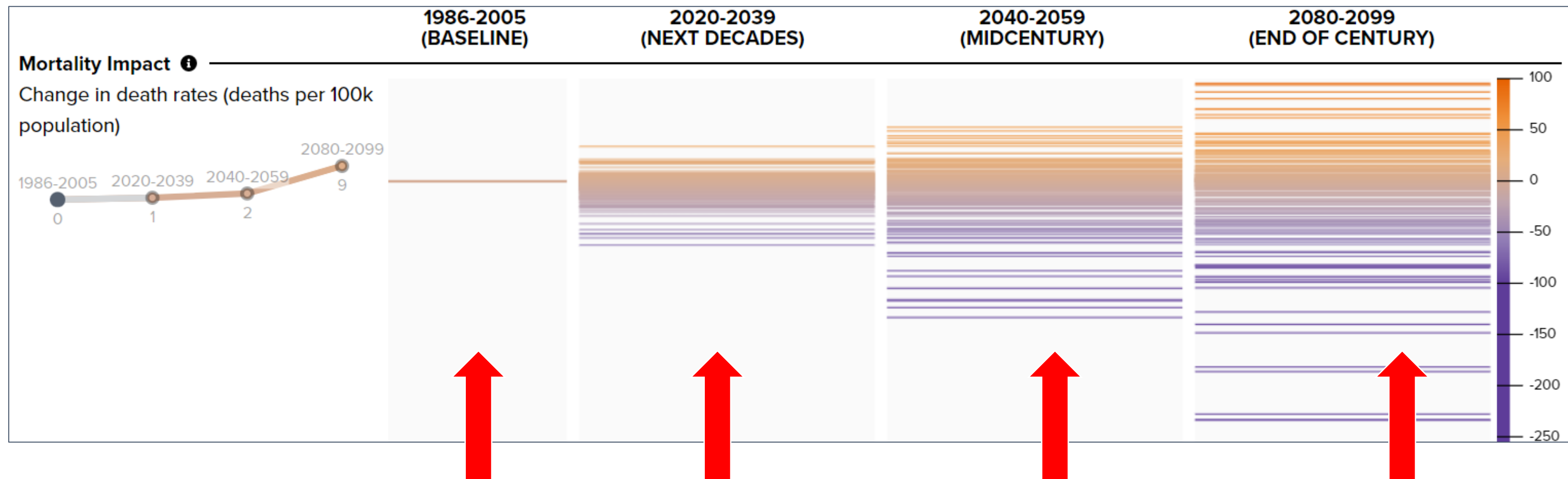
Emissions Scenario:  
— High (RCP 8.5) - - - Moderate (RCP 4.5)

Map: Malaysia | 2080-2099 (end of century) | High emissions scenario (RCP 8.5)



# CLIMATE CHANGE IS AN INEQUALITY BOMB

- A comparison of the health impacts of climate change across and within countries offers an even more extreme picture: **an escalation in inequalities will shape our warmer future over this century.**

