AQLI Air Quality Life Index® Bangladesh Fact Sheet

Bangladesh is the world's most polluted country. Fine particulate air pollution ($PM_{2.5}$) shortens the average Bangladeshi resident's life expectancy by 6.8 years, relative to what it would be if the World Health Organization (WHO) guideline of 5 µg/m³ was met.[1] Some areas of Bangladesh fare much worse than average, with air pollution shortening lives by 8.3 years in Gazipur, the country's most polluted district located near the capital city of Dhaka.

KEY TAKEAWAYS

- All of Bangladesh's 164.8 million people live in areas where the annual average particulate pollution level exceeds both the WHO guideline and the country's own national standard of 15 µg/m³. Even in the least polluted district of Sylhet, particulate pollution is 9.7 times the WHO $PM_{2.5}$ guideline and 3.2 times the national standard.
- Measured in terms of life expectancy, particulate pollution is the second greatest threat to human health in Bangladesh (closely following cardiovascular diseases), taking 6.8 years off the life of the average Bangladeshi. In contrast, tobacco use reduces average life expectancy by 2.1 years, while child and maternal malnutrition reduces average life expectancy by 1.4 years.
- While particulate pollution decreased slightly (2.2 percent) from 2020 to 2021, it has increased over time. Since 1998, average annual particulate pollution has increased by 63 percent, further reducing life expectancy by 2.8 years.
- In some of the most polluted districts of the country, spread across the states of Dhaka and Chittagong, 74.7 million residents or 45.3 percent of Bangladesh's population are on track to lose 7.6 years of life expectancy on average relative to the WHO guideline and 6.6 years relative to the national standard if the current pollution levels persist.[2]
- If Bangladesh were to reduce particulate pollution to meet the WHO guideline, residents in Dhaka—the most populous district in Bangladesh—would gain 8.1 years of life expectancy. In Chittagong—the country's second most populous district—residents would gain 6.9 years.

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

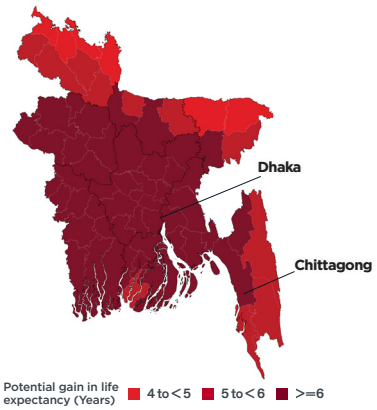
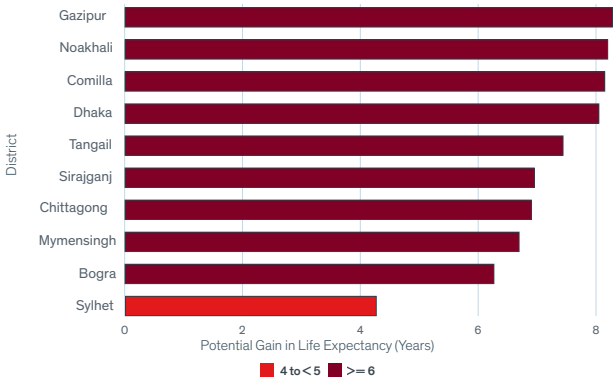


Figure 2 · Potential gain in life expectancy from reducing $PM_{2.5}$ from 2021 levels to the WHO guideline in the 10 most populous districts of Bangladesh



POLICY IMPACTS

The current $PM_{2.5}$ national standard in Bangladesh is 15 µg/m³. If the country's pollution concentration were to meet this national standard, this would add 5.8 years onto the life of the average Bangladeshi citizen. The availability of reliable, timely and ready-to-use data on air pollution is one area where Bangladesh can make significant improvements.[3] According to OpenAQ's Open Air Quality Data: The Global Landscape 2022 report, the country does not have fully open air quality data. Making these datasets more fully accessible on a more timely basis would allow Bangladeshi citizens with a variety of skill sets to participate in addressing air pollution.

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.

