



**Brigham and Women's Hospital**

Founding Member, Mass General Brigham

# **Climate Change, Global Inequities and the Kidney:**

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- University of Witwatersrand Medical School, South Africa
- Medicine Residency @ Jackson Memorial Hospital, Miami
- Nephrology Fellowship @BWH

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- Affiliate Lecturer in Medicine/Nephrology @ HMS
- Nephrologist, University Children's Hospital, Zurich
- Honorary Associate Professor, Department of Paediatrics and Child Health, University of Cape Town
- Scientific Officer, Department of Public and Global Health, Epidemiology, Biostatistics and Prevention Institute, University of Zurich



# DISCLOSURES

Royalties as editor of Brenner and Rector textbook, The Kidney  
Speaker honoraria donated directly from company to 3<sup>rd</sup> party

Privileges:

- President European Kidney Health Alliance
- Member Renal Disaster Preparedness Task Force of ISN and ERA
- Chair, Ethics Committee ERA
- Periodic consultancies, Health Ethics and Governance Unit and NCD unit WHO



# OBJECTIVES

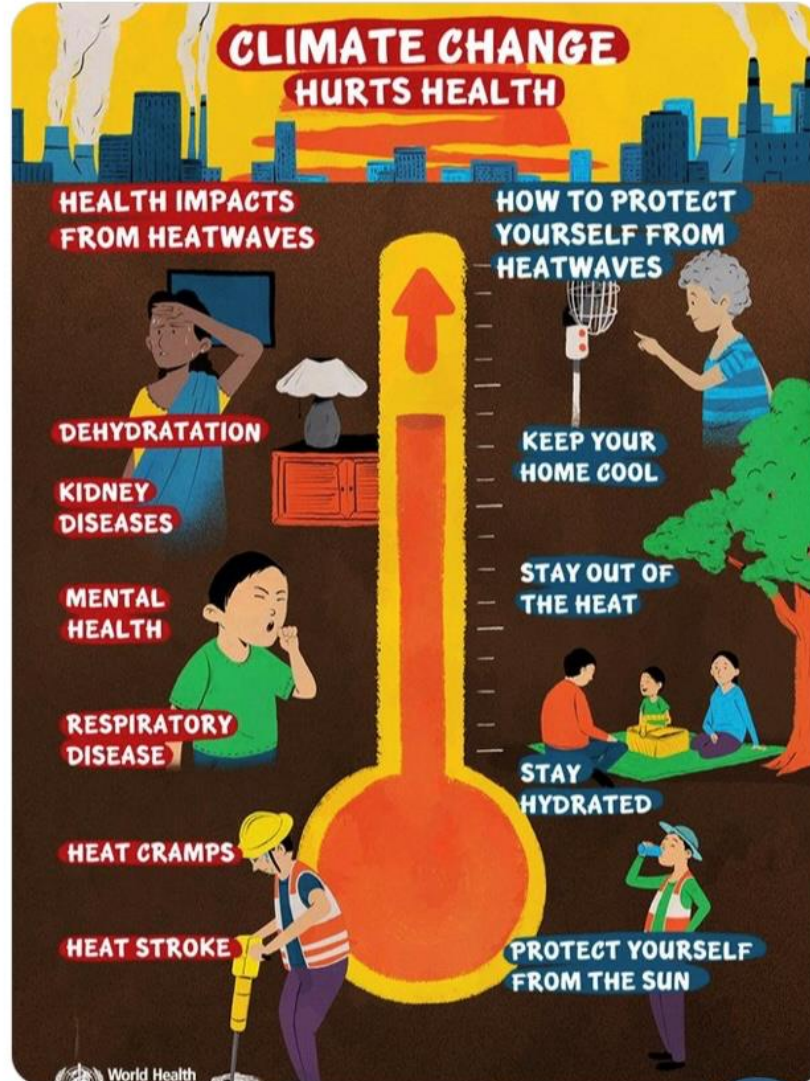
- Climate change
  - What is climate change?
  - Risks of kidney disease associated with climate change and the environment
- Equity:
  - Global inequities in access to kidney care
- How we (nephrology professionals/society) can make a difference





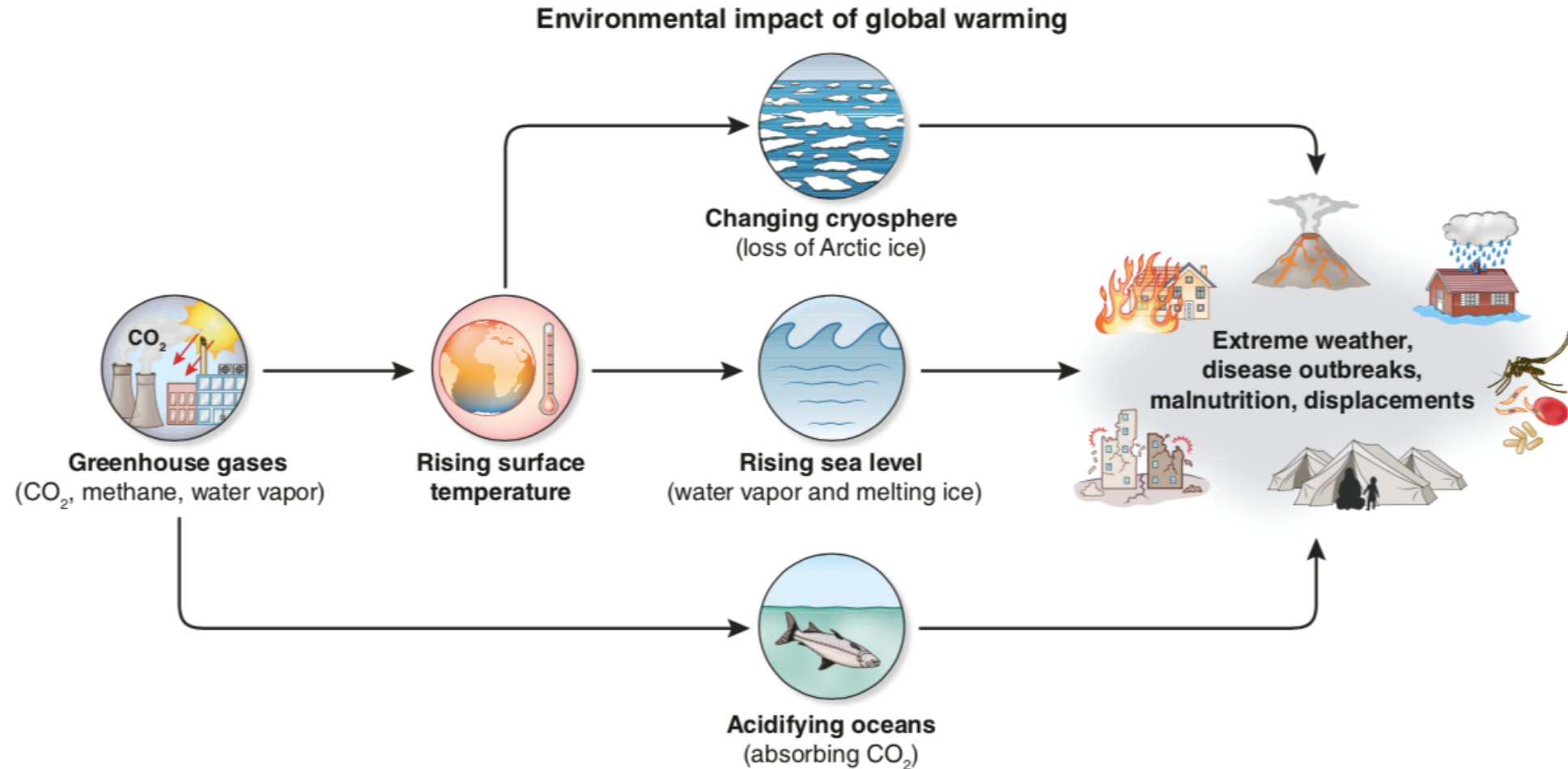
World Health Organization (WHO) · 1d

The [#ClimateCrisis](#) is driving health impacts such as heat stress, heart disease, asthma, and infectious diseases like dengue and cholera.

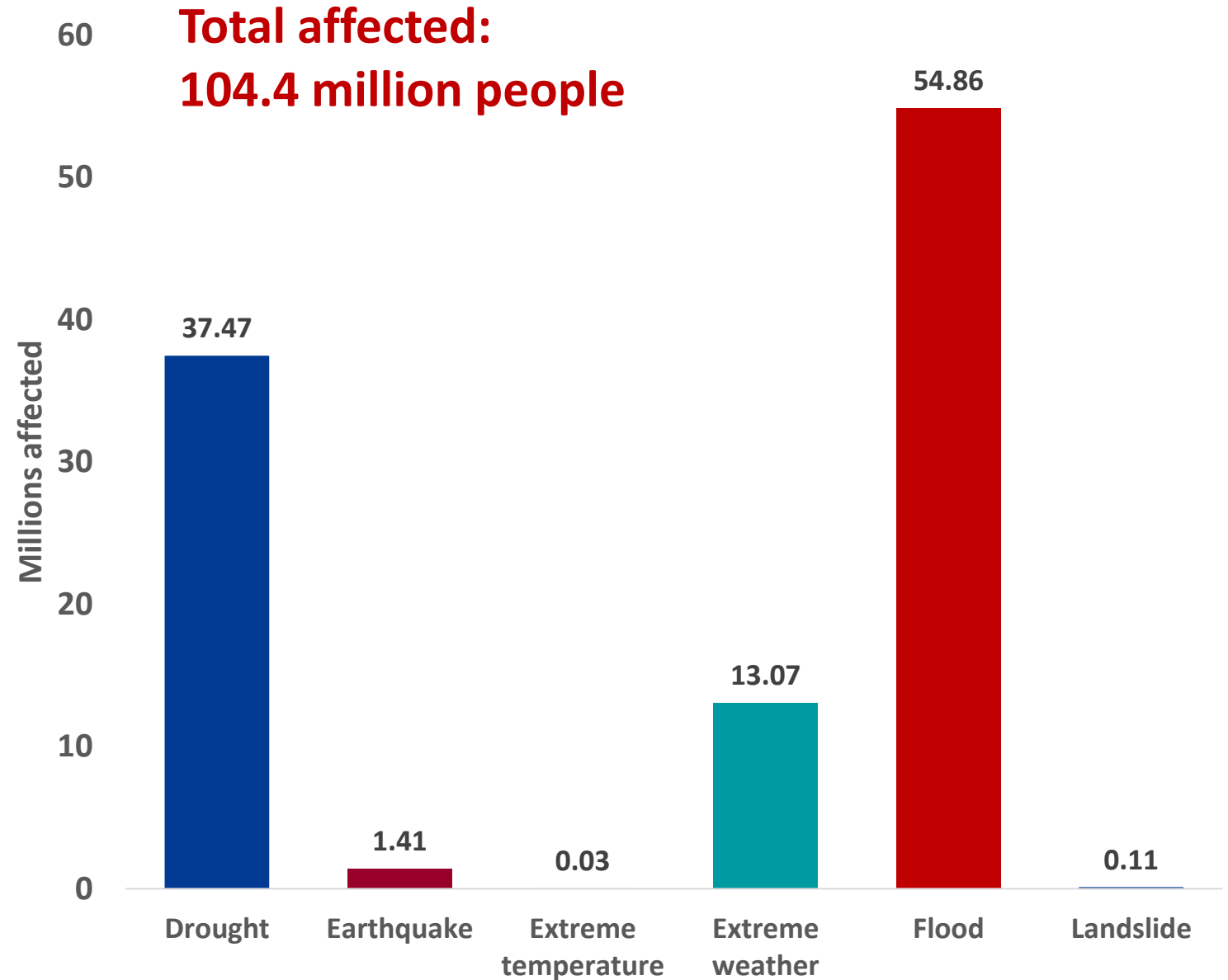


563 312 504 107K

# Climate change



Millions affected  
by natural  
disasters in 2022  
which may affect  
kidney health

