AQLI Air Quality Life Index® | India Fact Sheet

India is the world's second most polluted country. Fine particulate air pollution ($PM_{2.5}$) shortens an average Indian's life expectancy by 5.3 years, relative to what it would be if the World Health Organization (WHO) guideline of 5 μg/m³ was met.[1] Some areas of India fare much worse than average, with air pollution shortening lives by 11.9 years in the National Capital Territory of Delhi, the most polluted city in the world.

KEY TAKEAWAYS

- All of India's 1.3 billion people live in areas where the annual average particulate pollution level exceeds the WHO guideline; 67.4 percent of the population live in areas that exceed the country's own national air quality standard of 40 μg/m³.
- Measured in terms of life expectancy, particulate pollution is the greatest threat to human health in India, taking 5.3 years off the life of the average Indian. In contrast, cardiovascular diseases reduce the average Indian's life expectancy by about 4.5 years, while child and maternal malnutrition reduce life expectancy by 1.8 years.
- Particulate pollution has increased over time. From 1998 to 2021, average annual particulate pollution increased by 67.7 percent, further reducing average life expectancy by 2.3 years. From 2013 to 2021, 59.1 percent of the world's increase in pollution has come from India.
- In the most polluted region of the country—the Northern Plains—521.2 million residents or 38.9 percent of India's population are on track to lose 8 years of life expectancy on average relative to the WHO guideline and 4.5 years relative to the national standard if current pollution levels persist.[2]
- If India were to reduce particulate pollution to meet the WHO guideline, residents in Delhi—India's capital and most populous city—would gain 11.9 years of life expectancy. In North 24 Parganas—the country's second most populous district—residents would gain 5.6 years of life expectancy.

Figure 1 · Potential gain in life expectancy from permanently reducing $PM_{2.5}$ from 2021 concentration to the WHO guideline

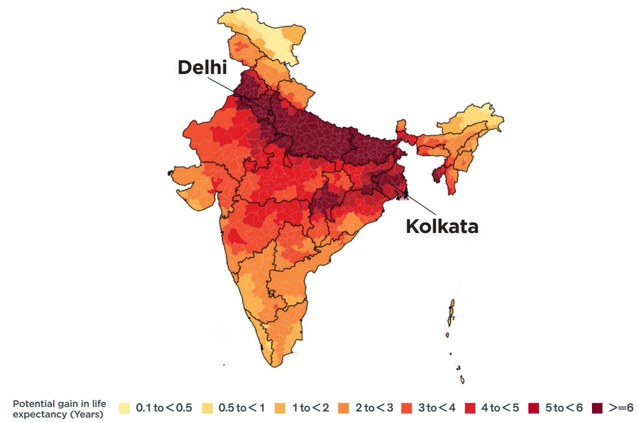
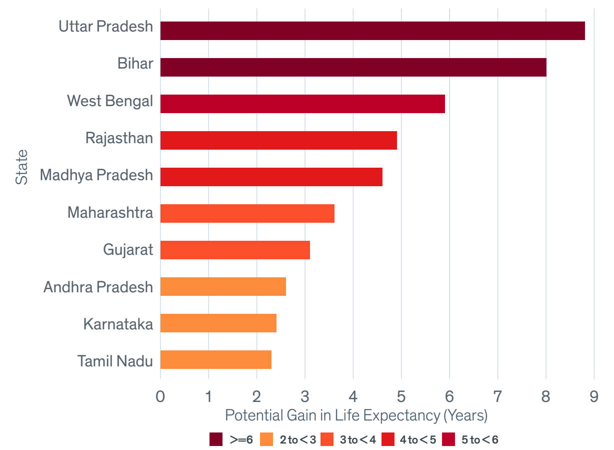


Figure 2 · Potential gain in life expectancy from reducing $PM_{2.5}$ concentrations from 2021 levels to the WHO guideline in the 10 most populous states of India



1 This data is based on the AQLI 2021 dataset. All annual average $PM_{2.5}$ values (measured in micrograms per cubic meter: μg/m³) are population weighted.

2 We define the Northern Plains of India as the following seven states and union territories: Bihar, Chandigarh, Delhi, Haryana, Punjab, Uttar Pradesh, and West Bengal. In this analysis, Northern Plains of India is synonymous with North India, Northern India, and the North Indian Belt.