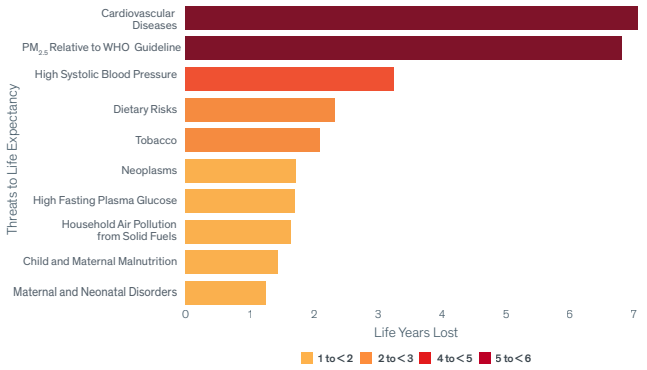
2 Population weighted average of $PM_{2.5}$ concentrations across all districts of Dhaka and Chittagong was computed and converted into average life expectancy lost for the region as a whole using AQLI methodology. See methodology section at the end for more details.

3 Open Air quality data, The global landscape 2022 community summary table: https://docs.google.com spreadsheets/d/1m3KfNOGQNlBBGn-jSqPoRmKH-IU0ic1AY9UNCIXQb3I/edit#gid=1038230352

Potential life expectancy impacts of particulate pollution reductions in the 25 most populous districts of Bangladesh

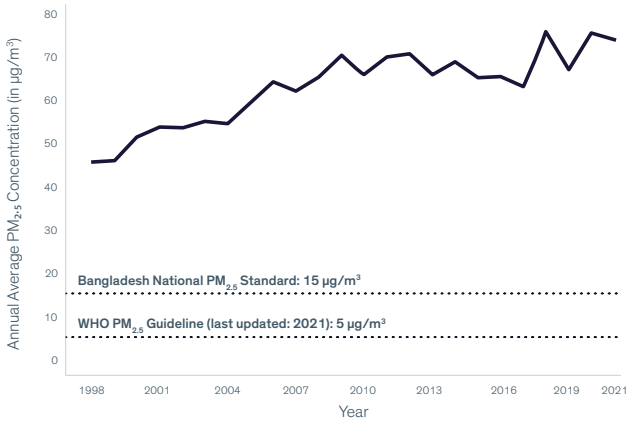
Division	District	Population (millions)	$PM_{2.5}$ concentration 2021 (in µg/m³)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentrations to the WHO guideline of 5 µg/m³ (years)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentrations to the national standard of 15 µg/m³ (years)	Life expectancy gains from reducing $PM_{2.5}$ from 2021 concentrations by 30 percent (years)
Dhaka	Dhaka	13.8	87.2	8.1	7.1	2.6
Chittagong	Chittagong	8.7	75.5	6.9	5.9	2.2
Chittagong	Comilla	6.1	88.2	8.2	7.2	2.6
Mymensingh	Mymensingh	5.8	73.5	6.7	5.7	2.2
Dhaka	Tangail	4.1	81	7.4	6.5	2.4
Dhaka	Gazipur	4	89.8	8.3	7.3	2.6
Sylhet	Sylhet	3.9	48.5	4.3	3.3	1.4
Rajshahi	Bogra	3.9	69.1	6.3	5.3	2
Chittagong	Noakhali	3.5	88.7	8.2	7.2	2.6
Rajshahi	Sirajganj	3.5	76	7	6	2.2
Chittagong	Cox'S Bazar	3.5	62.7	5.7	4.7	1.8
Rangpur	Dinajpur	3.4	64	5.8	4.8	1.9
Dhaka	Kishoreganj	3.3	82	7.6	6.6	2.4
Rangpur	Rangpur	3.3	59.2	5.3	4.3	1.7
Chittagong	Brahamanbaria	3.3	83.1	7.7	6.7	2.4
Dhaka	Narayanganj	3.2	86.9	8	7	2.6
Khulna	Jessore	3.1	70.2	6.4	5.4	2.1
Rajshahi	Rajshahi	3	67.5	6.1	5.2	2
Rajshahi	Naogaon	3	69.7	6.3	5.4	2
Rajshahi	Pabna	2.9	72.4	6.6	5.6	2.1
Sylhet	Sunamganj	2.8	53.9	4.8	3.8	1.6
Chittagong	Chandpur	2.7	87.8	8.1	7.1	2.6
Rangpur	Gaibandha	2.7	64.6	5.8	4.9	1.9
Khulna	Khulna	2.6	72.9	6.7	5.7	2.1
Mymensingh	Jamalpur	2.6	67.7	6.2	5.2	2

Figure 3 · Top 10 threats to life expectancy in Bangladesh



Sources: 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 Bangladesh, 1998-2021



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.