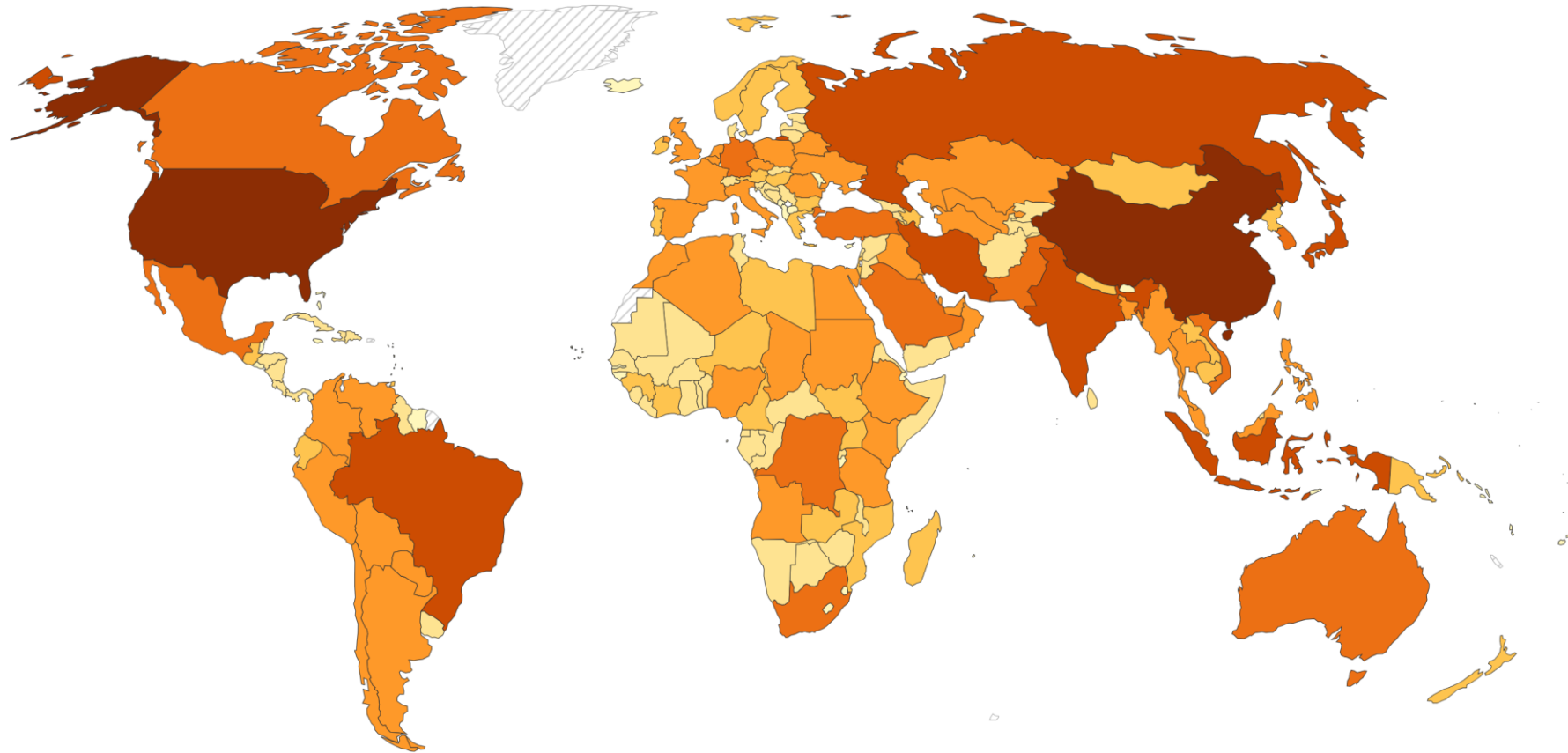


# Inequity in generation of greenhouse gases, 2021

## Greenhouse gas emissions, 2021

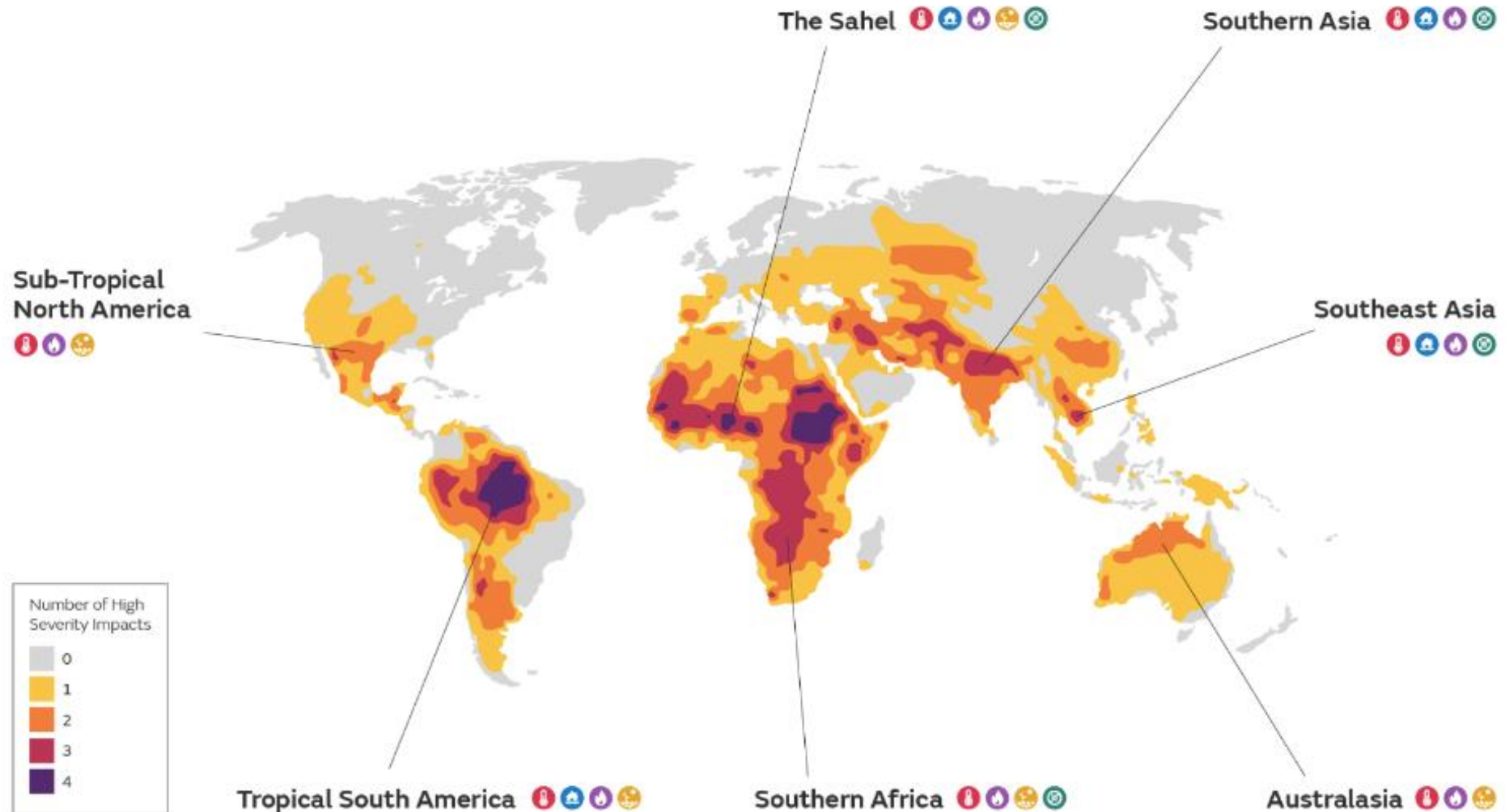
Greenhouse gas emissions include carbon dioxide, methane and nitrous oxide from all sources, including agriculture and land use change. They are measured in carbon dioxide-equivalents<sup>1</sup> over a 100-year timescale.

Our World  
in Data





# ... inequitable distribution of risk



Twenty of the richest billionaires are estimated, on average, to be emitting as much as 8,000 times more carbon than the billion poorest people.<sup>5</sup>

**8,000 X  
MORE**

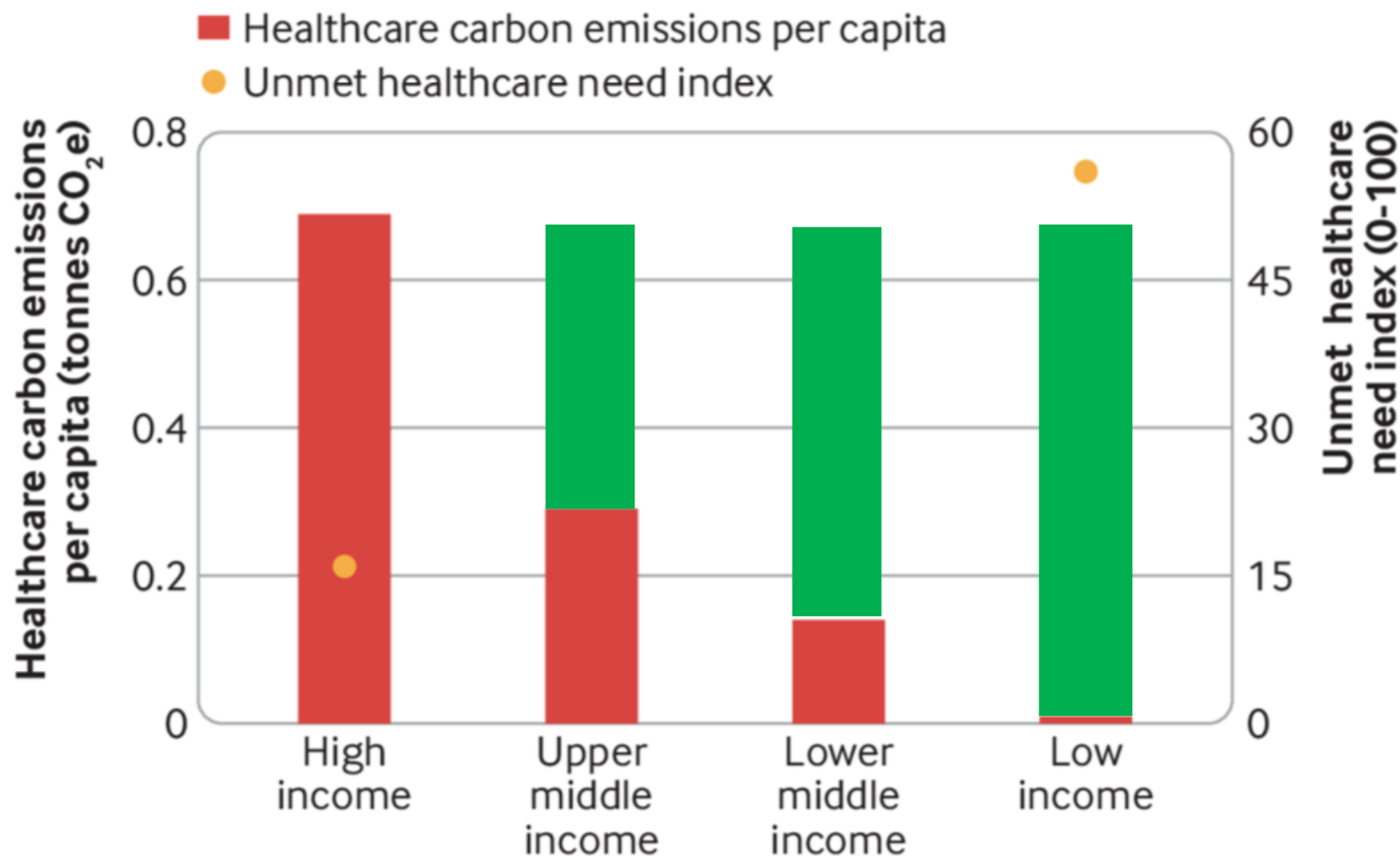


Richest 20



Poorest 1 billion

# Health care emissions and unmet healthcare needs



# Contributions to carbon emissions of an average Swiss hospital






Pharma emissions >50% higher than automotive industry!  
-> careful prescribing!



