

State of Global Air 2020

Release Webinar | November 5, 2020

STATE OF
GLOBAL AIR /2020



Agenda

Welcome

Dr. Pallavi Pant

State of Global Air 2020

Dr. Katherine Walker

Dr. Michael Brauer

Perspectives

Dr. Susan Niermeyer

Dr. Catherine Kyobutungi

Q&A

Key Findings

Dr. Katherine Walker, Health Effects Institute

A longstanding collaboration

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The screenshot shows the top navigation bar of the HEI website with the logo on the left and links for 'About HEI', 'News & Events', 'Research & Funding', and 'Publications'. A search bar is located on the right. Below the navigation is a large banner image of a city skyline with a river. The text reads: 'Welcome to the Health Effects Institute'. Below this, a paragraph states: 'We provide high-quality, trusted science for cleaner air and better health. Read more about our research mission and unique model of equal partnership by government and industry.'

The screenshot shows the IHME website header with the logo and tagline 'Measuring what matters'. The navigation bar includes 'Home', 'Results', 'News & Events', 'Projects', 'Get Involved', and 'About'. Below the navigation is a large red banner with the text 'GBD 2019' in a white box. Below the banner is a green bar with the text 'Global Burden of Disease (GBD) 2019'. At the bottom, there are four small image thumbnails: a green abstract shape, red flowers, children wearing face masks, and a person writing on a whiteboard.

State of Global Air: What is air pollution's contribution?

Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019



GBD 2019 Risk Factors Collaborators*

Summary

Background Rigorous analysis of levels and trends in exposure to leading risk factors and quantification of their effect on human health are important to identify where public health is making progress and in which cases current efforts are inadequate. The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019 provides a standardised and comprehensive assessment of the magnitude of risk factor exposure, relative risk, and attributable burden of disease.

Methods GBD 2019 estimated attributable mortality, years of life lost (YLLs), years of life lived with disability (YLDs), and disability-adjusted life-years (DALYs) for 87 risk factors and combinations of risk factors, at the global level, regionally, and for 204 countries and territories. GBD uses a hierarchical list of risk factors so that specific risk factors (eg, sodium intake), and related aggregates (eg, diet quality), are both evaluated. This method has six analytical steps. (1) We included 560 risk–outcome pairs that met criteria for convincing or probable evidence on the basis of research



Lancet 2020; 396: 1223–49

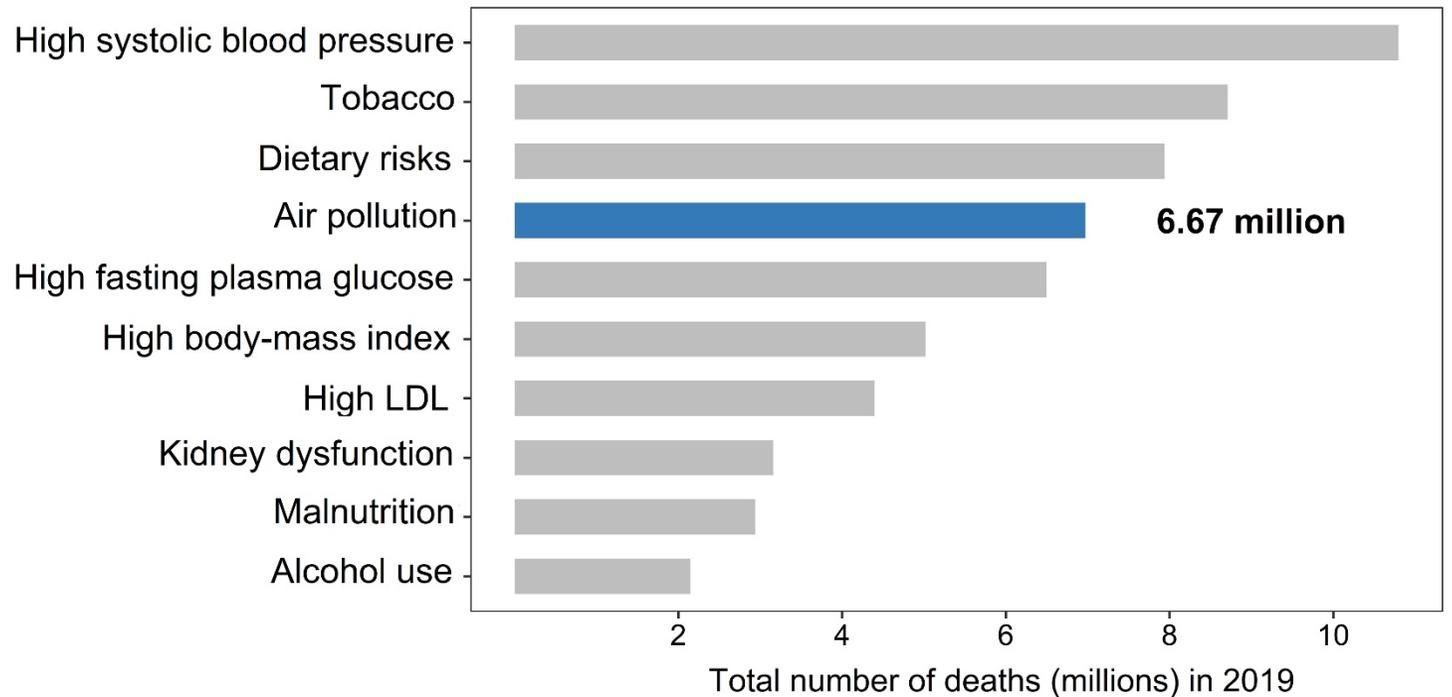
*For the list of Collaborators see [Viewpoint Lancet](#) 2020; 396: 1135–59

Correspondence to:
Prof Christopher J L Murray,
Institute for Health Metrics and
Evaluation, University of
Washington, Seattle, WA 98195,
USA
cjlm@uw.edu

Our goal: To put air pollution in perspective

Air pollution is a leading risk factor for premature death and disability.

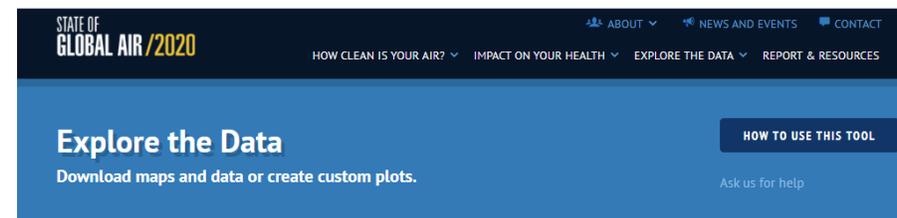
In 2019, it contributed to **12% of global deaths.**



Global ranking of risk factors by total number of deaths from all causes in 2019.

Our goal: To make data accessible

- Exposure
 - PM_{2.5}, Ozone, Household Air Pollution
- Health impacts
 - Mortality (deaths)
 - Disability adjusted life years (DALYs) – healthy life years lost
 - Age-standardized death and DALY rates
 - Cause-specific % contributions (new)
- Data for 1990 to 2019
- Downloadable data & figures



Go to Resources page to download complete data sets
<https://www.stateofglobalair.org/resources>

Major findings in 2019

- Over **90%** of the world's population lived in areas above WHO Guideline for PM_{2.5}
- **Nearly half** of the world's population — **3.8 billion** people — continues to be exposed to household air pollution from solid fuel burning for cooking.
- About **476,000 infants** died in the first month after birth due to exposure to air pollution.

PM_{2.5} exposures are highest in **Asia, Africa, and the Middle East.**

You can also explore the 11x11 km gridded data if you zoom in.