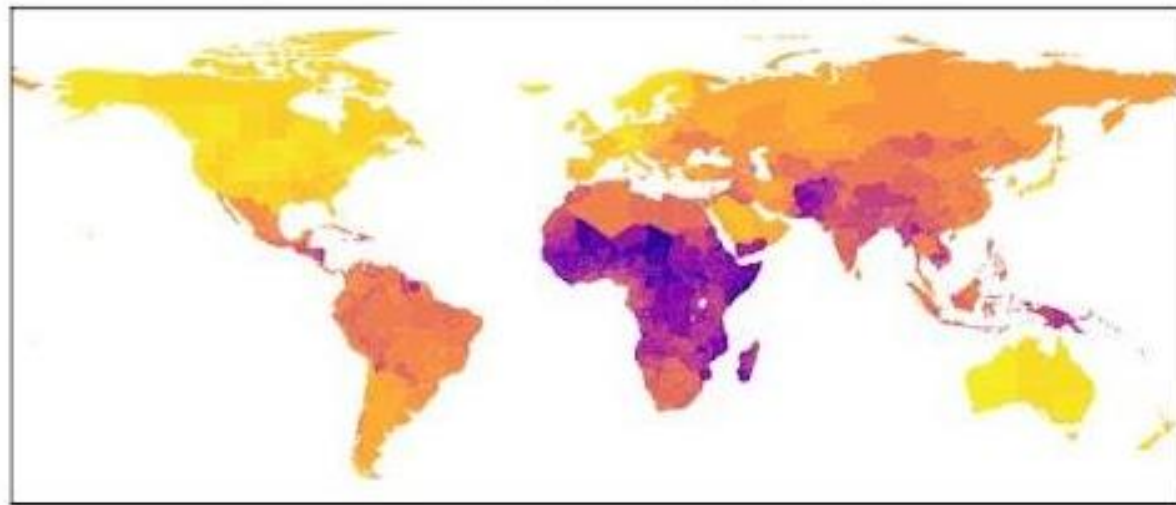


- These can be avoided with continued global progress towards Paris Agreement targets, which the modeling projects could reduce projected mortality from extreme heat in 2100 by about 80%, translating into the possibility of saving millions of lives.

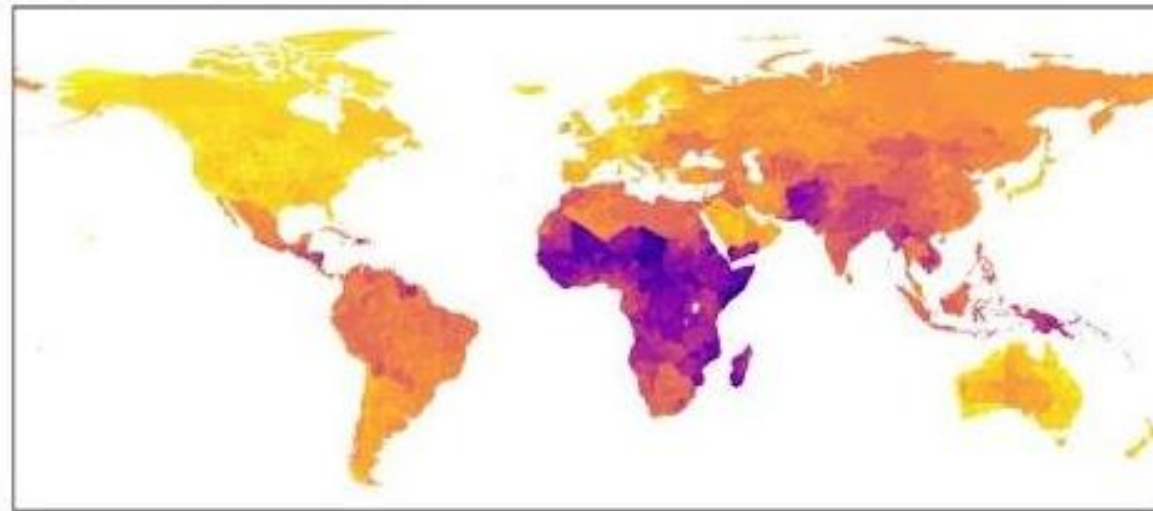


# DISAGGREGATING THE HDI USING SIML

Observations of HDI at ADM1 (Smits and Permanyer, 2019)



Predictions of HDI at ADM2



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NBER WORKING PAPER SERIES

GLOBAL HIGH-RESOLUTION ESTIMATES OF THE UNITED NATIONS HUMAN DEVELOPMENT INDEX USING SATELLITE IMAGERY AND MACHINE-LEARNING