# Impact of hemodialysis on Planetary Health

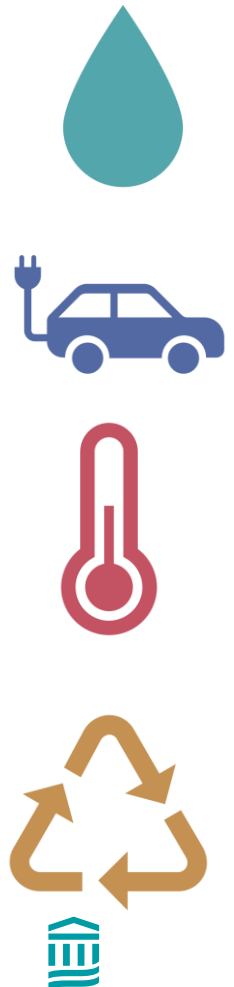
## - 4000 Pt/year, 3 x/week

Per person/session

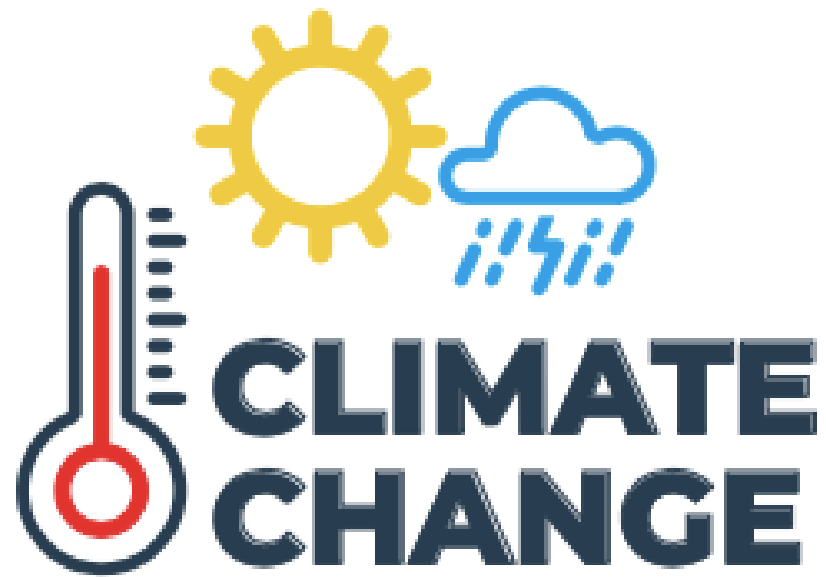
	<b>400 L/HD</b> (250L wasted)
	<b>12 kWh/HD</b>
	<b>4 tCO<sub>2</sub>-eq/year</b>
 	<b>2.5 Kg/HD</b>

# Impact of hemodialysis on Planetary Health

## - 4000 Pt/year, 3 x/week



Per person/session	700 000 Pt/y	Comparable to:	
<b>400 L/HD</b> (250L wasted)	<b>40. 300 billion L/year</b> (156 Mio L/y wasted)	<b>Olympic swimming pools?</b> (= 2.5 million L/pool)	<b>16 128 pools</b>
<b>12 kWh/HD</b>	<b>1.2 billion kWh/year</b>	<b>Car trips from New York to Los Angeles (4500 km)?</b> (= 1 kWh/Km)	<b>268 thousand trips</b>
<b>4 tCO2-eq/year</b>	<b>2.8 million tCO2-eq/year</b>	<b>US households?</b> (= 48 tCO2/HH (2.2 People))	<b>93 333 households</b>
<b>2.5 Kg/HD</b>	<b>252 million Kg/year</b>	<b>African elephants?</b> (= 5000 Kg)	<b>50 400 elephants</b>



## DIRECT IMPACTS

- Storm
- Drought
- Flood
- Heatwave
- Temperature Change
- Wildfires



## INDIRECT IMPACTS

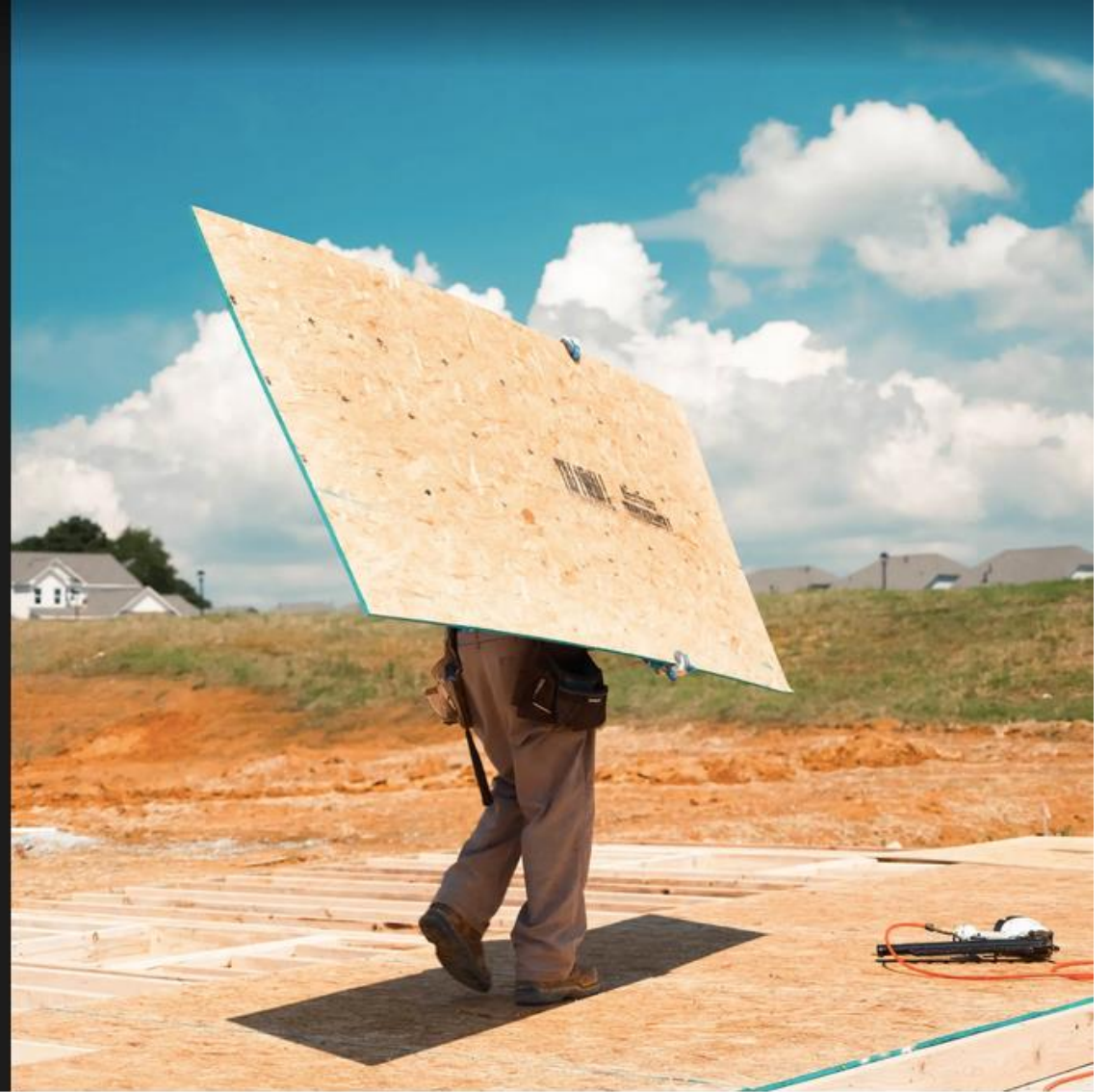
- Water Quality
- Air Quality
- Land Use Change
- Ecological change



# Chronic Kidney Disease Is Poised to Become the Black Lung of Climate Change

By Aryn Baker

READ  
▼



Construction workers toil in the heat working on a new subdivision being built in Loganville, Ga., in July 2023. José Ibarra Rizo for TIME