Visit: <https://www.stateofglobalair.org/air>

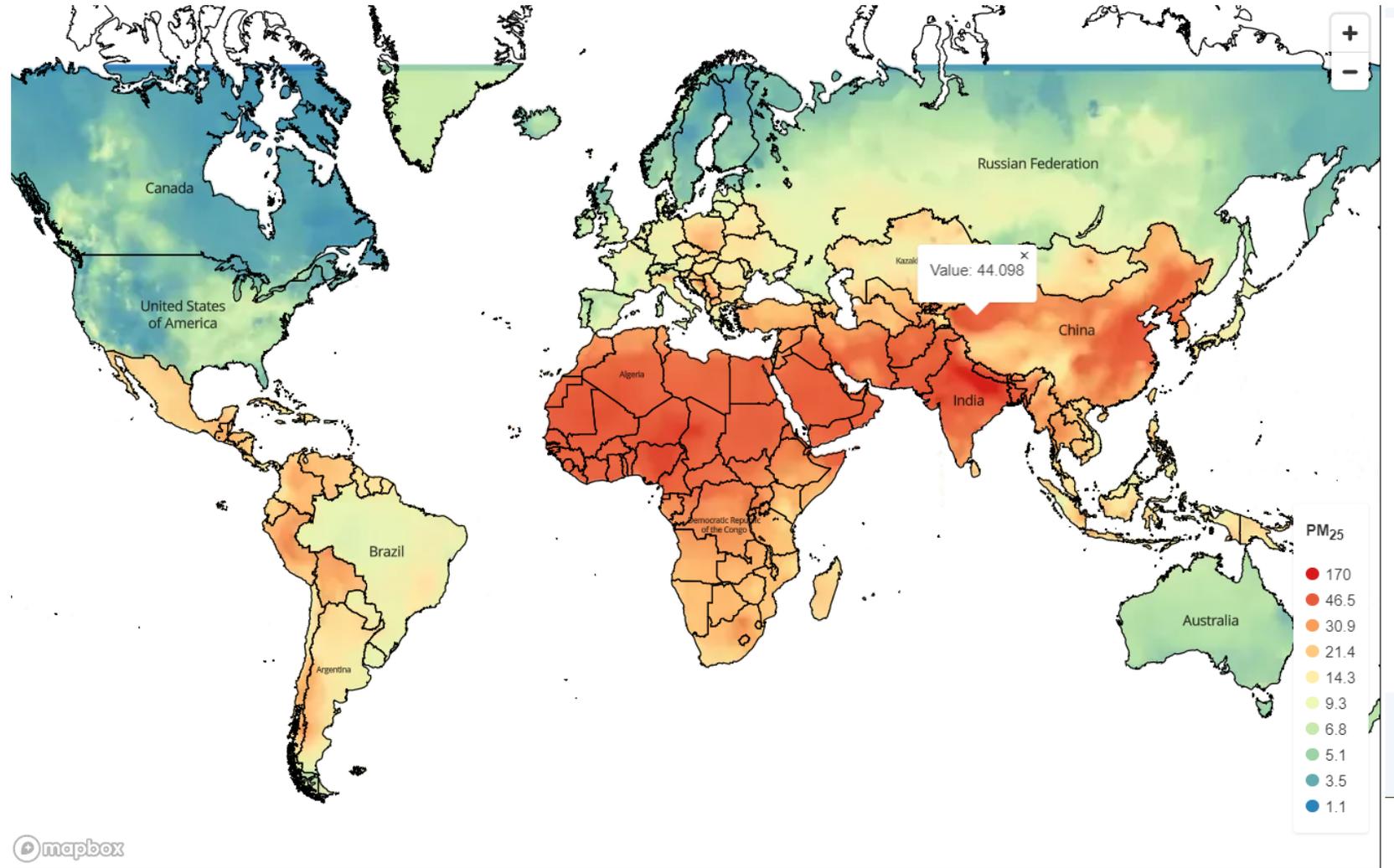
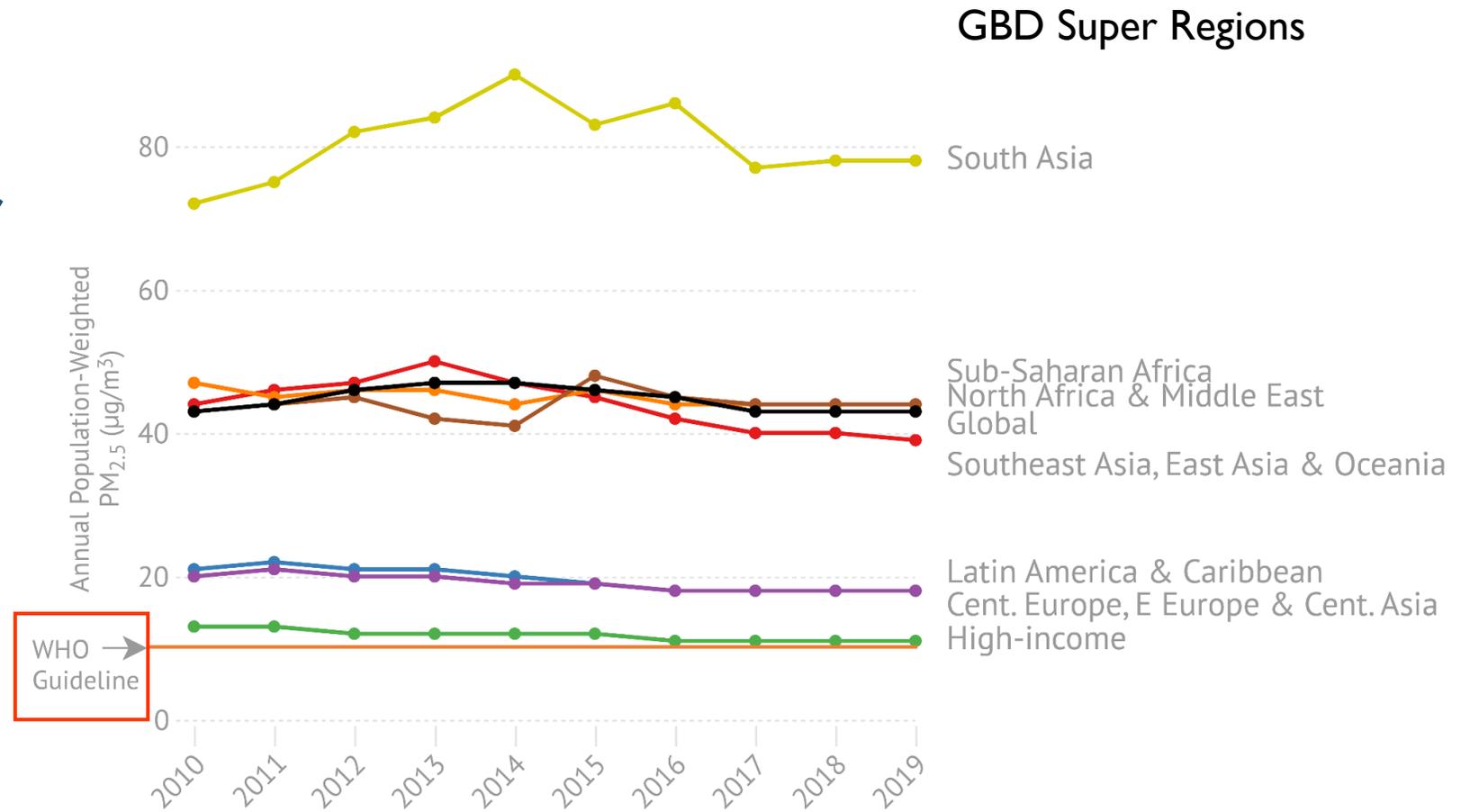


Figure A. Population-weighted annual average PM_{2.5} concentrations in 2019. Drag or zoom to explore