Luke Sherman  
Jonathan Proctor  
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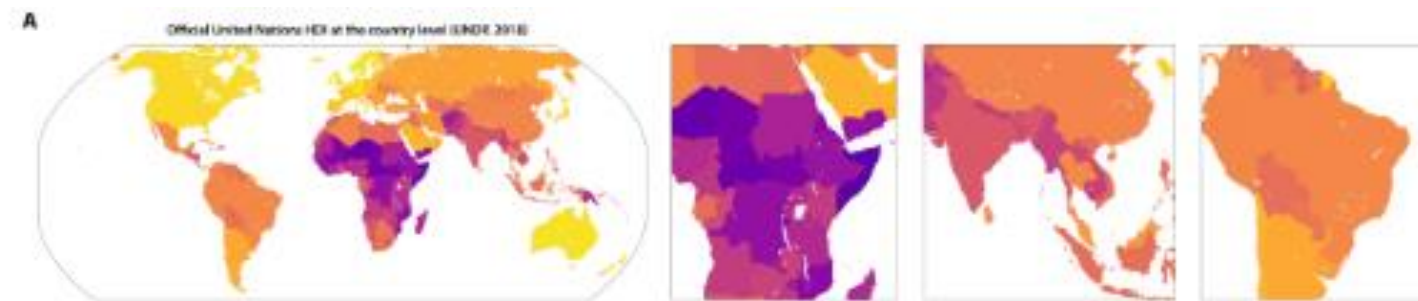
Working Paper 31044  
<http://www.nber.org/papers/w31044>

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
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March 2023