# Temperature





82 studies  
included in meta-analysis

**Percentage changes per 1 °C  
increase in temperature for  
kidney disease morbidity**



**Urolithiasis**  
*(ICD-10 N20-N23)*

**2.2%**



**Acute kidney injury**  
*(ICD-10 N17)*

**1.2%**



**Urinary tract infections**  
*(ICD-10 N10-N12, N30, N39)*

**0.8%**



Repeated heat stress



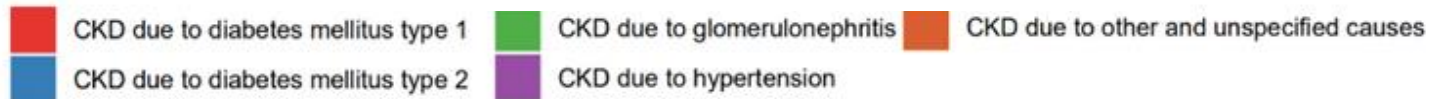
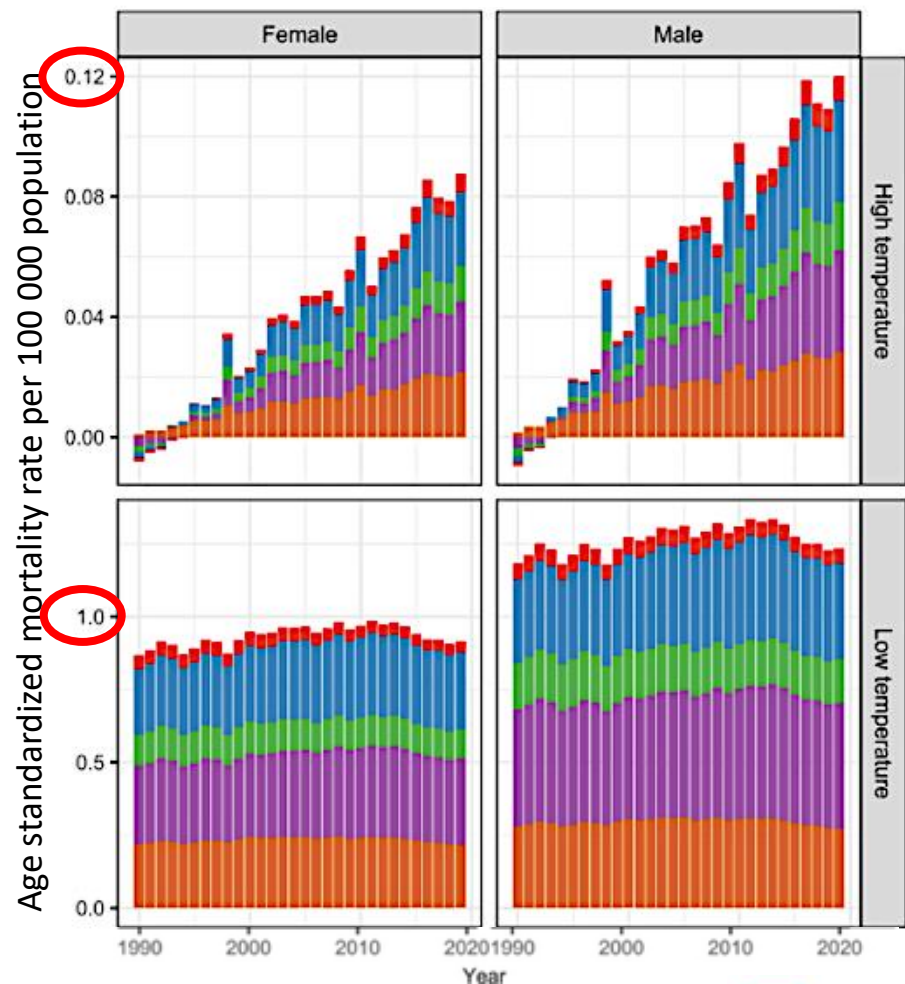
**CKD**

# Kidney disease mortality from temperature extremes

Global

High T°

Low T°



## Pakistan floods: A health crisis of epic proportions

*With 33 million people affected by the flooding, there are increased risks of waterborne diseases and disrupted access to healthcare.*



[Jawahir Al-Naimi/Al Jazeera]

