# The Global Impact of Air Pollution on Human Health (2010–2019)

- "Air pollution kills 7 million people every year — WHO."

- Air pollution stands as one of the gravest global health threats of our time. Fine particulate matter (PM2.5) penetrates deep into the lungs and enters the bloodstream, leading to millions of preventable deaths each year. The World Health Organization (WHO) attributes approximately 7 million annual deaths to this silent killer.

- This presentation delves into how air-pollution-related deaths varied by region, country, and gender between 2010 and 2019, highlighting the urgent need for action.
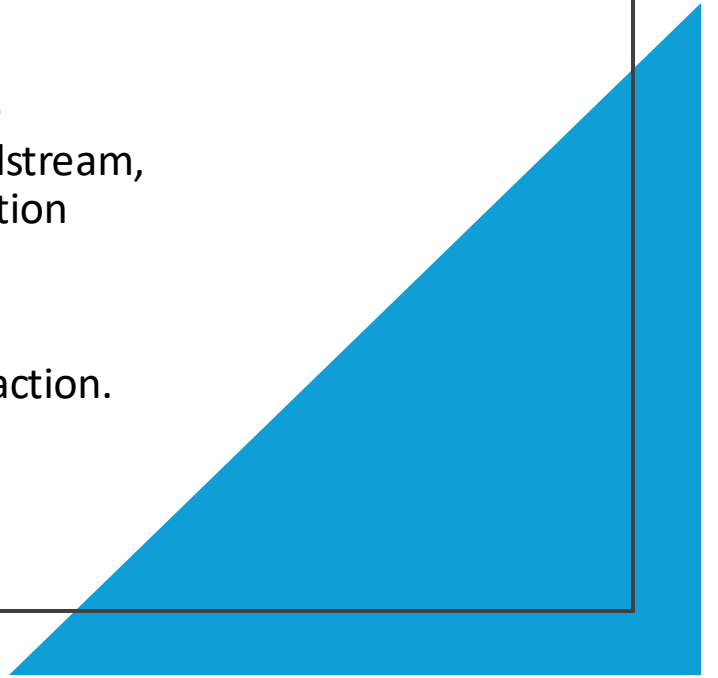
Data and Source

Source: WHO Global Health Observatory (Air Pollution Mortality & PM2.5 dataset).

Collected by: *World Health Organization (WHO)* for public research.
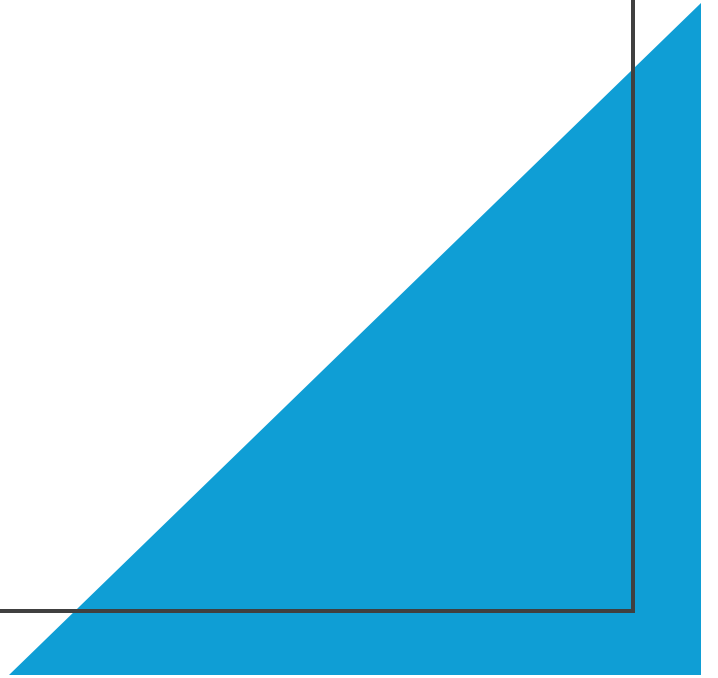
Timeframe: 2000–2020, analyzed 2010–2019 for consistency.

Method: Country-level mortality estimates from PM2.5 exposure.

Dataset size: ~12,000 rows × 9 columns (categorical + continuous).

License: Open-access under WHO data use policy.

Variables include - Region, Country, Gender, Year, PM2.5 level, and Deaths.

Research Framework

Main Question:
How has air pollution affected global mortality patterns (2010–2019)?