# TOWARDS HYPER LOCAL ESTIMATES OF HUMAN DEVELOPMENT

Using Machine Learning and Satellite Imagery... we can go from

Country



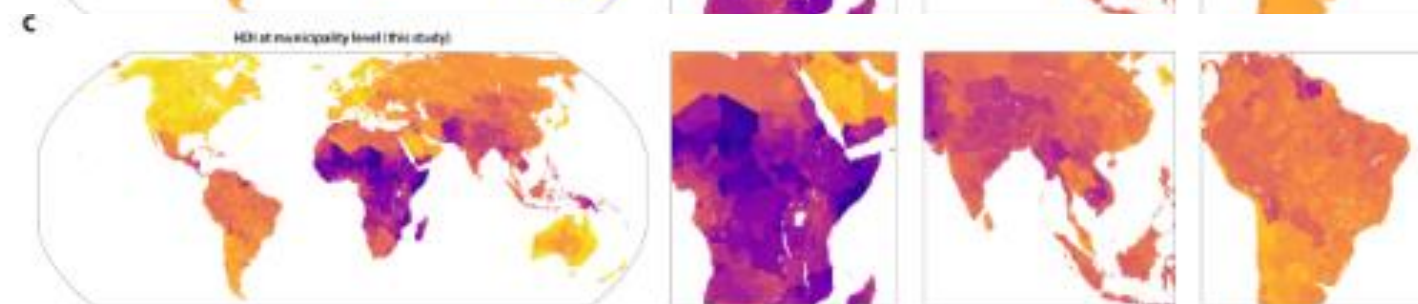