By Dr Amir Khan

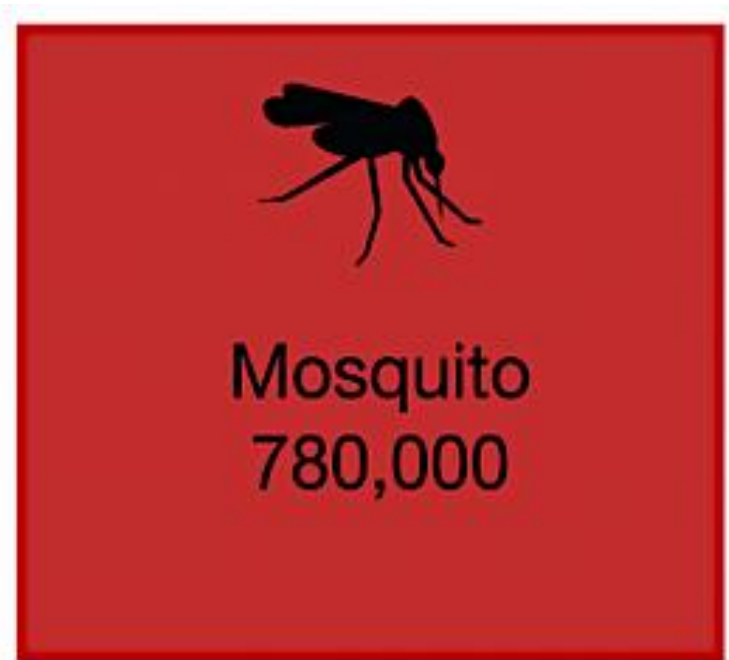
13 Sep 2022



# Floods



Deadliest animals: global deaths by animal, 2016

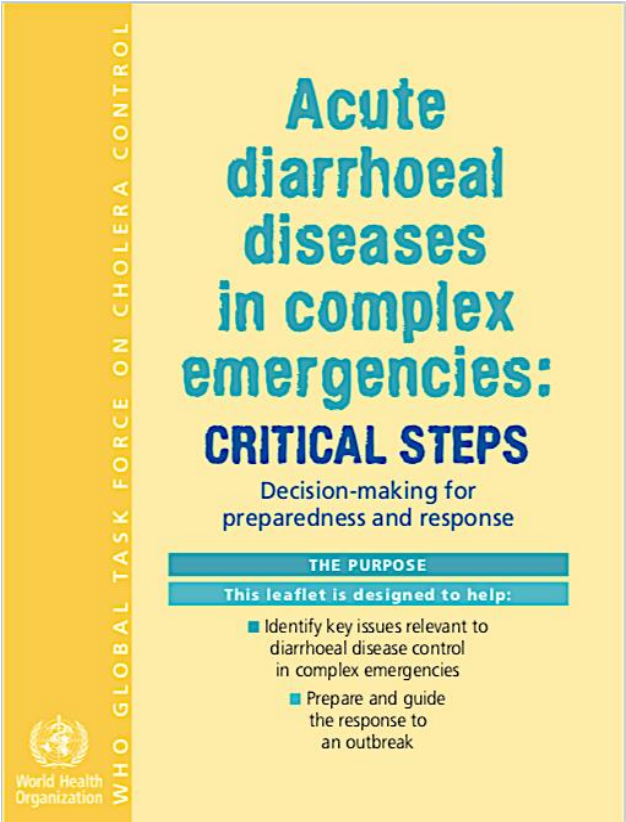


**Deaths:**

Malaria 2021:	748, 131
Dengue 2021:	29,076
Enteric illness 2021:	1,336,220

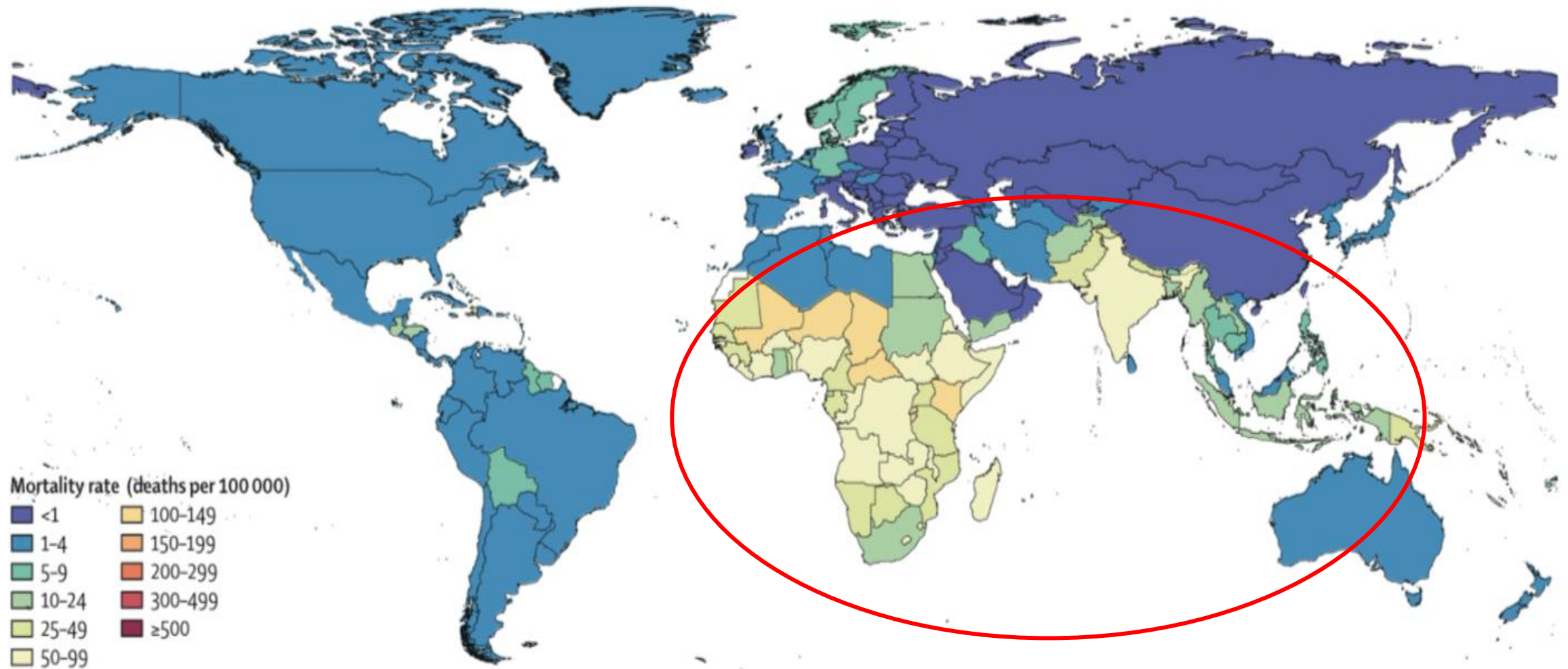


**AKI ?**

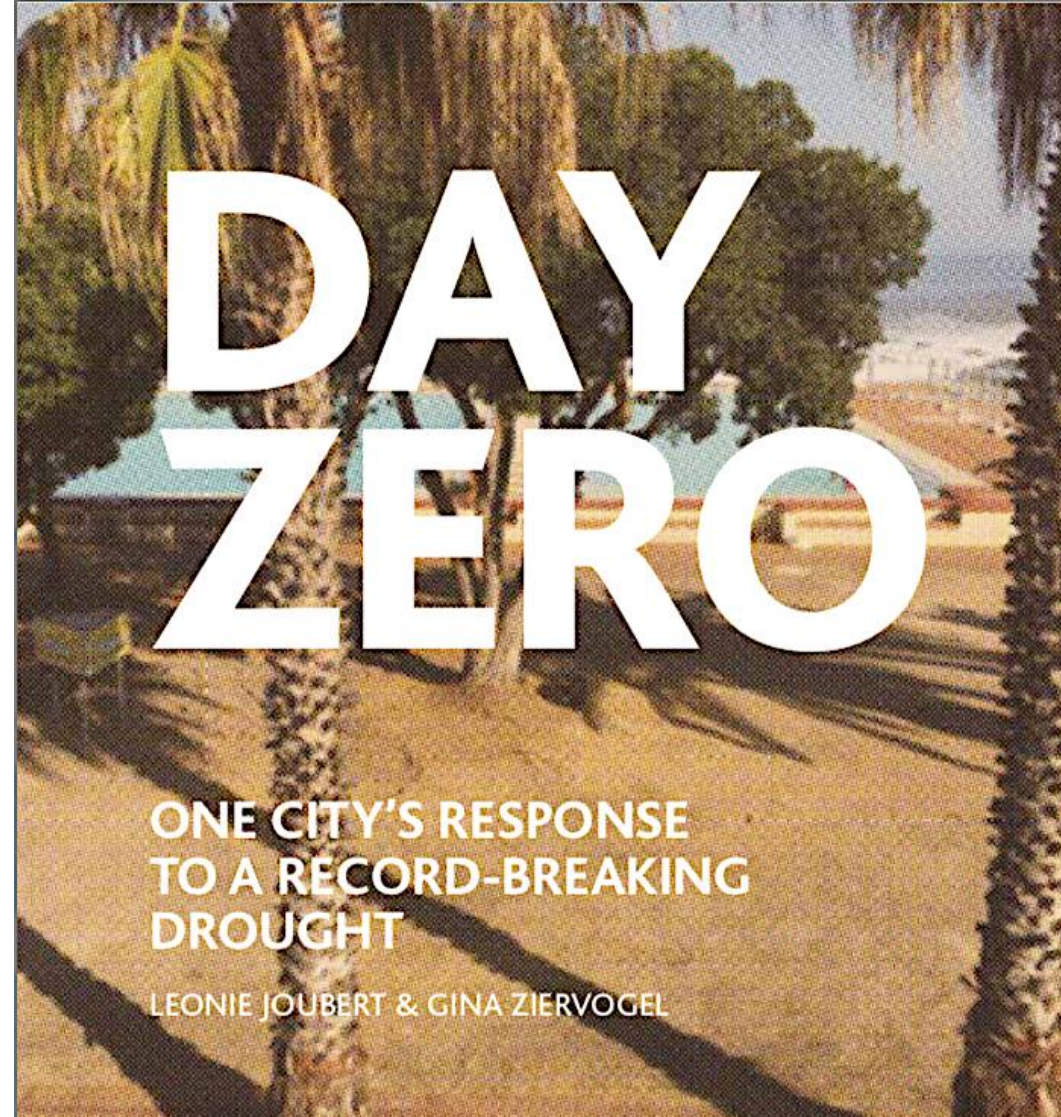




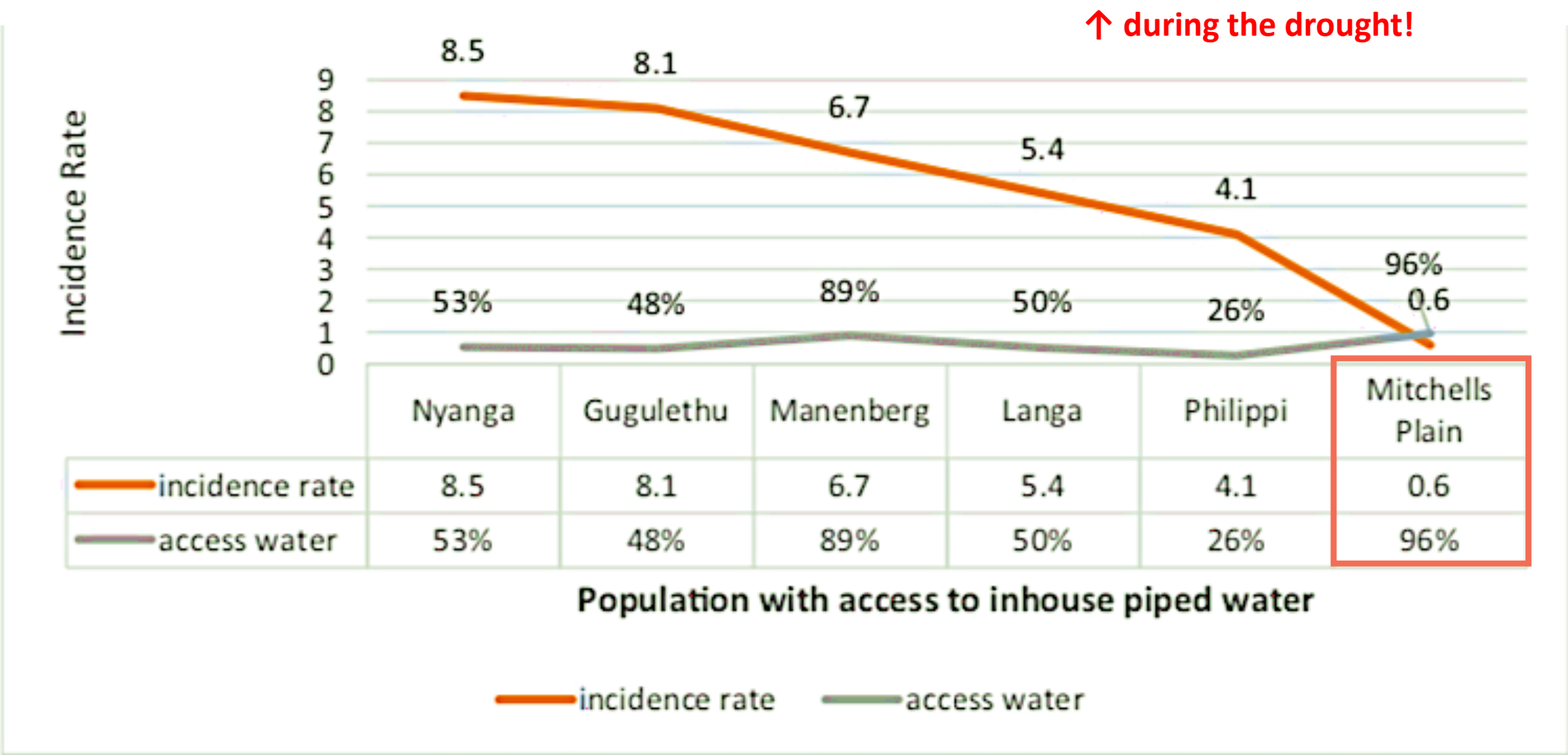
...and guess who is at risk of death from diarrhoea? – 2016



# Drought



# Lower incidence of post-infectious glomerulonephritis in children with access to piped water at home





# Air pollution

## ***Beijing Is Tackling Its Air Pollution Problem. Why Can't New Delhi?***

The return of smog season in India's capital has again left residents asking why nothing has changed. The answer may be largely political.

Give this article



518



The India Gate in New Delhi this month. Recent high levels of pollution in Delhi have prompted officials to halt truck traffic, close schools and ask people to work from home. Money Sharma/Agence France-Presse — Getty Images



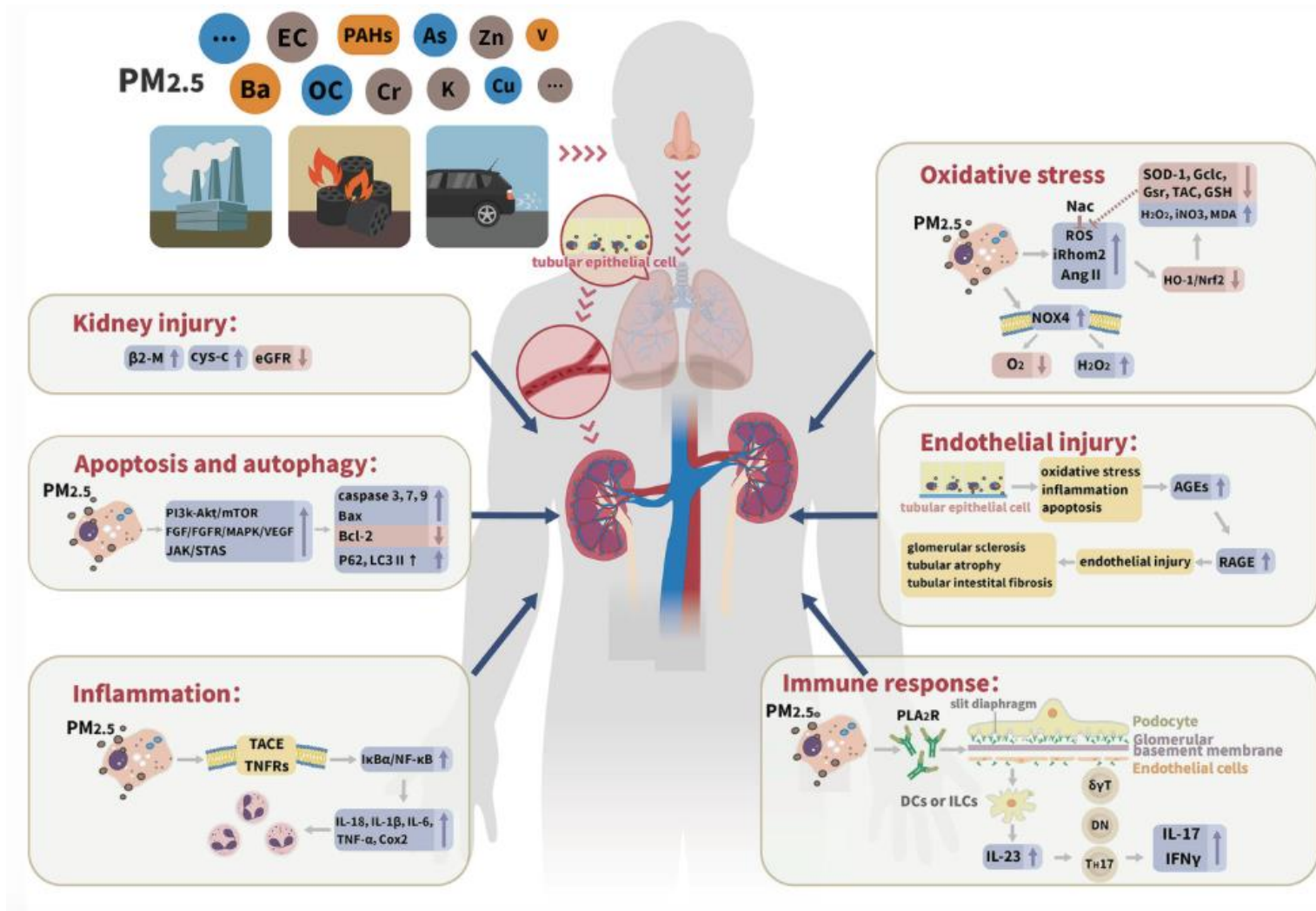
By **Suhasini Raj**, **Matt Stevens**, **John Yoon** and **Keith Bradsher**

Suhasini Raj reported from New Delhi, Matt Stevens and John Yoon from Seoul and Keith Bradsher from Beijing.