Sub-Questions:

- How have deaths changed globally and regionally over time?

- Which countries are most and least affected, and how does air quality differ?
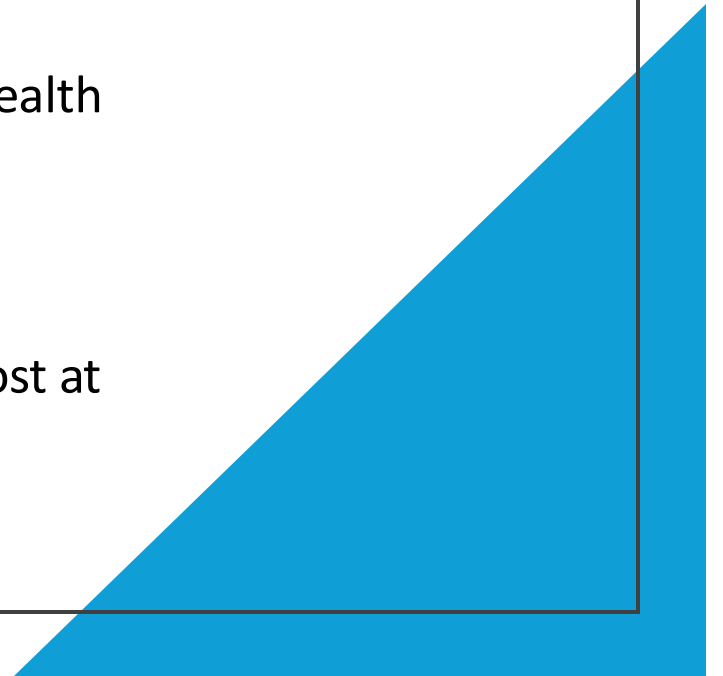
- How do gender patterns vary across regions?

Goal:
Understand global, regional, and demographic inequalities in air-pollution-related deaths.