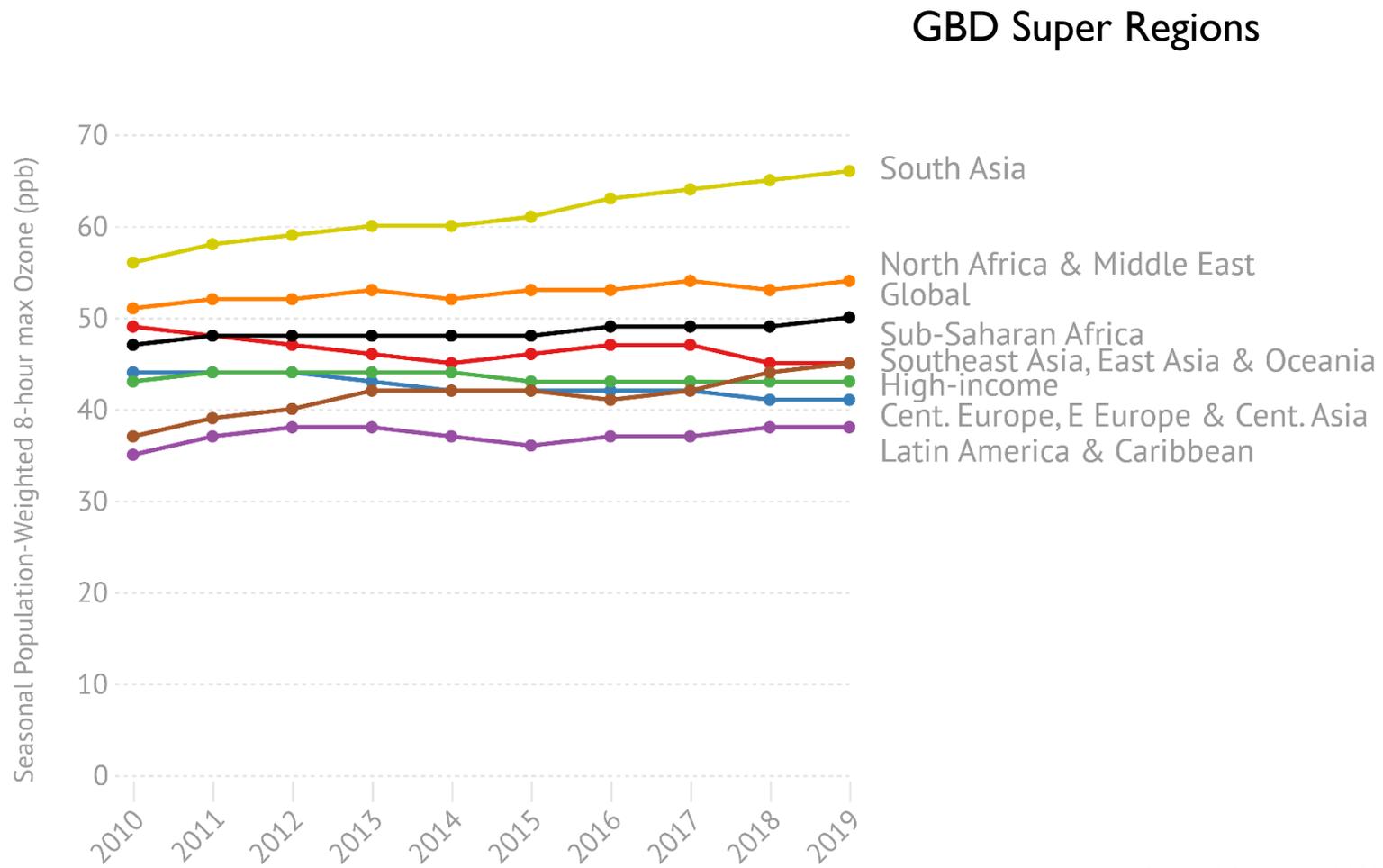
Marked disparities in air quality among regions have barely changed over the last decade; disparities in death and DALYs numbers and rates also persist.



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Regional trends in annual average PM_{2.5} 2010 -2019

Ground-level ozone exposures are slowly but steadily increasing; ozone attributable deaths and DALYs are rising.

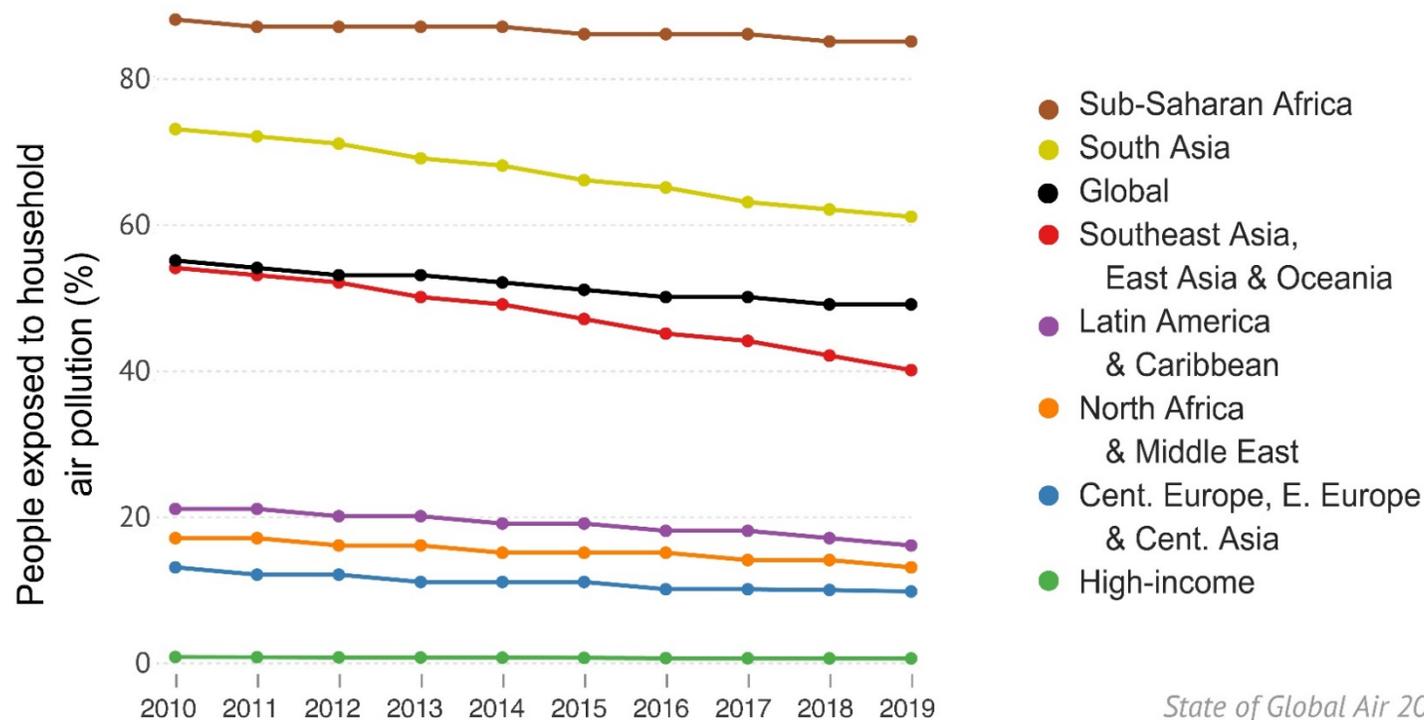


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Regional trends in seasonal 8-hr max ozone , 2010 -2019

Exposures to household air pollution are **falling steadily** as more people adopt cleaner fuels; health impacts are also declining