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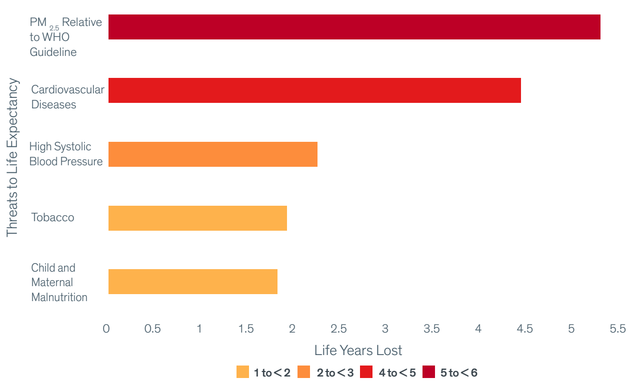
POLICY IMPACTS

In 2019, India declared a “war against pollution” and launched its National Clean Air Programme (NCAP), signaling its desire to reduce particulate pollution. NCAP originally aimed to reduce particulate pollution by 20-30 percent nationally relative to 2017 levels by 2024 and focused on 102 cities that were not meeting India’s national annual average $PM_{2.5}$ standard, termed “non-attainment cities.” In 2022, the Indian Government announced its revamped particulate pollution reduction target for NCAP, setting no national goal but increasing its ambition at the city level. The new goal aims for a 40 percent reduction relative to 2017 levels for an expanded number of 131 non-attainment cities by 2025-26.[3] If the ambition of the revised target is met, these cities’ overall annual average $PM_{2.5}$ exposure would be 21.9 µg/m³ lower than 2017 levels. This would add 2.1 years onto the life of the average Indian living in these specific 131 cities and 7.9 months onto the life of the average Indian country-wide.

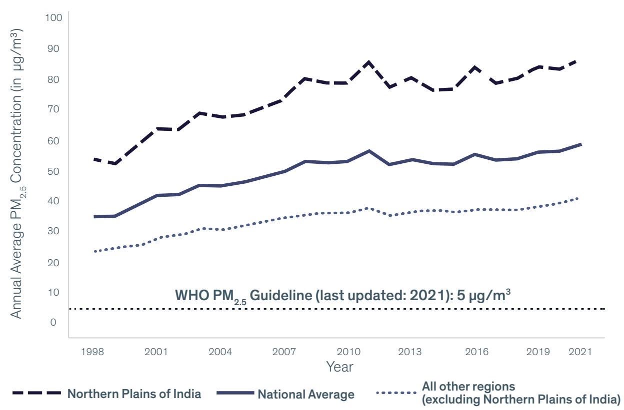
The availability of reliable, timely and ready-to-use data on air pollution is one area where India can make significant improvements. Although air pollution data is available from Central and State pollution control board websites, it’s often not straightforward to access it and even if it is, it’s not in an analysis-ready format and might require significant amounts of pre-processing (e.g. in case of PDFs) before it's ready for use. The inability to smoothly access air quality data sets India apart from many other nations with similar or even much smaller air quality monitoring networks.[4] Making these datasets more accessible (with better APIs) and available on a more timely basis would allow Indian citizens with a variety of skill sets to participate in addressing one of India’s largest public health crises.

Figure 3 · Top 5 threats to life expectancy in India



Source: Global Burden of Disease (https://vizhub.healthdata.org/gbd-results/) level-2 causes and risks data and WHO Life Tables (https://apps.who.int/gho/data/node.main.LIFECOUNTRY?lang=en) were combined with the Life table method to arrive at these results. "$PM_{2.5}$ relative to WHO Guideline" bar displays the reduction in life expectancy relative to the WHO guideline as calculated by latest AQLI (2021) data.