Global Trends Over Time

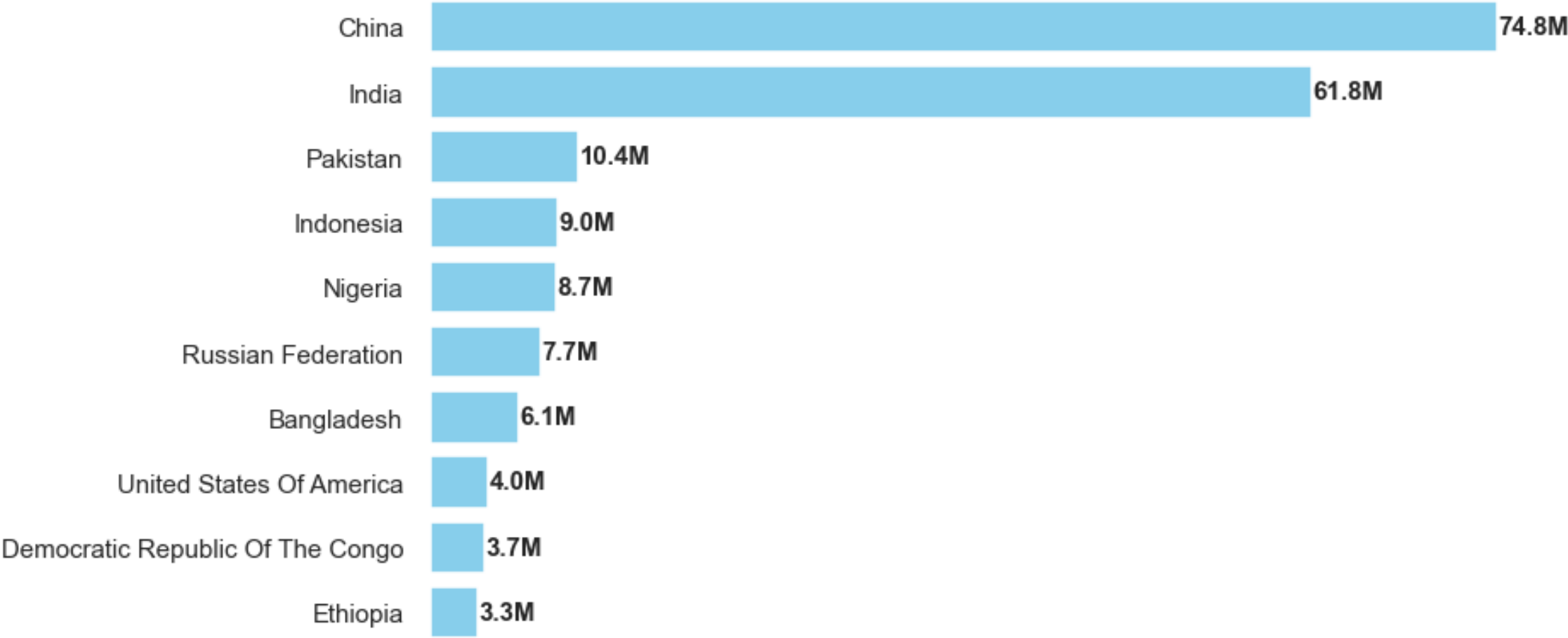Air Pollution–Related Deaths by WHO Region, 2010–2019 (in millions)
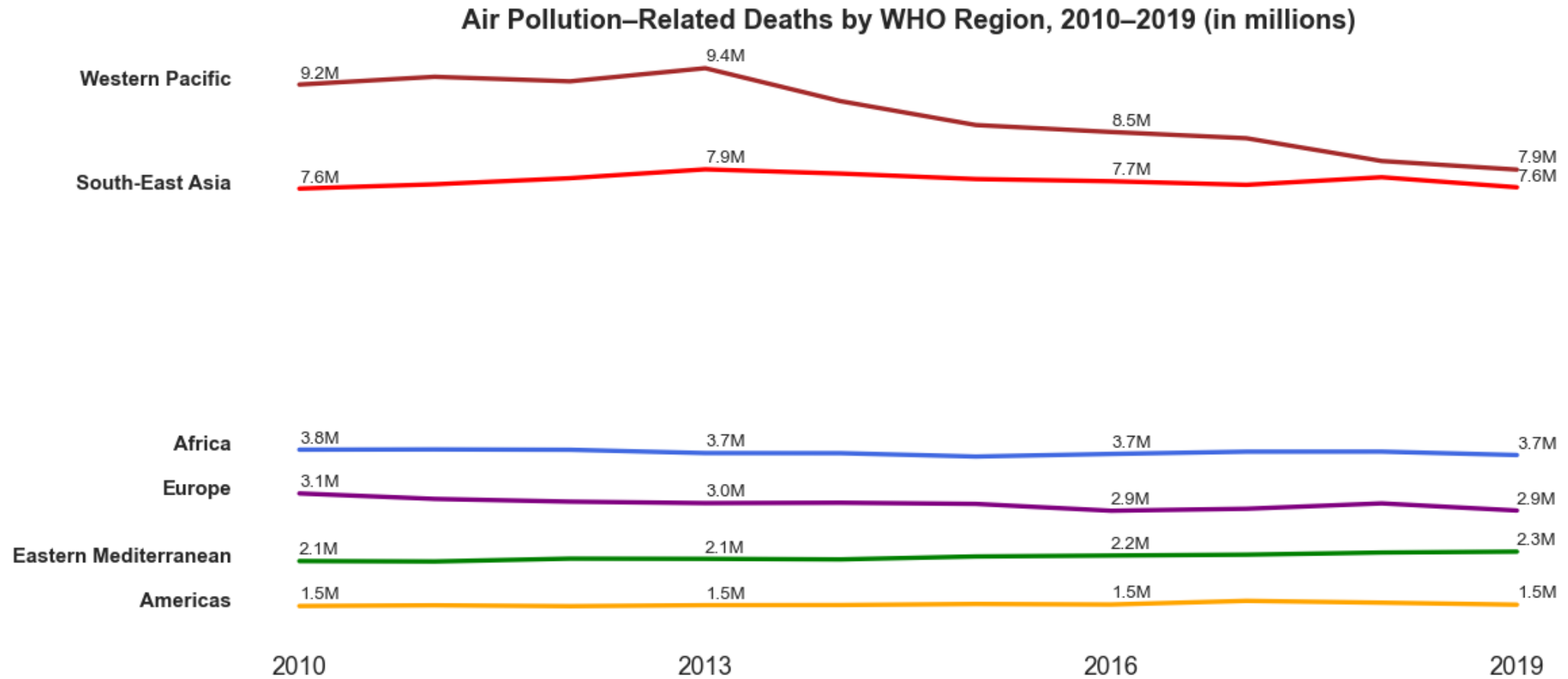
- Western Pacific and South-East Asia had the highest deaths throughout the decade.
- Both regions show a slight decline after 2013, hinting at policy or health improvements.
- Africa and Europe remained stable but still high.
- Americas had the lowest death rates globally.
- Overall, progress is uneven, with densely populated regions still most at risk.