Nov. 22, 2022



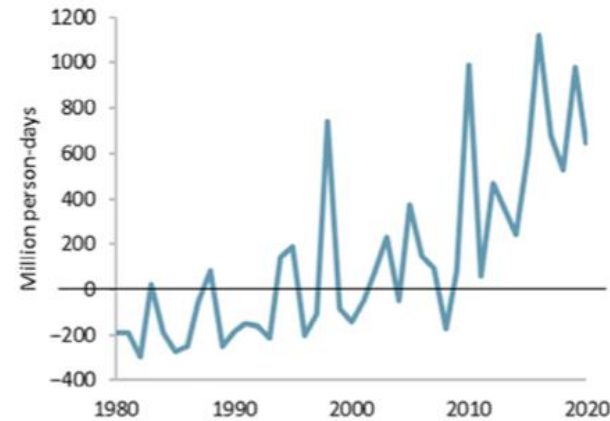
# Fine particulate matter is associate with an increased risk of CKD and ESKD



# Climate risks are interconnected

↑CO<sub>2</sub>  
↓  
↑CHO,  
↓protein

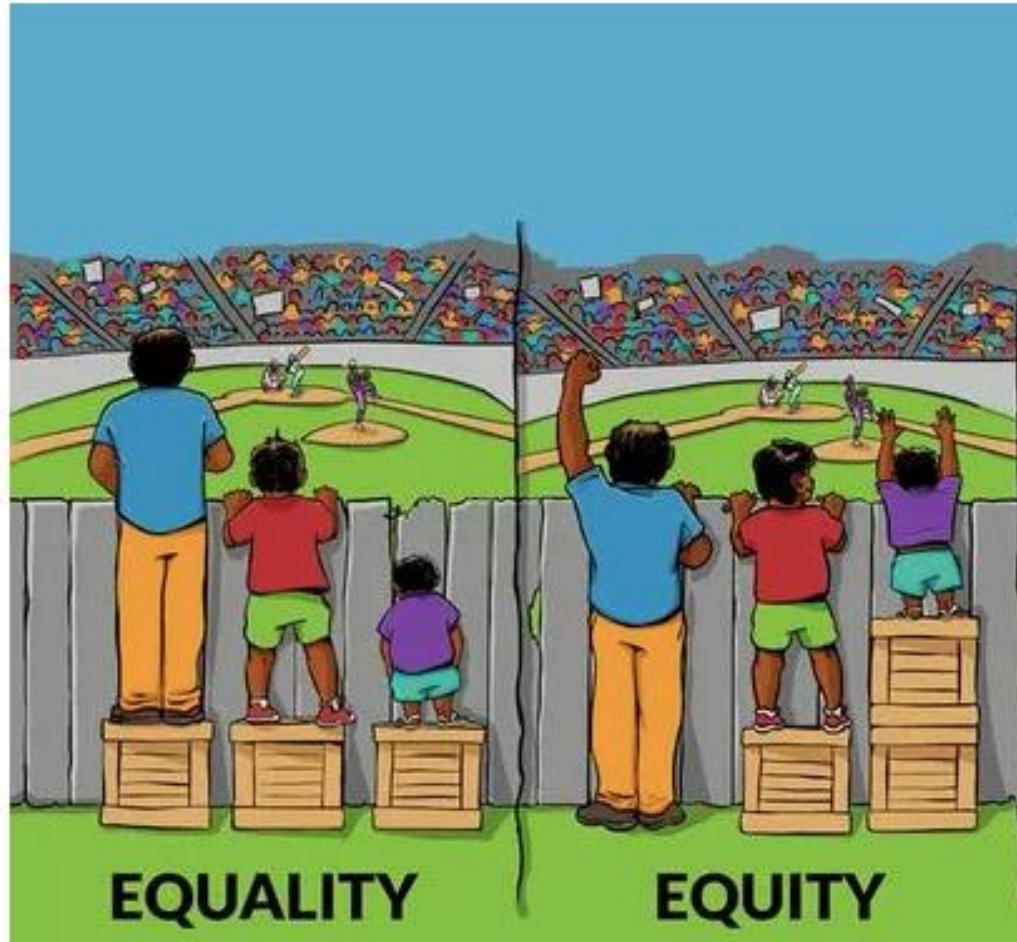
(b) Heatwave exposure



# Impact of climate change on kidney function over the life course



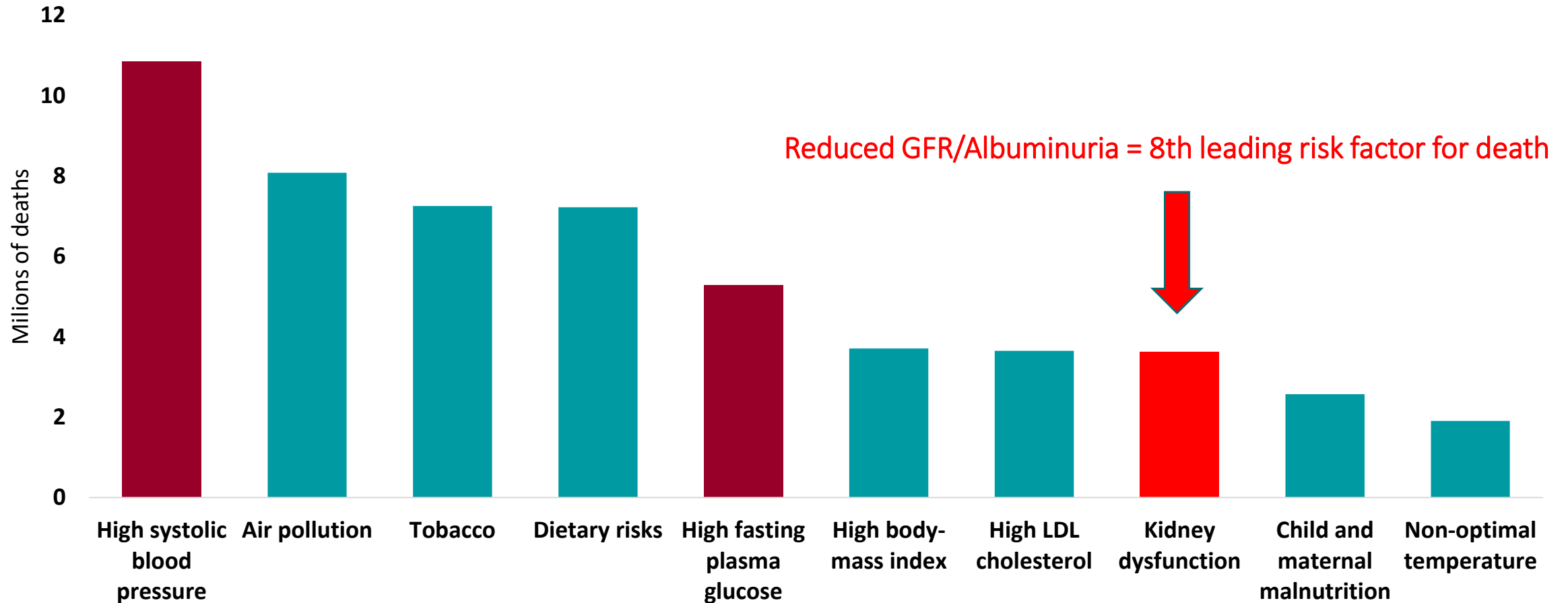
# Equality is not equity



February 4, 2016 — <https://twitter.com/urbandata/status/695261718344290304>

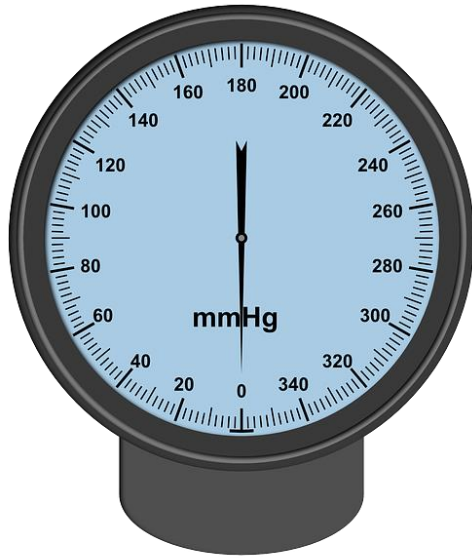


# Risk factors associated with greatest number of deaths (millions) world-wide, 2021

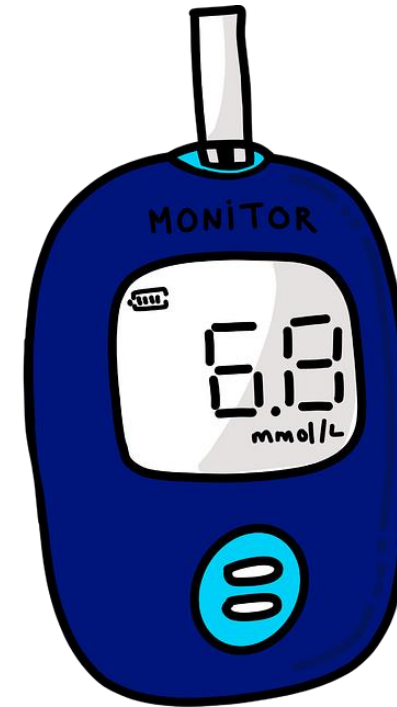




# Low hanging fruit – treat common risk factors for CKD

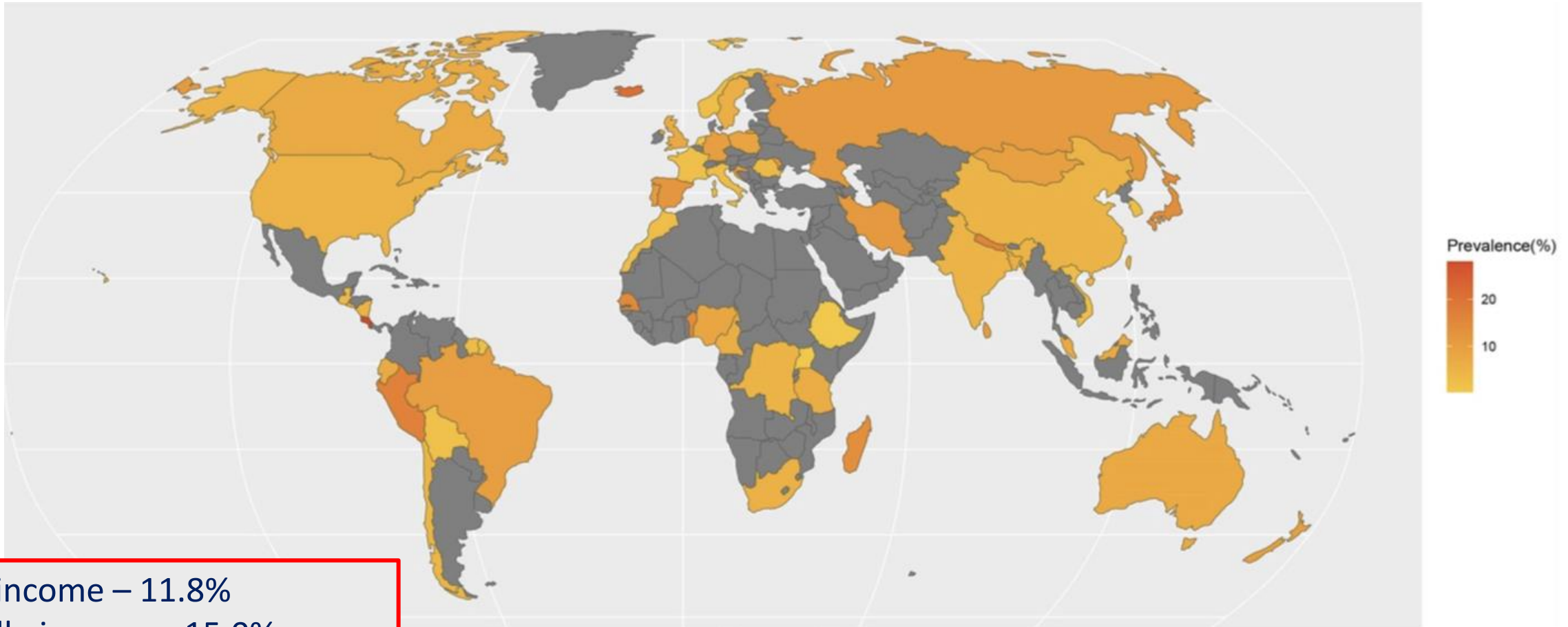


**1.3 billion**  
**50% diagnosed**  
**20% treated to target**



**550 million**  
**60% diagnosed**  
**40% treated to target**

# World-wide Prevalence of CKD 1 - 5



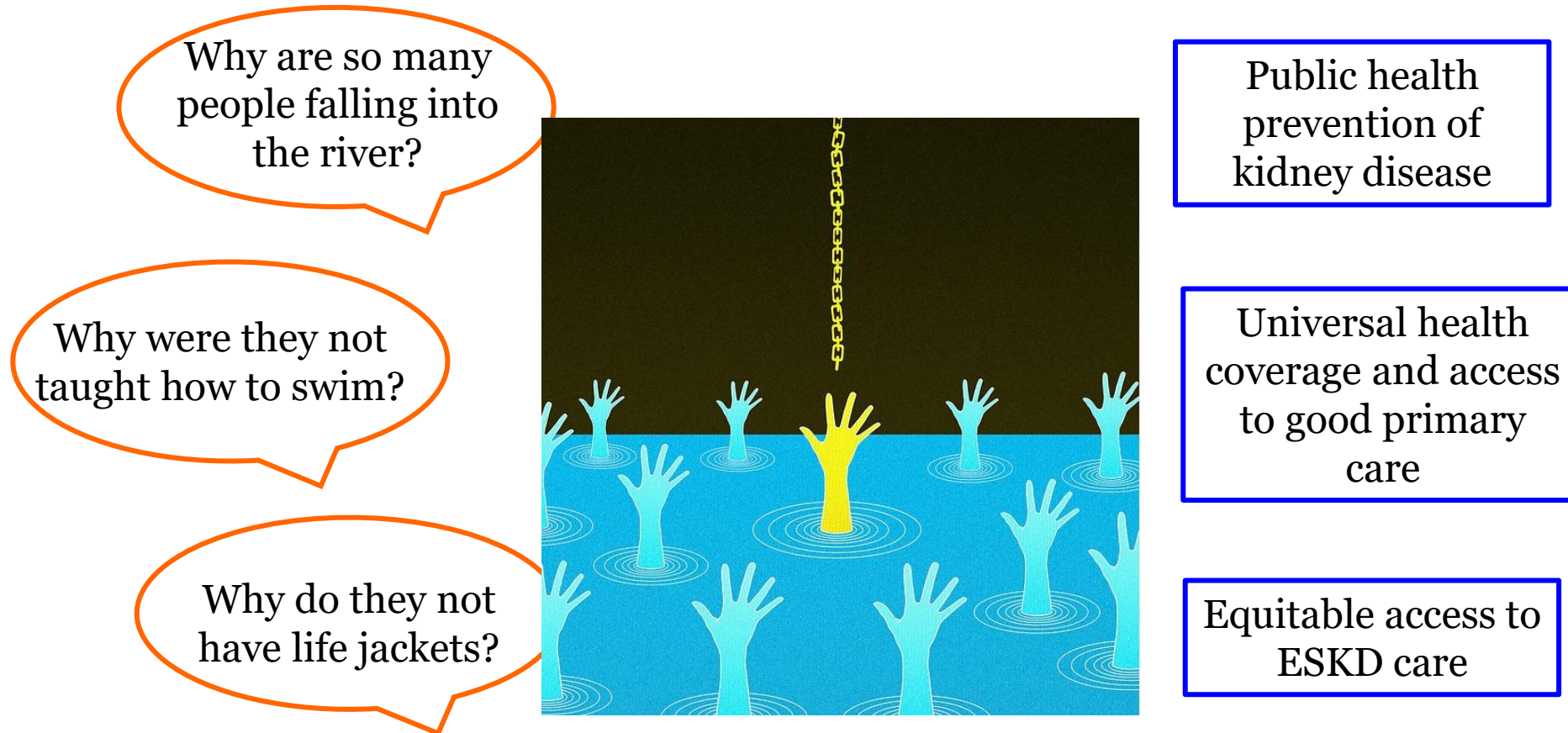
Low income – 11.8%  
Middle income – 15.0%  
High income – 10.8%

Gray = no data!









# “Doctor” spending all their time pulling drowning people out of the river...



# Many tools for diagnosis are still missing in LMICs

	LICs	LMICs	UMICs	HICs
<b>Primary Care</b>				
 eGFR	22%	39%	65%	94%
 UACR	28%	39%	49%	95%
<b>Secondary/Tertiary Care</b>				
 eGFR	39%	73%	89%	98%
 UACR	44%	70%	92%	100%



# Pont of care creatinine testing can reduce inequities in access to diagnosis of CKD

## Advantages of creatinine POCT in resource-limited primary care settings

### Individual level



Creatinine and eGFR determination permits early diagnosis in those at-risk