GBD Super Regions



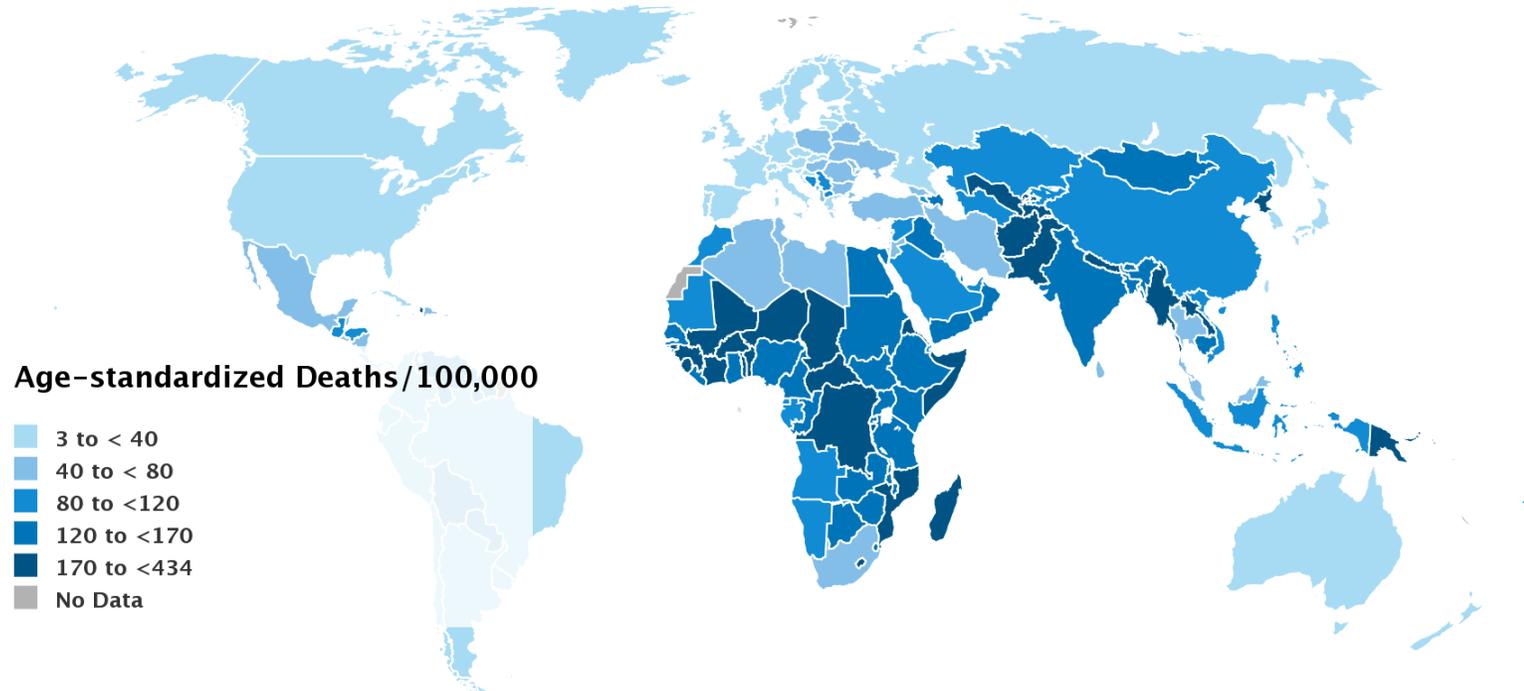
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Trends in the proportion of each country's population cooking with solid fuels globally and in the GBD Super Regions, 2010–2019.

Age-standardized Deaths/100,000 Attributable to Air Pollution in 2019

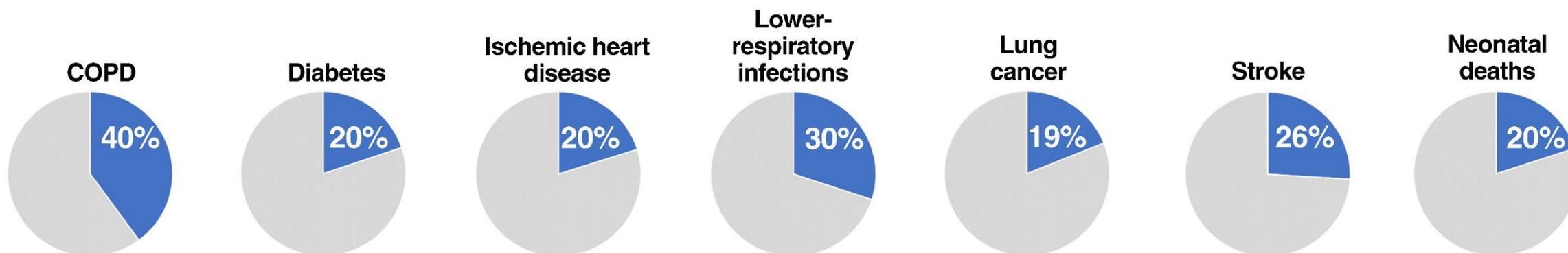
Total air pollution mortality burden dominated by high pollution and/or high population countries

But age-adjusted mortality rates reveal different patterns of underlying vulnerabilities



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About 80% of air pollution's burden is attributed to non-communicable diseases (NCDs).