Country-Level Analysis

Top 10 Countries by Air Pollution Deaths (2010–2019, in millions)

Country	Deaths
China	74.8M
India	61.8M
Pakistan	10.4M
Indonesia	9.0M
Nigeria	8.7M
Russian Federation	7.7M
Bangladesh	6.1M
United States Of America	4.0M
Democratic Republic Of The Congo	3.7M
Ethiopia	3.3M

Bottom 10 Countries by Air Pollution Deaths (2010–2019)

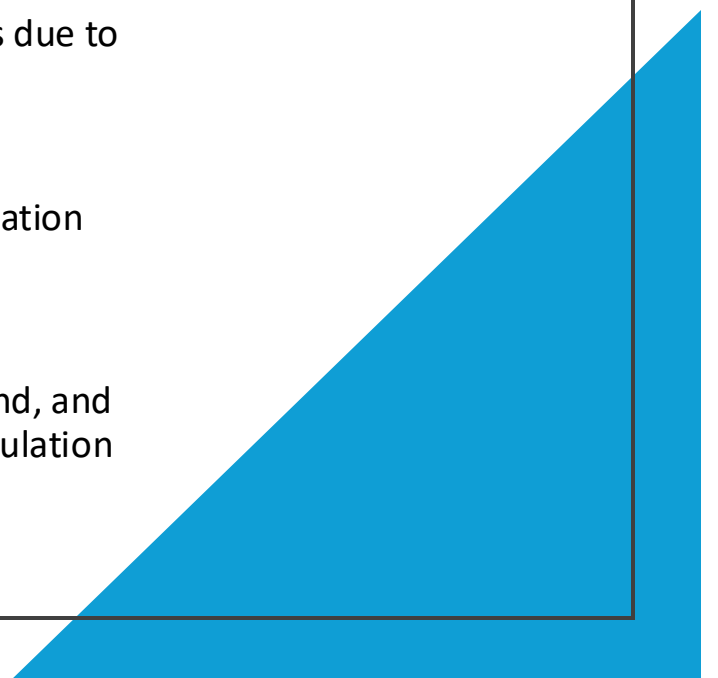| Country	Deaths
Antigua And Barbuda	792
Bahamas	1,377
Seychelles	1,696
Saint Vincent And The Grenadines	1,917
Brunei Darussalam	2,130
Saint Lucia	2,207
Grenada	2,507
Iceland	2,700
Belize	3,408
Maldives	3,587
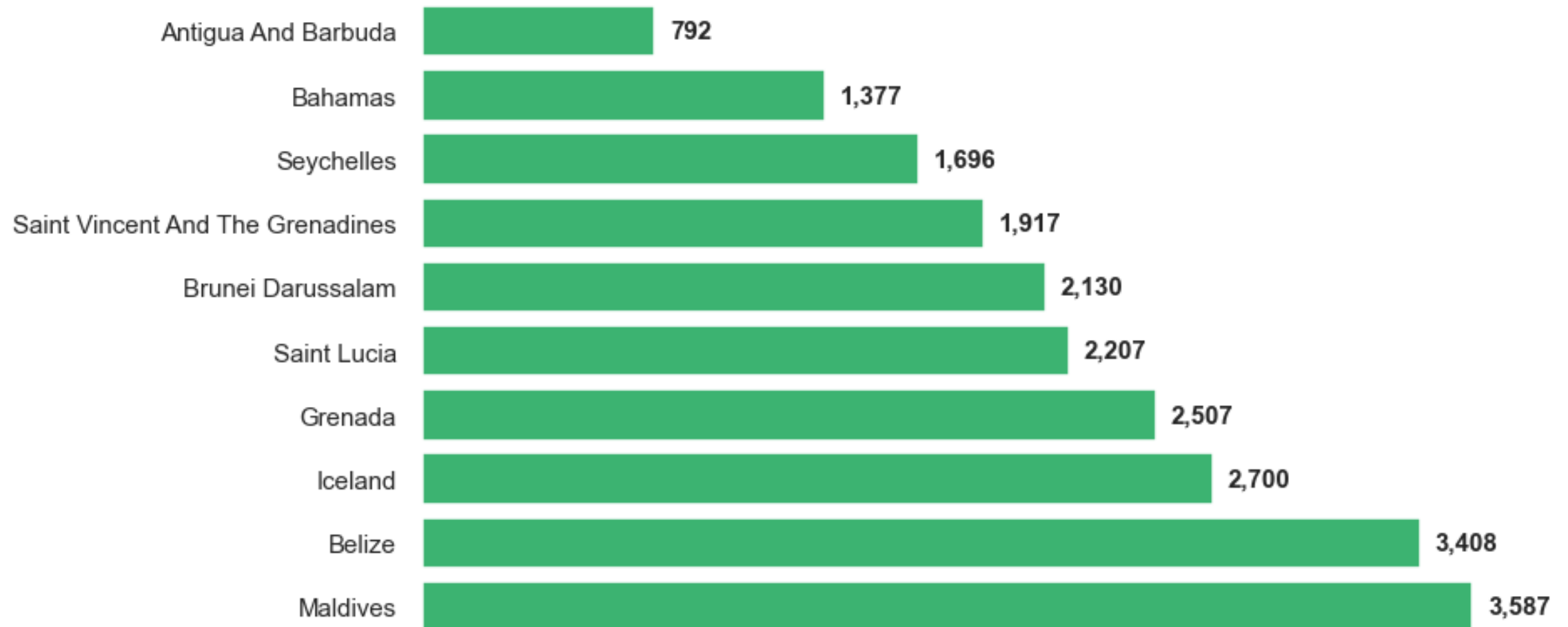
Dominance of Asian Giants