N=191

Province



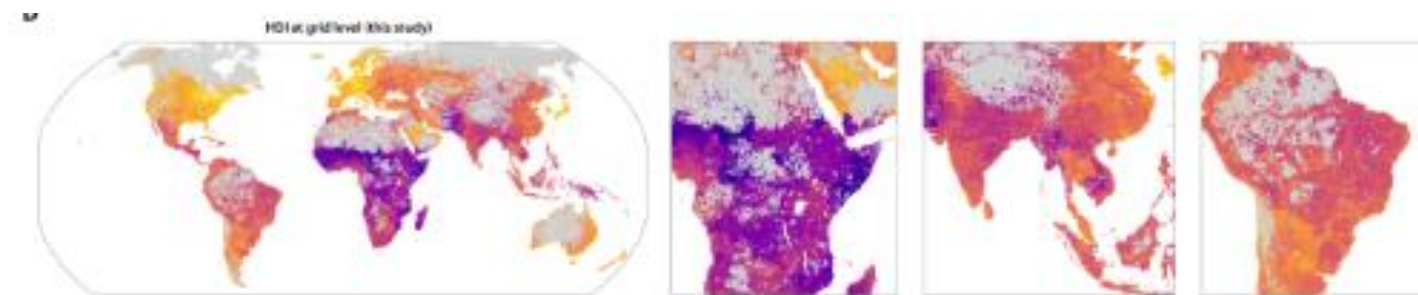
N=1,765

Municipality

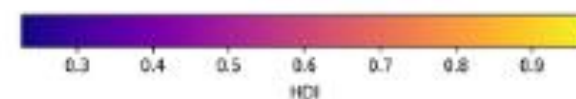


N=61,591