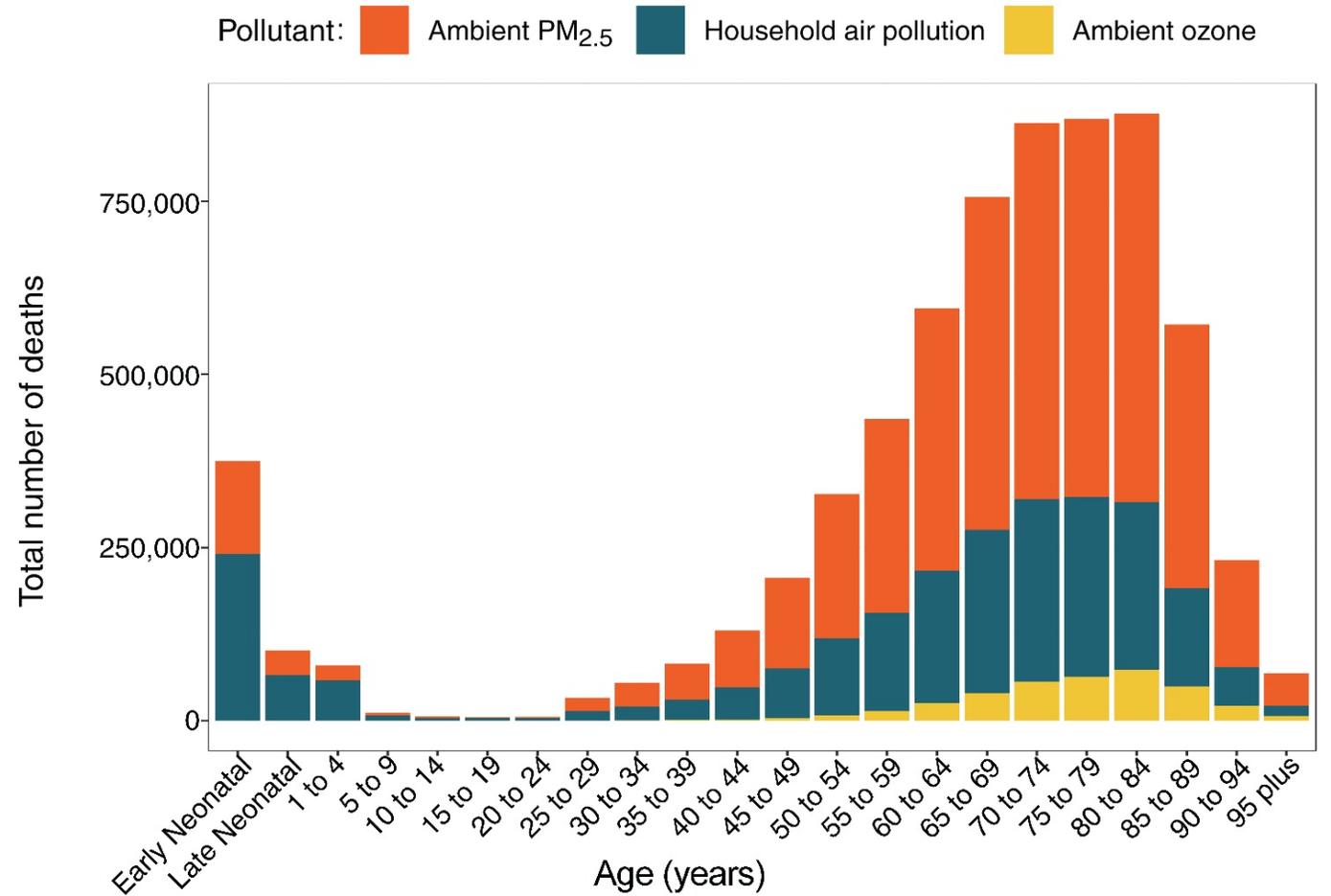


Percentage of global deaths from specific causes attributable to total air pollution.

NOTE: Cause-specific contributions to mortality and DALYs from PM_{2.5}, ozone, and HAP are now available for every country on the State of Global Air site.

<https://www.stateofglobalair.org/data/#/health/bar>

Children and older adults are most affected.



Distribution of global deaths in 2019 attributable to PM_{2.5}, ozone, and household air pollution by age (years, except early neonatal [0 to 6 days] and late neonatal [7 to 27 days]).

Air Pollution's Impacts on Neonatal Mortality

In 2019, air pollution contributed to **476,000** deaths globally among infants in their first month of life*

75% related to low birthweight and preterm birth

20% of newborn deaths were attributed to air pollution.

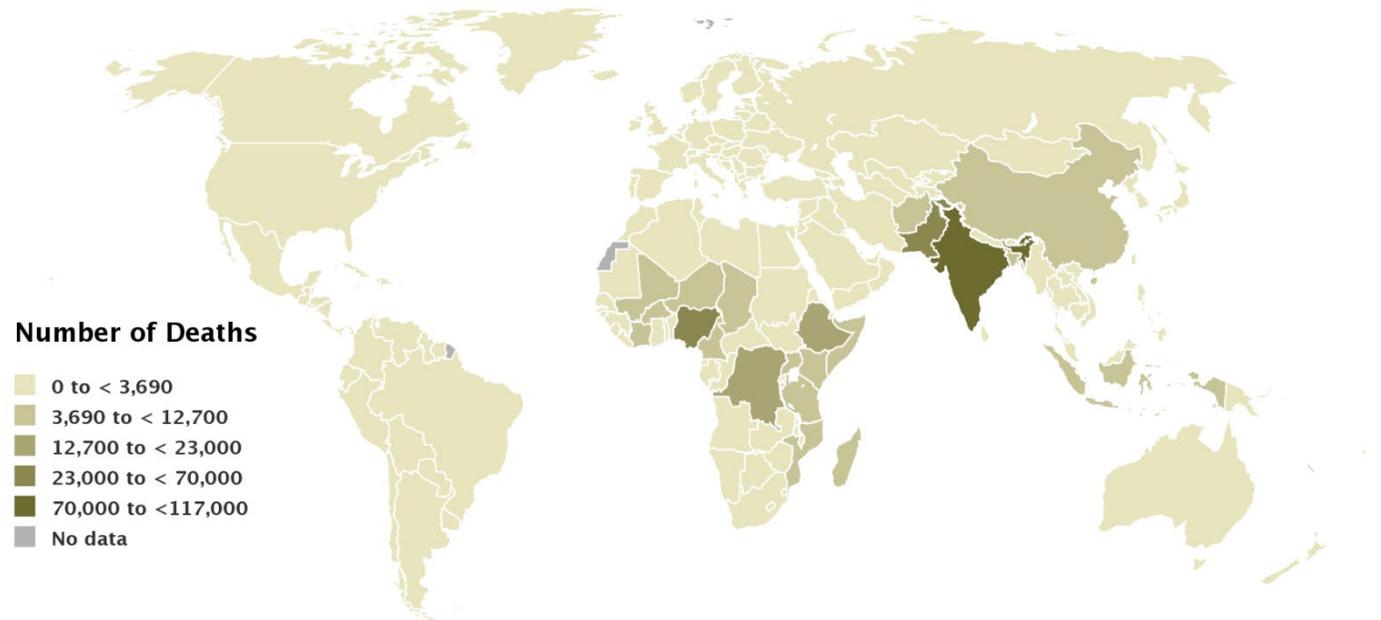


*Neonatal period (0-27 days): Deaths during this period are estimated from complications of being born too small (low birth weight) or too early (preterm birth) as a result of maternal exposure to air pollution as well as from lower respiratory infections (e.g. pneumonia) after birth.

Where are infants most at risk?

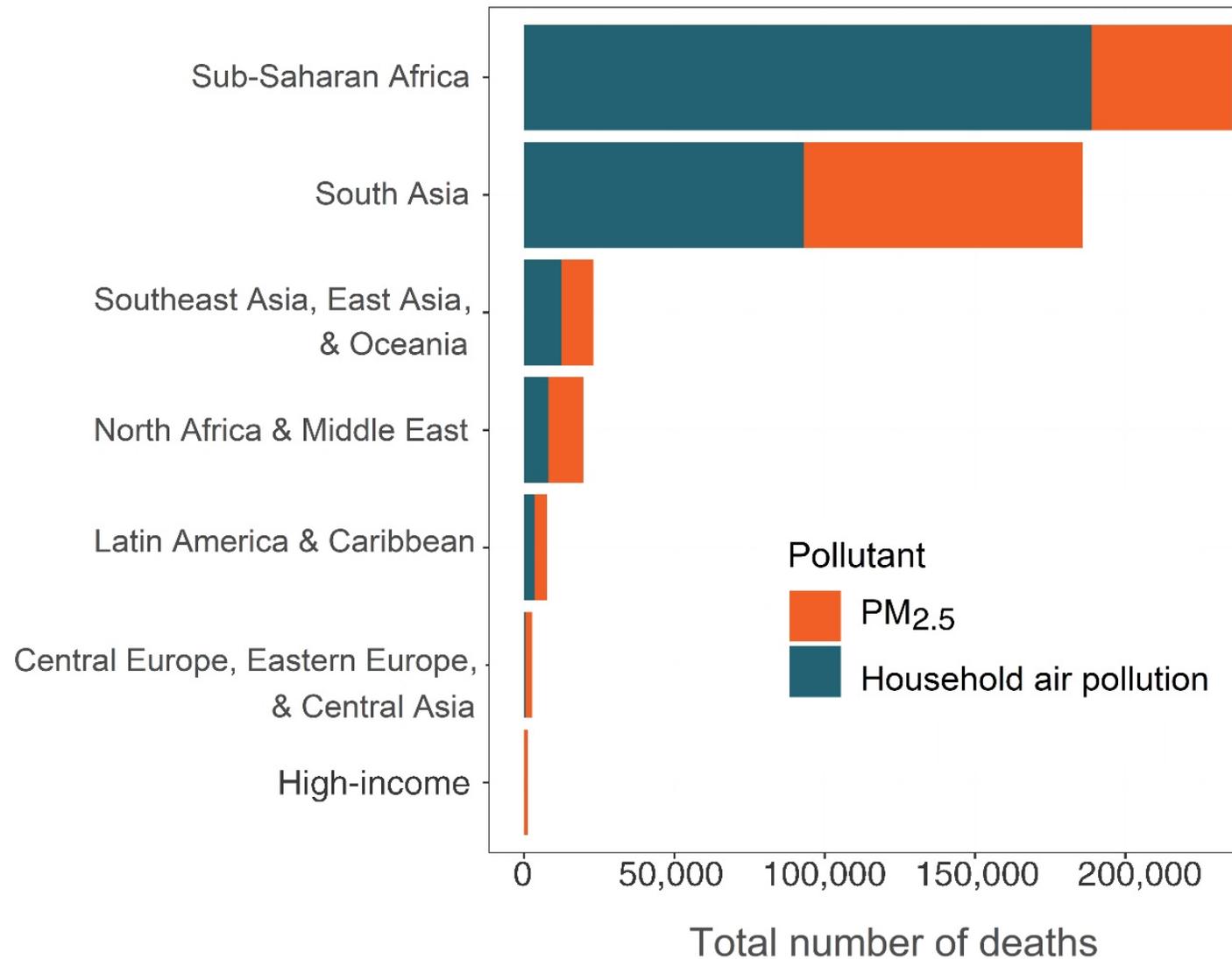
Neonatal deaths attributable to particulate air pollution in 2019