- China (74.8 million) and India (61.8 million) alone account for over half of all global deaths due to air pollution, underscoring the immense challenge faced by these populous nations.

Industrialization & Population Density

- The most affected countries are predominantly Asian nations, characterized by high population densities and extensive industrial activity.
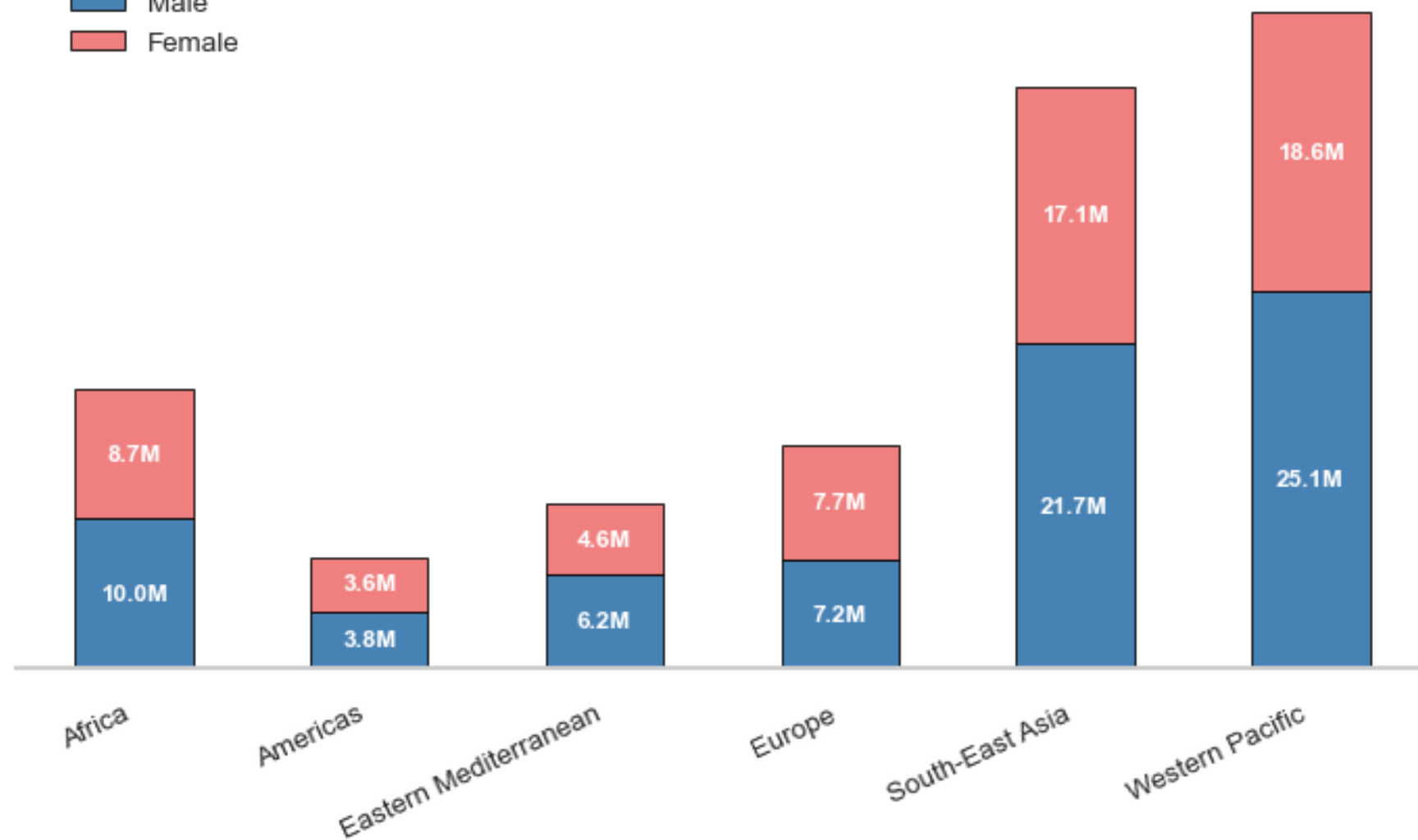
Minimal Impact Nations