Figure 4 · Annual average $PM_{2.5}$ concentrations in India, 1998-2021



3 https://indianexpress.com/article/india/centre-aims-at-40-percent-reduction-in-particulate-matter-2026-8175260/

4 Open Air Quality Data: The Global Landscape, OpenAQ, 2022: https://documents.openaq.org/reports/Open+Air+Quality+Data+Global+Landscape+2022.pdf

Potential life expectancy impacts of particulate pollution reductions in all states/UTs of India

State/UT	Population (lakhs)	Annual average 2021 $PM_{2.5}$ concentration (µg/m³)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentration to WHO $PM_{2.5}$ guideline of 5 µg/m³ (years)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentration to national $PM_{2.5}$ standard of 40 µg/m³ (years)
Andaman and Nicobar	3.7	19	1.4	0
Andhra Pradesh	521.7	31.6	2.6	0
Arunachal Pradesh	15.4	16.7	1.2	0
Assam	343.7	34.9	2.9	0
Bihar	1203.9	86.2	8	4.5
Chandigarh	11.7	48.6	4.3	0.8
Chhattisgarh	291	63.3	5.7	2.3
Dadra and Nagar Haveli	4.2	27.3	2.2	0
Daman and Diu	2.9	27.4	2.2	0
Goa	15.1	29.1	2.4	0
Gujarat	674.8	37.1	3.1	0
Haryana	285.1	90.1	8.3	4.9
Himachal Pradesh	73.7	30.6	2.5	0
Jammu and Kashmir	140.8	35.6	3	0
Jharkhand	374.7	64	5.8	2.4
Karnataka	666.4	29	2.4	0
Kerala	333.4	18.5	1.3	0
Ladakh	3.1	10.8	0.6	0
Lakshadweep	0.5	21	1.6	0
Madhya Pradesh	815.5	52.3	4.6	1.2
Maharashtra	1226.8	41.9	3.6	0.2
Manipur	31.8	33.8	2.8	0
Meghalaya	35.7	35.4	3	0
Mizoram	12.4	39.4	3.4	0
NCT of Delhi	180.3	126.5	11.9	8.5
Nagaland	19.4	28.7	2.3	0
Odisha	453.4	47.8	4.2	0.8
Puducherry	13	24.2	1.9	0
Punjab	297.7	70.3	6.4	3
Rajasthan	774.5	54.7	4.9	1.4
Sikkim	6.1	39.8	3.4	0
Tamil Nadu	788.2	28.2	2.3	0
Telangana	375	38.2	3.2	0
Tripura	40.2	67.3	6.1	2.7
Uttar Pradesh	2247.6	94.4	8.8	5.3
Uttarakhand	113.6	43.2	3.7	0.3
West Bengal	985.8	64.8	5.9	2.4

ABOUT THE AIR QUALITY LIFE INDEX (AQLI)

The AQLI is a pollution index that translates particulate air pollution into perhaps the most important metric that exists: its impact on life expectancy. Developed by the University of Chicago's Milton Friedman Distinguished Service Professor in Economics Michael Greenstone and his team at the Energy Policy Institute at the University of Chicago (EPIC), the AQLI is rooted in research that quantifies the causal relationship between long-term human exposure to air pollution and life expectancy. The Index then combines this research with hyper-localized, satellite measurements of global particulate matter ($PM_{2.5}$), yielding unprecedented insight into the true cost of pollution in communities around the world. The Index also illustrates how air pollution policies can increase life expectancy when they meet the World Health Organization's guideline for what is considered a safe level of exposure, existing national air quality standards, or user-defined air quality levels. This information can help to inform local communities and policymakers about the importance of air pollution policies in concrete terms.

Methodology: The life expectancy calculations made by the AQLI are based on a pair of peer-reviewed studies, Chen et al. (2013) and Ebenstein et al. (2017), co-authored by Michael Greenstone, that exploit a unique natural experiment in China. By comparing two subgroups of the population that experienced prolonged exposure to different levels of particulate air pollution, the studies were able to plausibly isolate the effect of particulate air pollution from other factors that affect health. Ebenstein et al. (2017) found that sustained exposure to an additional 10 µg/m³ of PM_{10} reduces life expectancy by 0.64 years. In terms of $PM_{2.5}$, this translates to the relationship that an additional 10 µg/m³ of $PM_{2.5}$ reduces life expectancy by 0.98 years. This metric is then combined with sea-salt and mineral dust removed satellite-derived $PM_{2.5}$ data. All 2021 annual average $PM_{2.5}$ values are population-weighted and AQLI's source of population data is https://landscan.ornl.gov/. We are grateful to the Atmospheric Composition Analysis Group, based at the Washington University in St. Louis for providing us with the satellite data. The original dataset can be found here: https://sites.wustl.edu/acag/datasets/surface-pm2-5/. To learn more deeply about the methodology used by the AQLI, visit: aqli.epic.uchicago.edu/about/methodology.

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