0.1 x 0.1 degrees

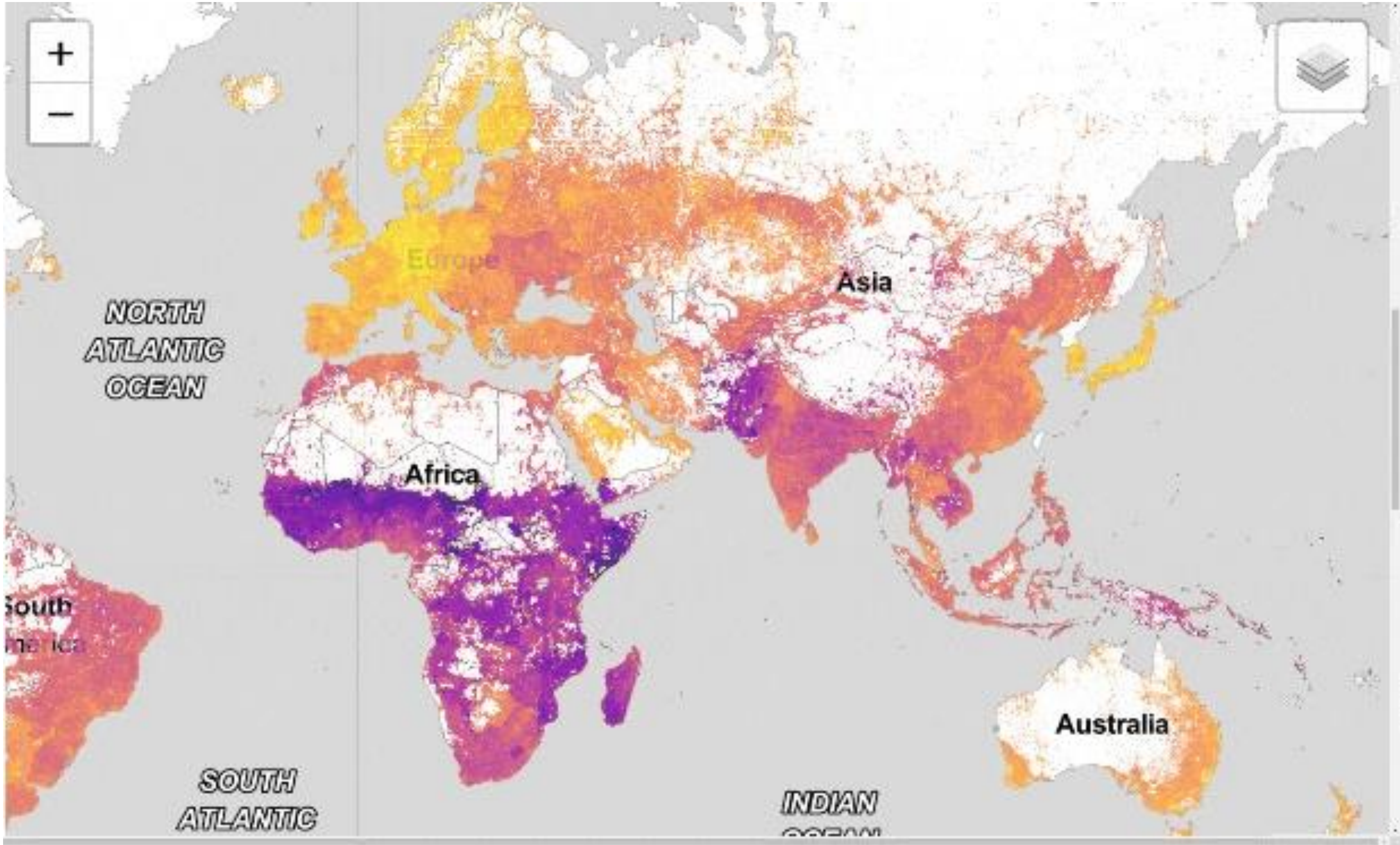


N=806,361



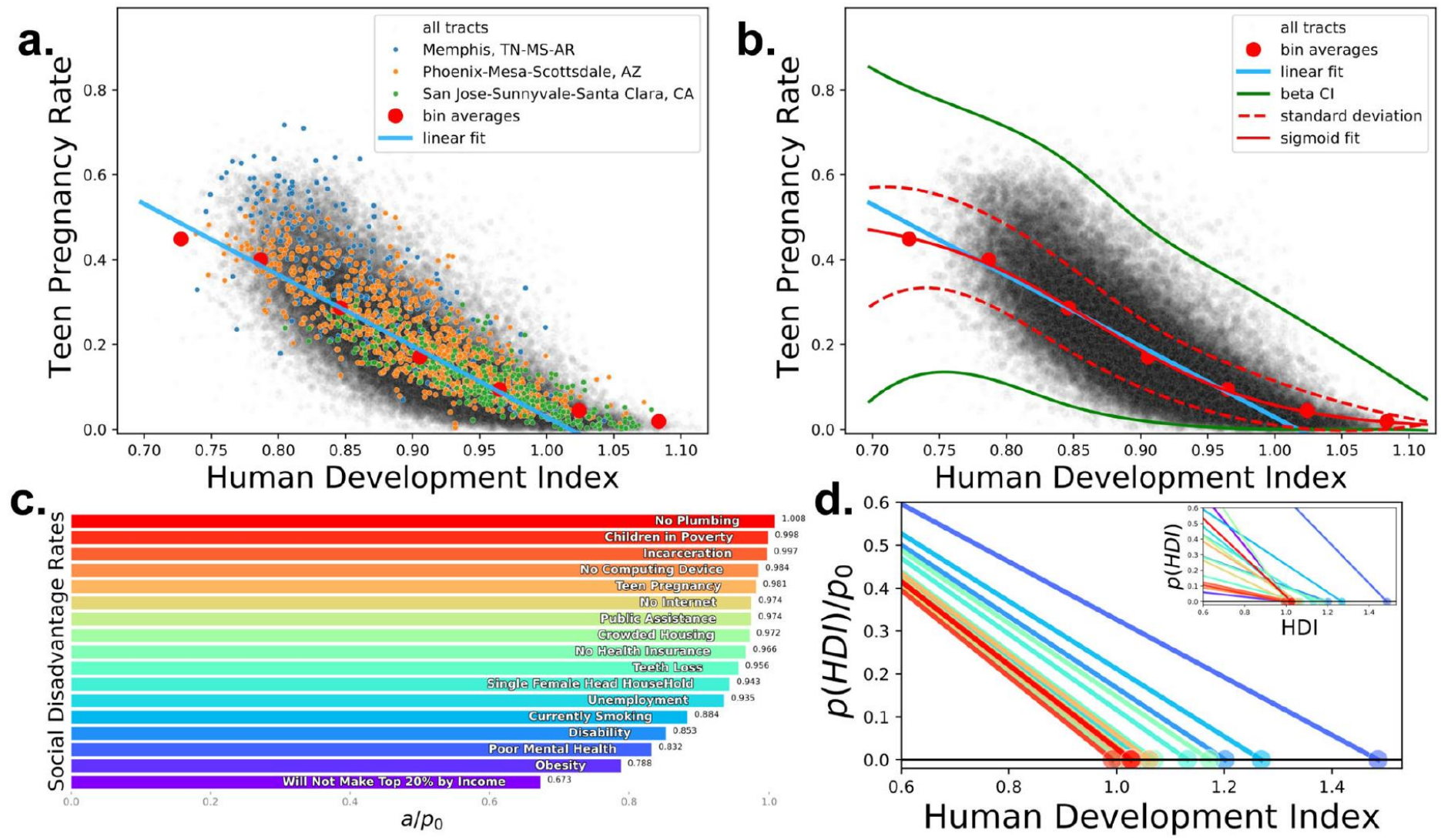
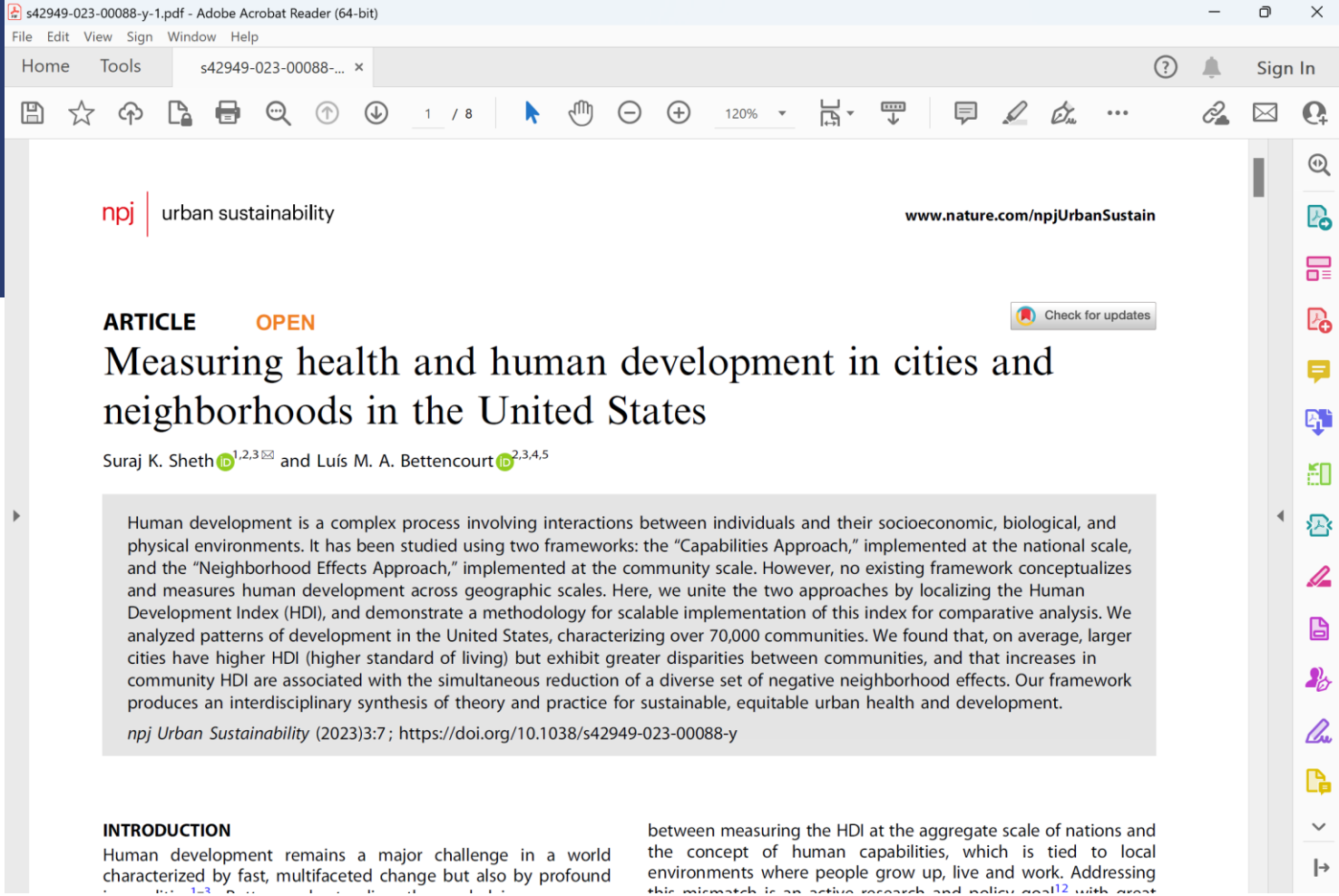