Early diagnosis coupled with early treatment and follow-up:

- delays CKD progression and onset of kidney failure
- reduces all-cause and cardiovascular mortality
- alleviates catastrophic out of pocket expenditure

Knowledge of eGFR informs drug dosing e.g antibiotic and chemotherapy

Baseline creatinine is useful for assessing AKI, AKD, and pregnancy-related AKI

Serial creatinine measurement guides AKI, AKD, and CKD management

Real-time results facilitate rapid reporting, at low cost, and greater convenience

POCT increases kidney disease awareness among health care workers

POCT performs better than Jaffe-based laboratory creatinine assays.



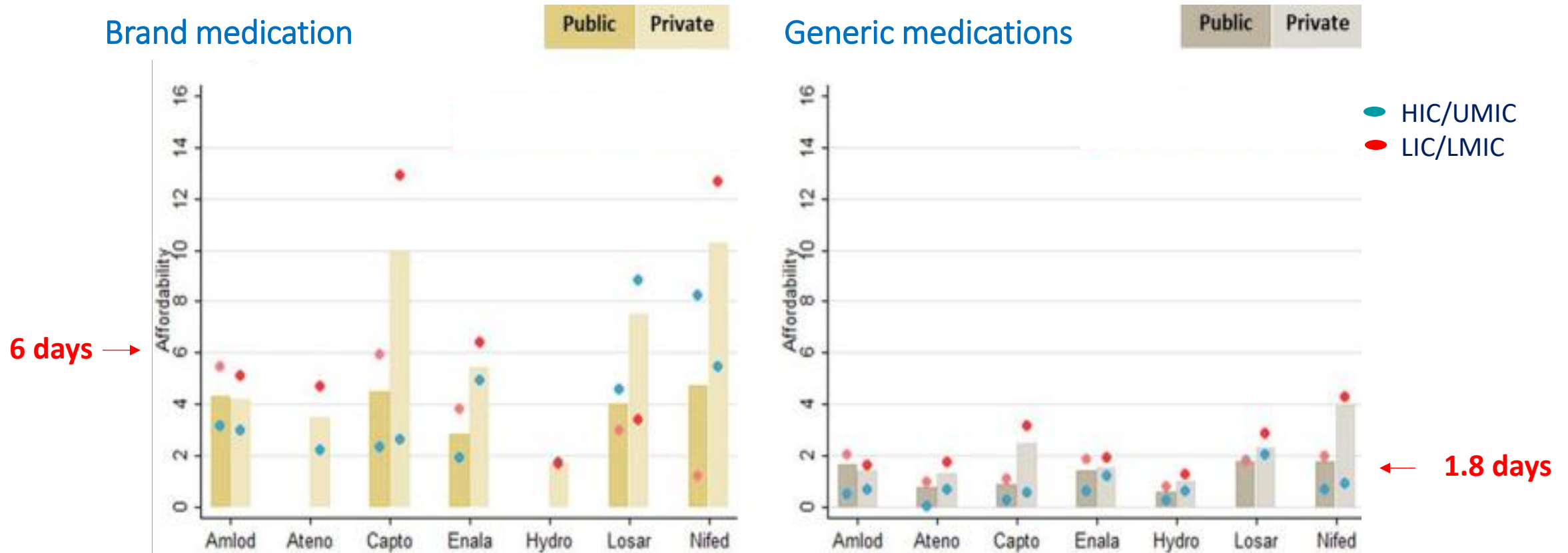
### Population level

If standardized, enables accurate enumeration of kidney disease burdens where no data exist

Characterising local and regional disease burdens allows:

- development of appropriate kidney disease research priorities
- informed public health policy and guideline development
- inequities to be redressed with improved representation of LMIC populations
- sustainable development goals related to kidney health to be achieved

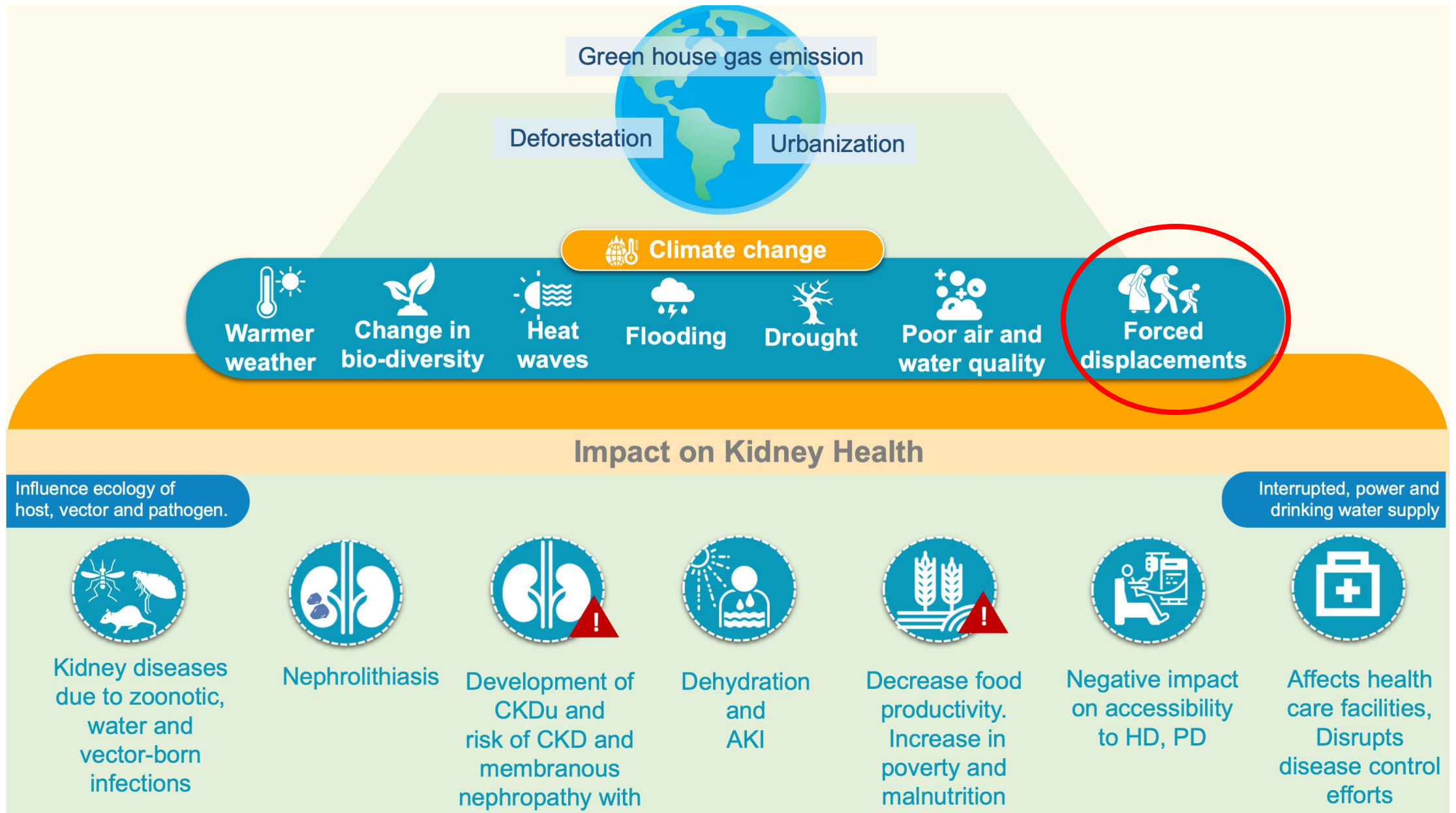
# Cost of 1 blood pressure medication is equivalent to multiple days of wages in 53 LMICs





# Final thoughts...





# Building Climate-Resilient Health Systems

The background of the slide is a photograph of several traditional sailboats, possibly dhow boats, on a calm blue sea under a clear sky. The boats have tall, thin masts and are spaced out across the horizon.