- Conversely, small island states and northern European nations such as the Maldives, Iceland, and Grenada recorded negligible deaths, reflecting cleaner environments and often lower population densities.
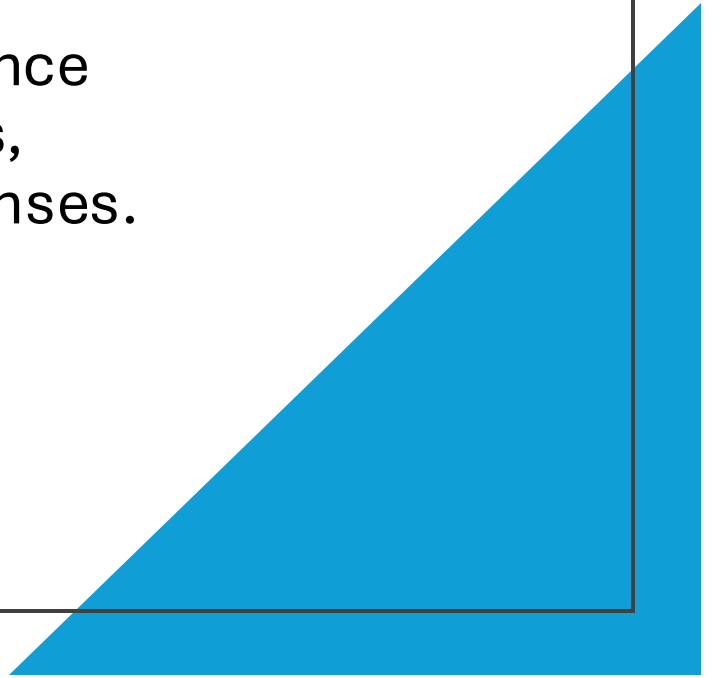
Total Air Pollution–Related Deaths by Gender and Region (2010–2019, in millions)