# HYPER LOCAL HUMAN DEVELOPMENT AT 0.1 X 0.1 DEGREES

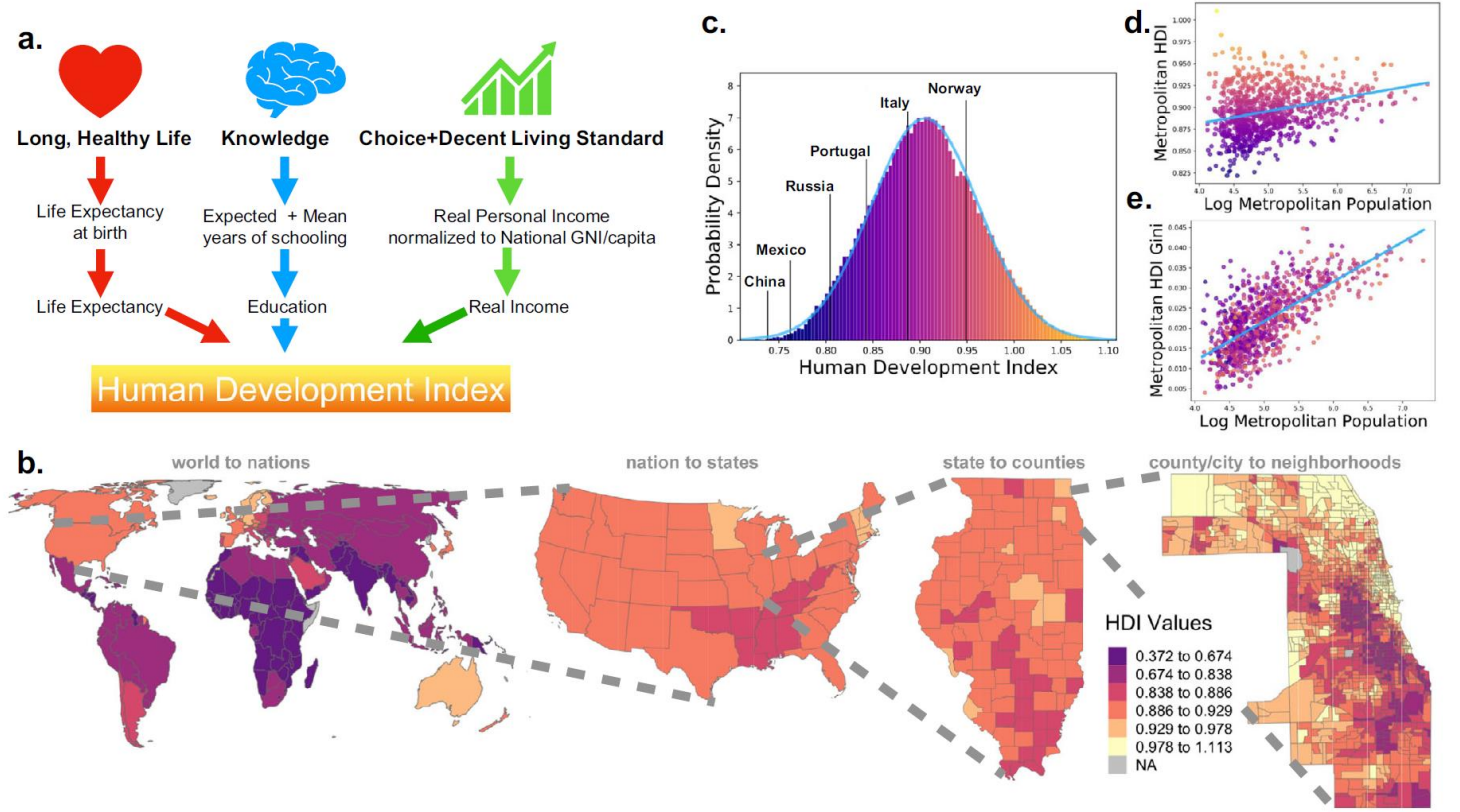




# US COMMUNITY HDI ASSOCIATED WITH 17 INDICATORS OF SOCIAL DISADVANTAGE

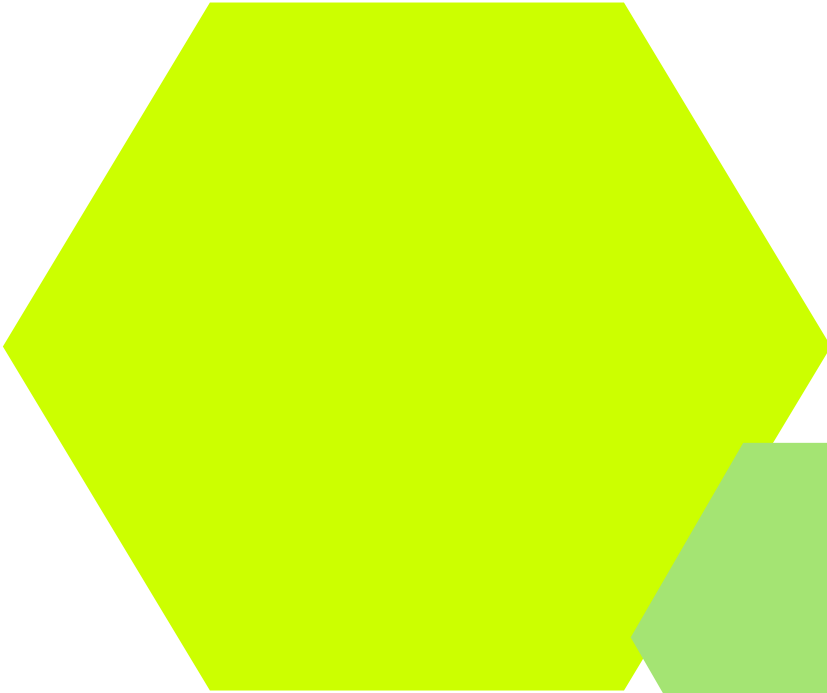


**Fig. 3 Higher human development index values are associated with many different lower social disadvantage rates.** **a** Highlights for three different metropolitan areas with low, medium and high HDI for teen pregnancy rates. The average rate (red circles) decreases approximately linearly (blue line) with HDI. **b** A Beta distribution with parameters varying with HDI gives a better description of the rate statistics, including slowing down at very high HDI and associated variance (risk) reduction. **c** The slopes of the negative linear relation between 17 rates of social disadvantage and HDI, shown in **d** inset. **d** When adjusted for rate initial magnitudes at low HDI, all social disadvantage rates display similar slopes and vanish for  $HDI \rightarrow 1$  or slightly above, see Supplementary Figs. 20 to 28 and Supplementary Tables 4 and 5.





# HUMAN DEVELOPMENT METRICS: AN ONGOING COLLABORATIVE JOURNEY



STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE





- 1990: Concept and Measurement
- 1991: Financing
- 1992: Global Dimensions
- 1993: People's Participation
- 1994: Human Security
- 1995: Gender
- 1996: Economic Growth
- 1997: Poverty
- 1998: Consumption
- 1999: Globalization
- 2000: Human Rights
- 2001: New technologies
- 2002: Democracy
- 2003: MDGs
- 2004: Cultural Liberty
- 2005: Aid, trade and security
- 2006: Water
- 2007-8: Climate Change
- 2009: Human Mobility
- 2010: Pathways to Human Development
- 2011: Sustainability and Equity: A Better Future for all
- 2013: The Rise of the South: Human Progress in a Diverse World
- 2014: Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience
- 2015: Work for Human Development
- 2016: Human Development for Everyone
- 2018: Human Development Indices and Indicators: Statistical Update
- 2019: Beyond income, beyond averages, beyond today: inequalities in human development in the 21st Century
- 2020: The next frontier: Human development and the Anthropocene
- 2021-2: Uncertain Times, Unsettled Lives: Shaping our Future in Transforming World**

**Human  
Development  
Report  
Office**