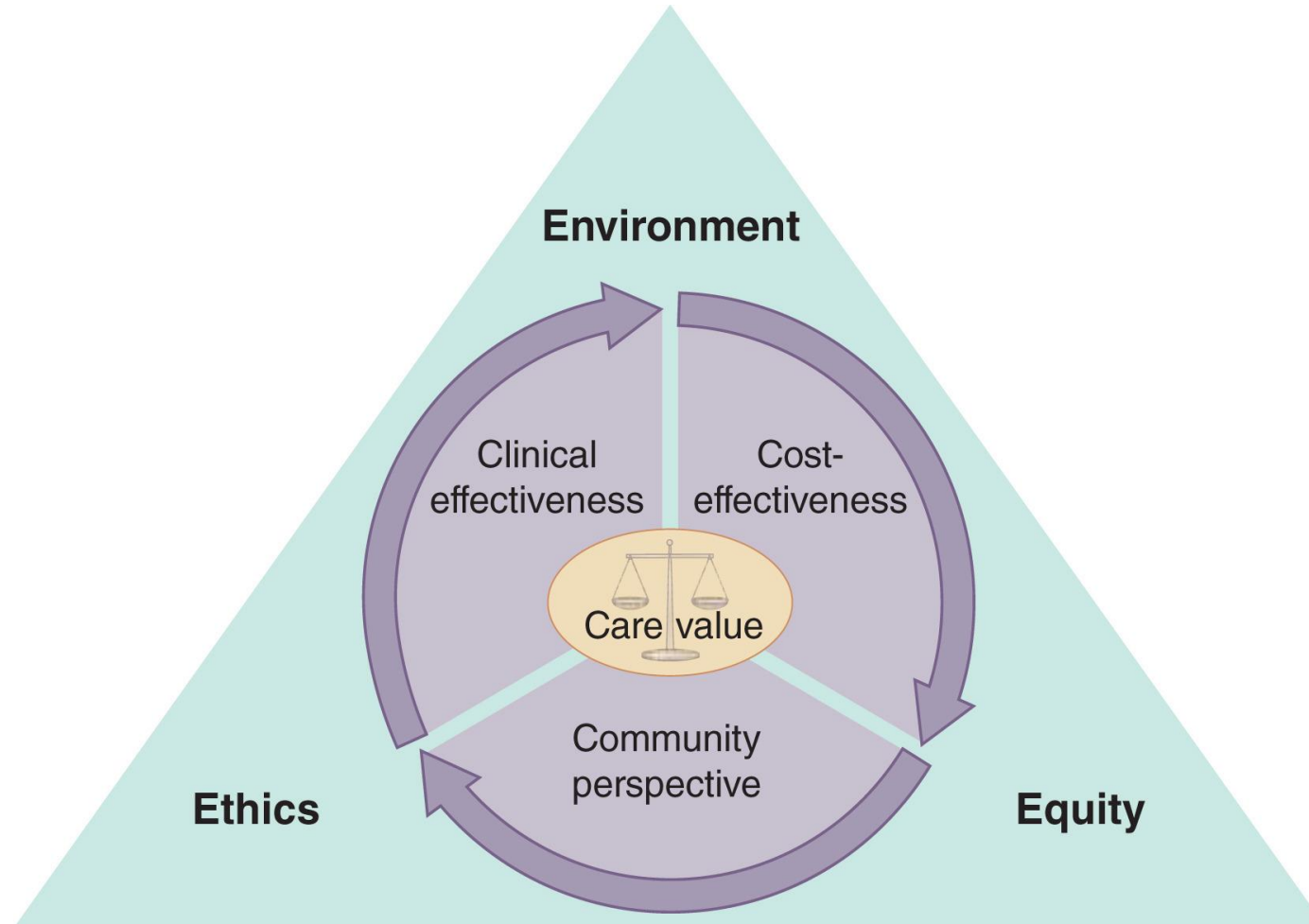
Governance,  
institutional  
and human  
capacity

Climate-  
sensitive  
disease  
surveillance

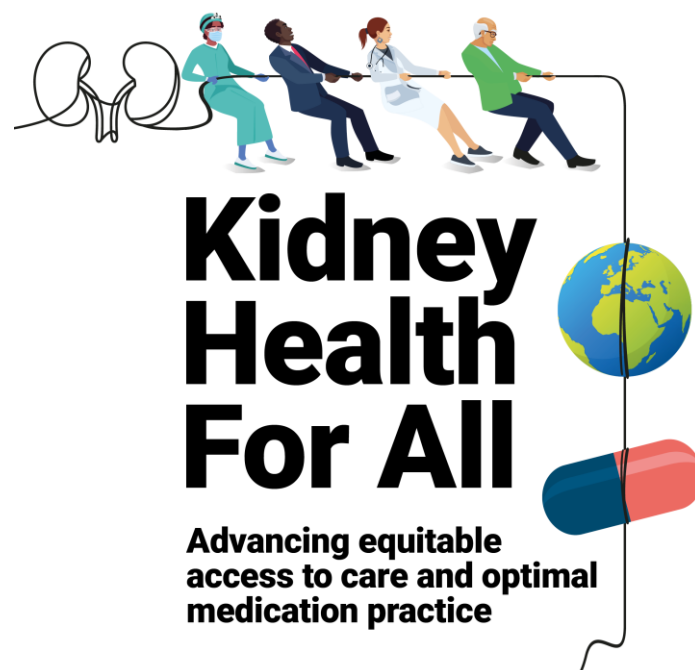
Climate-  
resilient  
health  
policies and  
plans



# Re-envision clinical care decision-making







#worldkidneyday  
#kidneyhealthforall  
www.worldkidneyday.org

World Kidney Day is a joint initiative of  
ISN KKF-WKA  
© World Kidney Day 2008 - 2024

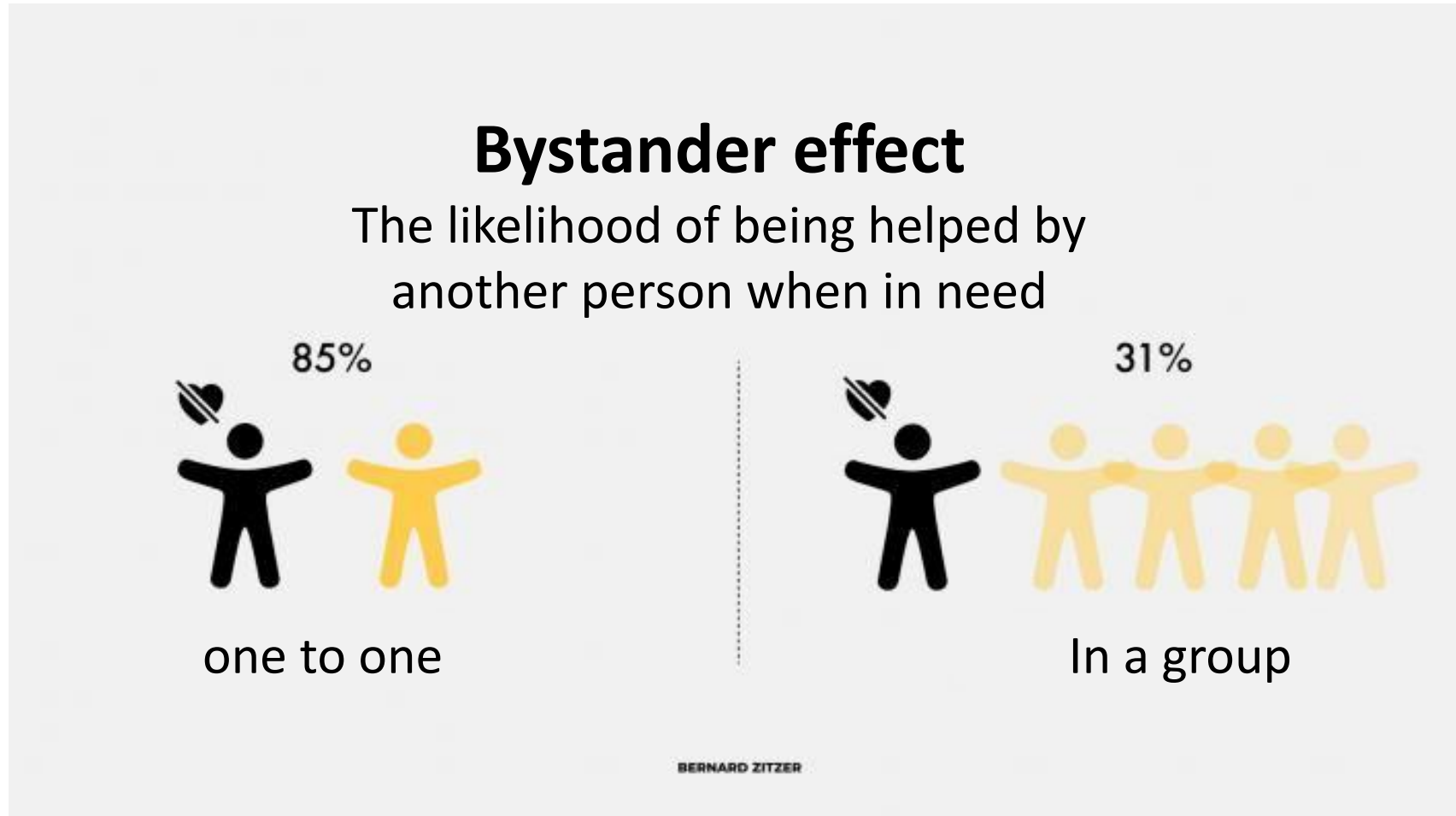


“Choosing wisely”- less is  
sometimes more





# Don't expect others to fix it...



# TAKE HOME MESSAGES



Climate change exacerbates inequity



Inequity and climate change exacerbate risk for kidney disease



Climate change can impact the kidney across the life course



Health systems resilience is required to improve health and health care



Healthier people generate fewer carbon healthcare emissions



As individuals at work and at home we can make a difference





# REFERENCES

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