- 21%** of infant deaths in *India*
- 20%** of infant deaths in *Pakistan*
- 23%** of infant deaths in *Ethiopia*
- 21%** of infant deaths in *Uganda*
- 52%** of infant deaths in *Democratic Republic of the Congo*



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Of infant deaths attributable to air pollution, nearly 2/3 are related to household air pollution.



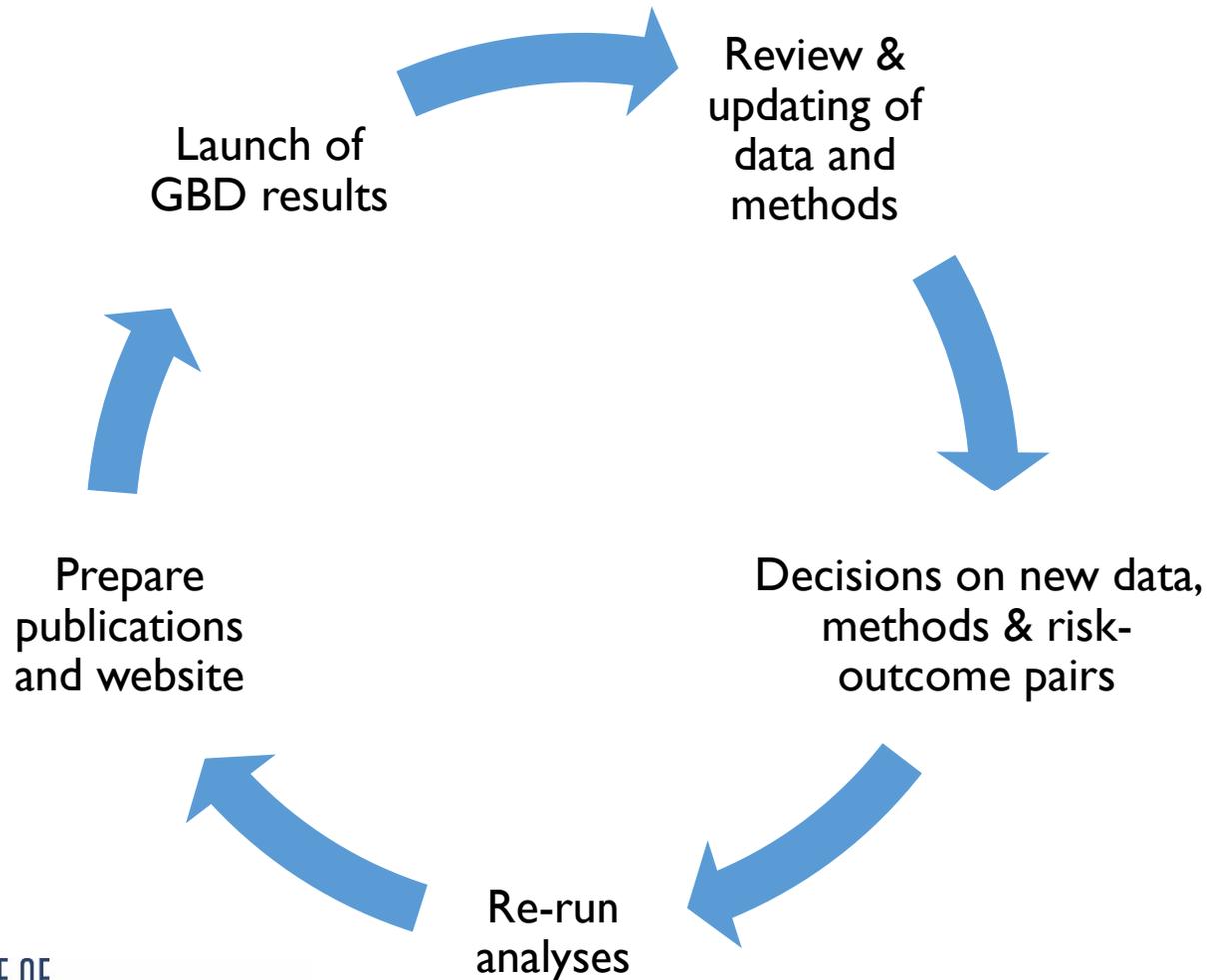
Deaths attributable to particulate matter in 2019 among babies in their first month of life in the GBD Super Regions.

Where do the data come from?

Dr. Michael Brauer

Institute for Health Metrics and Evaluation, USA and University of British Columbia, Canada

IHME Global Burden of Disease Annual Cycle



87 risk factors

369 diseases and injuries

204 countries and territories

3,700 researchers in 145+ countries

Important!

Time trends from 1990 are re-calculated every year

Eight Principles of the GBD

1. **Comprehensive** comparisons, a.k.a leave no blanks
2. Communicate the **strength** of the evidence (uncertainty)
3. Ensure internal **consistency**
4. **Iterative** approach to estimation
5. Identify **all relevant data** sources
6. Compare like with like, a.k.a crosswalk different measurements
7. **Correct** for data errors
8. Pick the best model based on **performance**