- Male
- Female

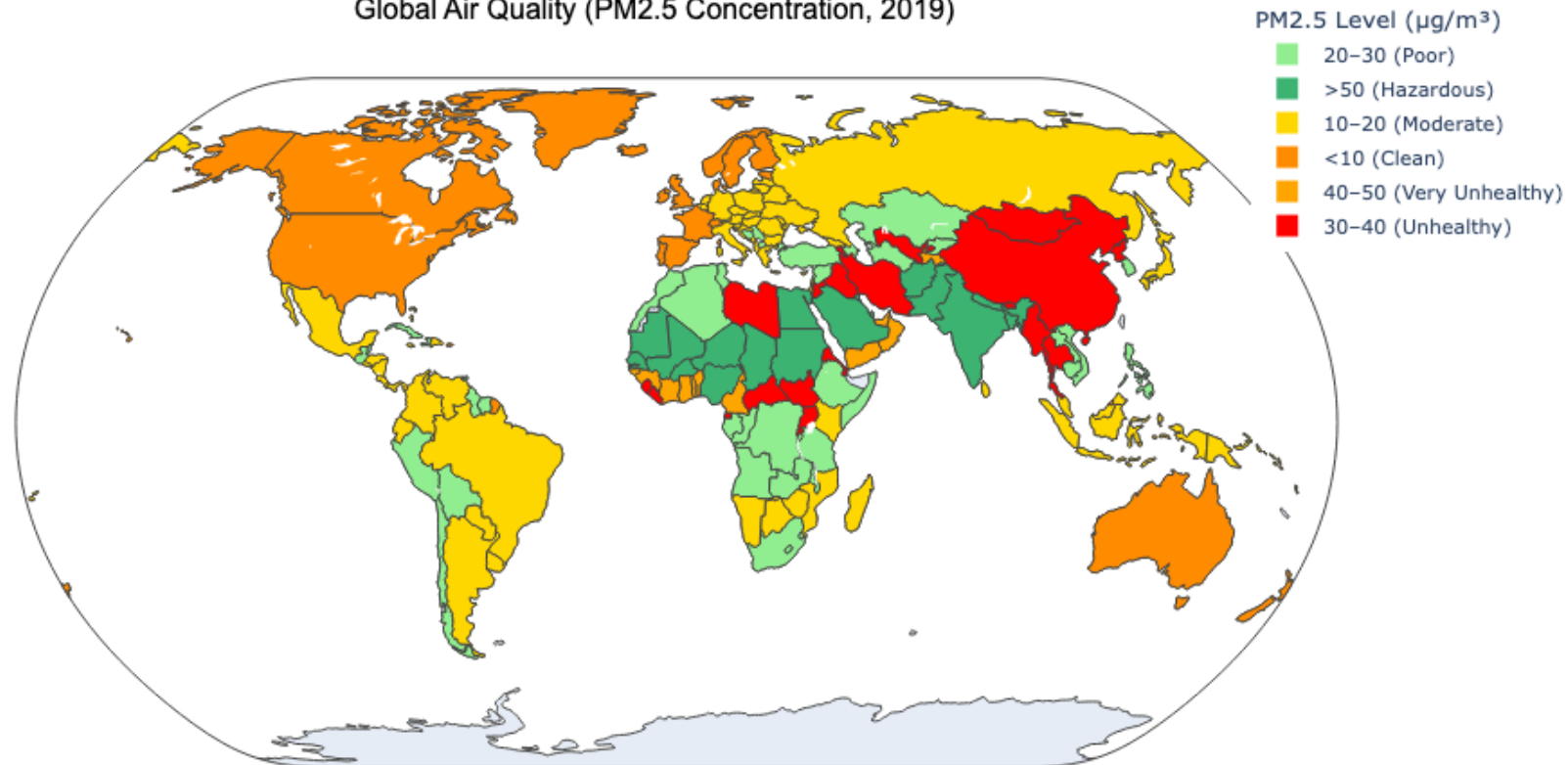| Region	Male	Female
Africa	10.0M	8.7M
Americas	3.8M	3.6M
Eastern Mediterranean	6.2M	4.6M
Europe	7.2M	7.7M
South-East Asia	21.7M	17.1M
Western Pacific	25.1M	18.6M

Gender Mortality Gap

A consistent, albeit slight, trend indicates men experience higher mortality rates than women across most regions, suggesting differential exposure or physiological responses.

Regional Air Quality

Global Air Quality (PM2.5 Concentration, 2019)

PM2.5 Level (µg/m³)
- 20–30 (Poor)
- >50 (Hazardous)
- 10–20 (Moderate)
- <10 (Clean)
- 40–50 (Very Unhealthy)
- 30–40 (Unhealthy)

Key Points:

- PM2.5 levels vary sharply across regions — Asia and the Middle East face the highest pollution.

- Countries like India, China, and parts of Africa record "Unhealthy" to "Hazardous" levels.

- North America, Europe, and Oceania show much cleaner air (<20 µg/m³).

- The map highlights a clear geographical divide between developed and developing regions.

Interpretation:

- Higher PM2.5 concentration means greater health risk — linking directly to increased air-pollution-related deaths seen in other charts.

Conclusion

- Air pollution remains a major global health threat, responsible for millions of deaths yearly.

- Western Pacific and South-East Asia bear the heaviest burden, while the Americas remain least affected.

- High PM2.5 levels strongly correlate with elevated mortality rates.

- Gender differences are minor, but regional gaps are vast.

- Despite small declines, global progress is uneven and insufficient.