Quantifying exposure to air pollution: building on all available data

Ground monitoring of air quality



Satellite data

Chemical transport models

Population data



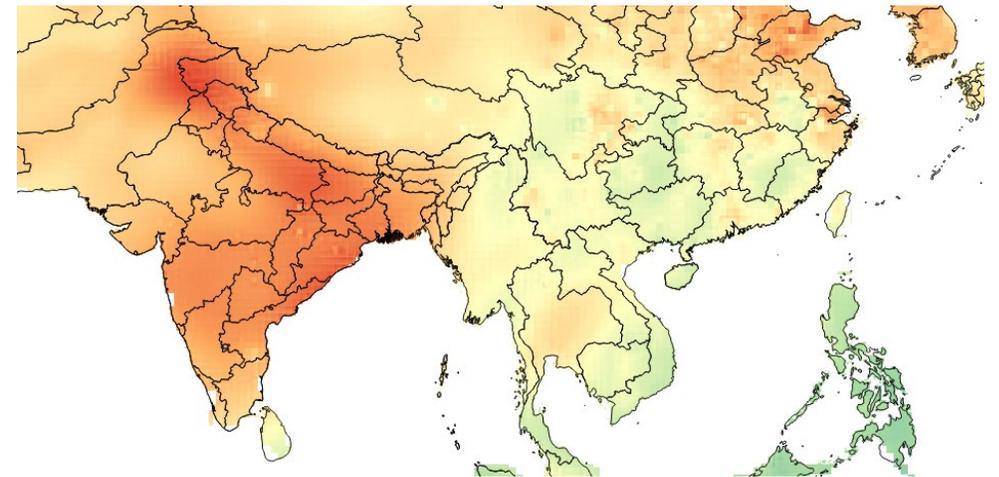
Fuel use and other surveys

PM_{2.5}

Ozone

Household Air Pollution

Population-weighted exposures for every country*



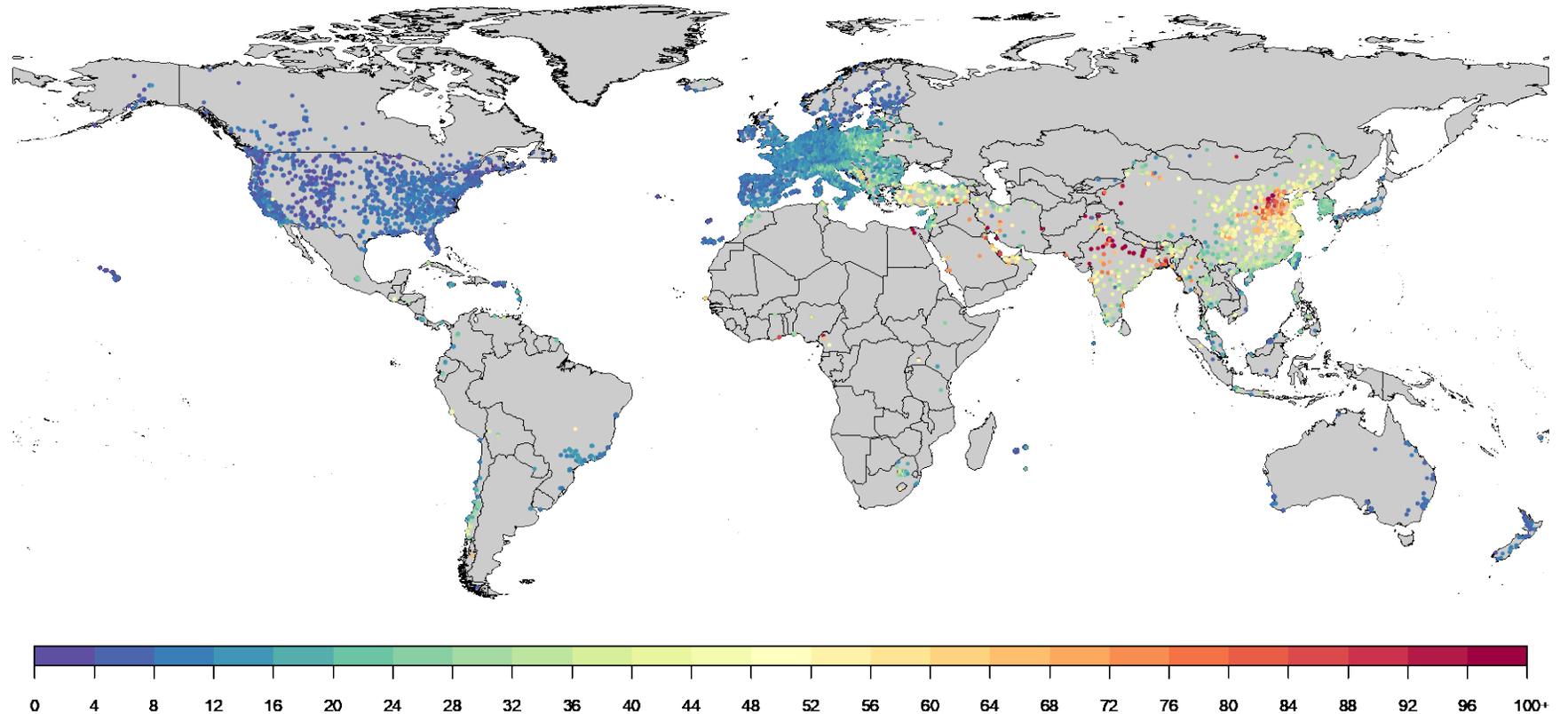
*Based on aggregation from estimates at 11x11 km grid scales

Air Quality Data: Ground Monitoring Stations

10,408 unique locations from 116 countries

85,160 ground measurements

Range from **1.1 - 221.6 $\mu\text{g}/\text{m}^3$**



$\mu\text{g}/\text{m}^3$

Global Health Outcome Data Sources

Example: Ischemic Heart Disease

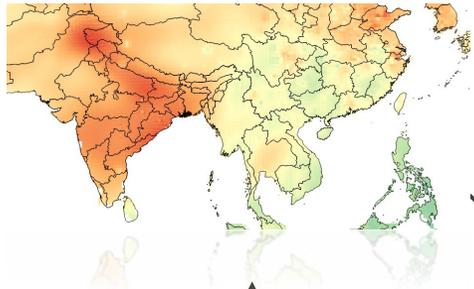
IHD is disease of the coronary arteries, usually from atherosclerosis, leading to myocardial infarction or ischaemia.

	Total sources
Incidence	296
Prevalence	88
Remission	0
Causes of death	3812
Other	109

Table 1: Total sources used in GBD 2019 estimation

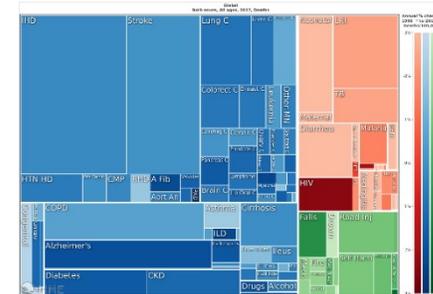
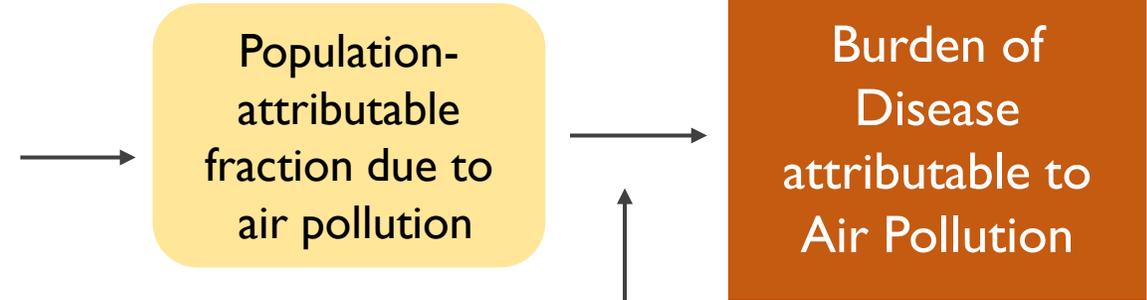
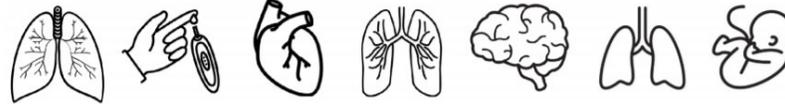
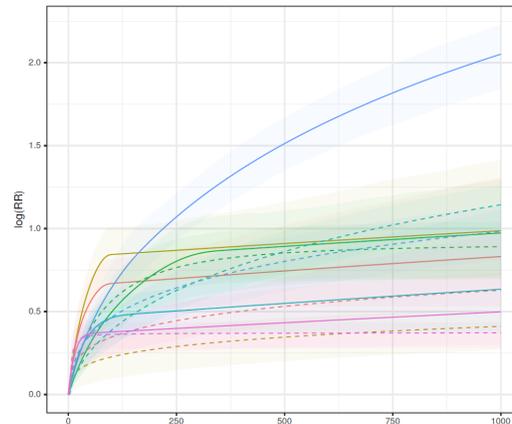
Estimating burden of disease from air pollution

Global population exposures



Minimum risk exposure level

Exposure-response relationships



Disease-specific burden

Important updates since last year

Methods

PM_{2.5}: Additional spatial and temporal variation in satellite calibration.

Ozone: Statistical combination of 9 (increased from 6) chemical transport models + measurements, 6 month, 8-hr daily maximum

Data

PM_{2.5}: Increased number of ground monitors to 10,408 in 116 countries.

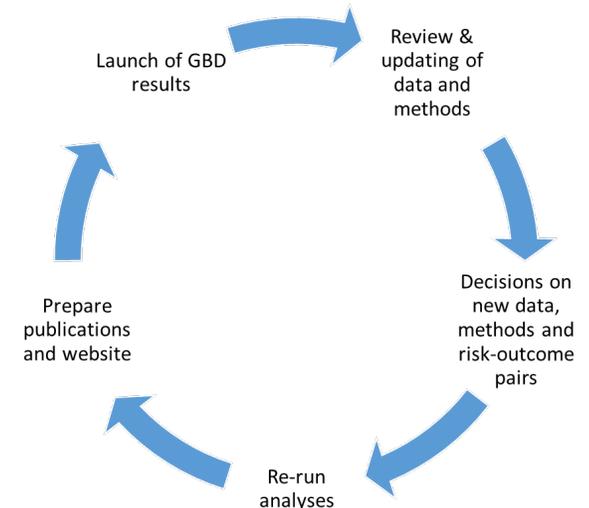
Ozone: Doubled ground monitoring sites to 8800

HAP: Updated survey and concentration measurement inputs

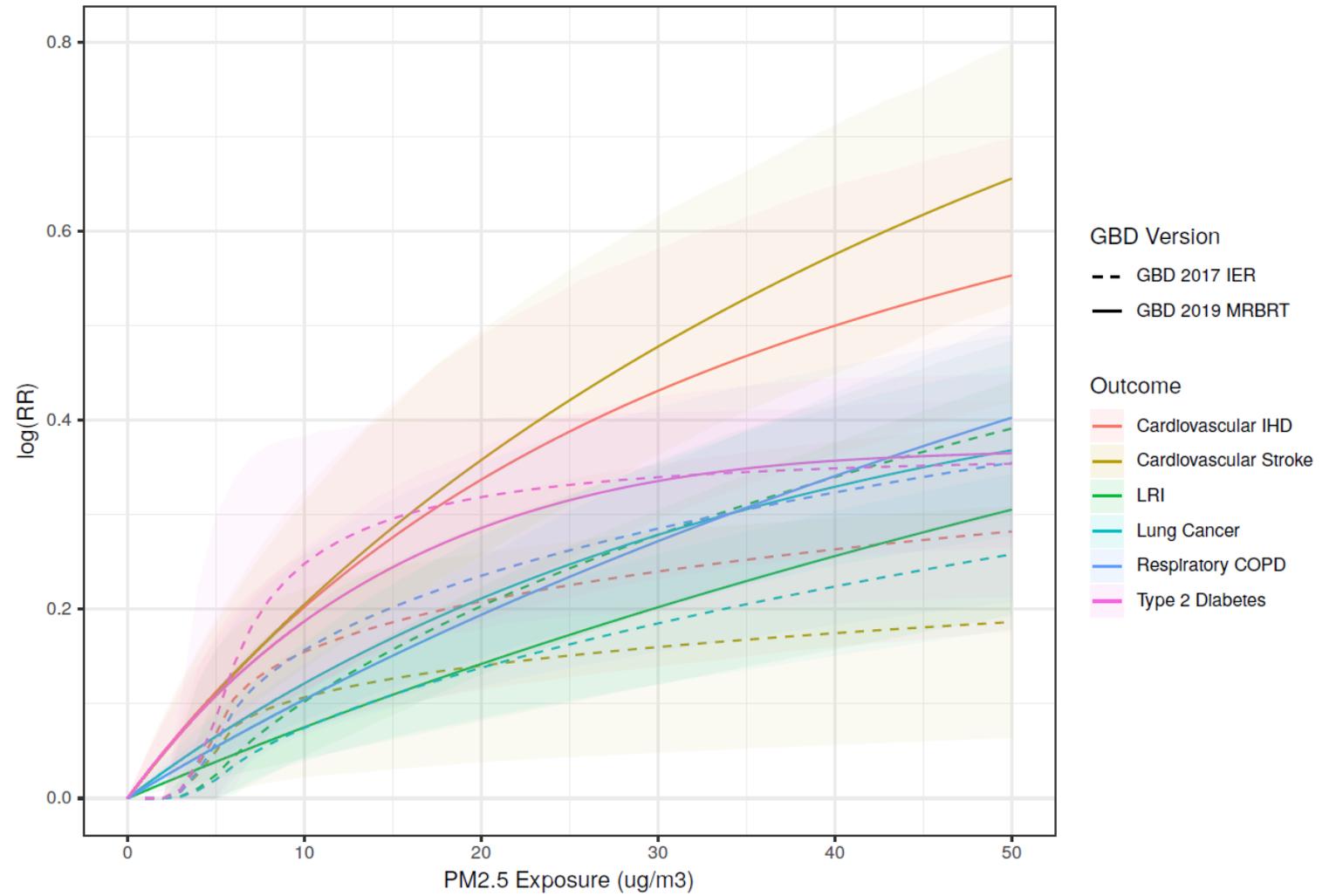
Exposure-response: Revised meta-analysis. - added high exposure studies from China/S. Asia; exclude smoking studies

Health outcomes

New: Adverse birth outcomes leading to neonatal mortality



Exposure-Response Relationships



Perspectives



Dr. Susan Niermeyer
University of Colorado, USA

Perspectives



Dr. Catherine Kyobutungi
APHRC, Kenya

Q&A

Please submit your questions via Q&A function on Zoom.

Accessing data via the website

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ABOUT NEWS AND EVENTS CONTACT

HOW CLEAN IS YOUR AIR? IMPACT ON YOUR HEALTH EXPLORE THE DATA REPORT & RESOURCES

Explore the Data

Download maps and data or create custom plots.

HOW TO USE THIS TOOL

Ask us for help

AIR QUALITY HEALTH IMPACT

Population-Weighted Concentration Burden On Your Health

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Select Pollutant: Ambient particulate matter pollution

Choose a country: Afghanistan

Compare to: Individual Countries Regions

Select comparison countries: Afghanistan

PLOTS MAPS TABLES

Average Annual Population-Weighted PM_{2.5}

Population-Weighted PM_{2.5} (ug/m³)

Year	Population-Weighted PM _{2.5} (ug/m ³)
2010	50
2011	48
2012	52
2013	45
2014	55
2015	58
2016	62
2017	60
2018	55
2019	52
2020	50

<https://www.stateofglobalair.org/data/#/air/plot>

DATA DATA REPORT

Total Deaths By Pollutant in 2019
117.17 KB ZIP

Infant Deaths By Country in 2019
78.52 KB ZIP

State of Global Air 2020
5.06 MB PDF

DATA DATA DATA

2020 Exposure Data - Ozone
29.11 KB XLSX

2020 Exposure Data - HAP
38.28 KB XLSX

2020 Exposure Data - PM_{2.5}
28.7 KB XLSX

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<https://www.stateofglobalair.org/resources>

State of Global Air Team



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Michael Brauer, Katrin Burkart, Sarah Wozniak, Kate Causey, Charlie Ashbaugh, Dean Owen



Michael Brauer

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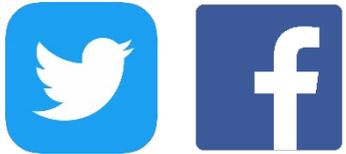


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