AQLI Air Quality Life Index® | Pakistan Fact Sheet

Fine particulate air pollution (PM2.5) shortens the average Pakistani resident's life expectancy by 3.3 years, relative to what it would be if the World Health Organization (WHO) guideline of 5 μg/m³ was met (Figure 1)[1], making it the top health threat to the country. Some areas of Pakistan fare much worse than average, with air pollution shortening lives by more than 5 years in the country's most polluted regions like Peshawar, Lahore, Nowshera, and Sheikhupura.

KEY TAKE-AWAYS

- All of Pakistan's 248.8 million people live in areas where the annual average particulate pollution level exceeds the WHO guideline; 98.4 percent of the population live in areas that exceed the country's own national air quality standard of 15 μg/m³.
- While particulate pollution takes 3.3 years off the life of the average Pakistani, child & maternal malnutrition and maternal & neonatal disorders takes off 2.3 years (Figure 2).
- Particulate pollution has increased over time. From 1998 to 2022, average annual particulate pollution increased by 35.1 percent, further reducing life expectancy by 1 year (Figure 3).
- In the most polluted provinces of the country—Punjab, Islamabad Capital Territory and Khyber Pakhtunkhwa—168.8 million residents or 69.5 percent of Pakistan's population are on track to lose between 3.2 to 4.6 years of life expectancy on average relative to the WHO guideline and between 2.2 to 3.6 years relative to the national standard if the current pollution levels persist (Figure 4).
- If Pakistan were to reduce particulate pollution to meet the WHO guideline, residents in Karachi—Pakistan's most populous city—would gain 2.6 years of life expectancy [2]. In Lahore—the country's second most populous city—residents would gain 5.3 years of life expectancy. In Pakistan's capital city of Islamabad, residents would gain 4.6 years.

Figure 1 · Potential gain in life expectancy from permanently reducing PM2.5 from 2022 concentration to the WHO guideline

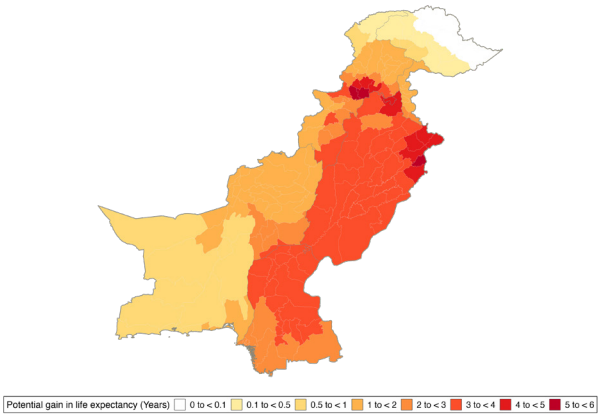
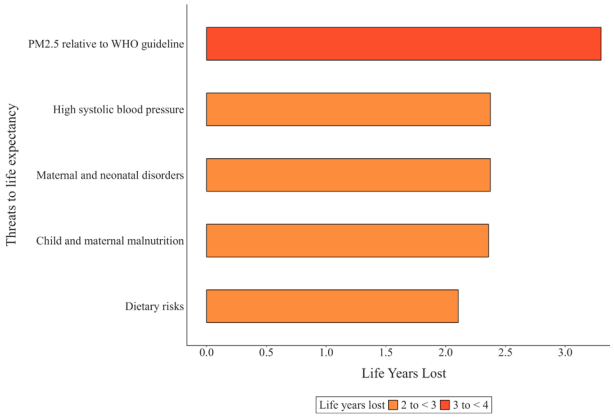


Figure 2 · Top 5 threats to life expectancy in Pakistan



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. 'PM2.5 relative to WHO Guideline' bar displays the reduction in life expectancy relative to the WHO guideline as calculated by latest AQLI (2022) data.

1 This data is based on the AQLI 2022 dataset. All annual average PM2.5 values (measured in micrograms per cubic meter: μg/m³) are population weighted.

2 We define Karachi as the following six regions to Central Karachi, East Karachi, Korangi Karachi, Malir Karachi, South Karachi and West Karachi

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

Region	Population (Millions)	Annual Average 2022 PM2.5 Concentration (µg/m³)	Life Expectancy Gains from reducing PM2.5 from 2022 concentration to WHO PM2.5 guideline of 5 µg/m	Life Expectancy Gains from reducing PM2.5 from 2022 concentration to National PM2.5 guideline of 15 µg/m³	Life Expectancy Gains from reducing PM2.5 from 2022 concentration by 30 percent	Life Expectancy Gains from reducing PM2.5 from 2022 Concentrations by 30 percent
Lahore	9.5	59.5	5.3	4.4	1.7	1.8
Faisalabad	7.3	37.2	3.2	2.2	1.1	1.7
East Karachi	6	32.9	2.7	1.8	1	1.8
Rawalpindi	6	48.9	4.3	3.3	1.4	1.7
Multan	5.9	43.6	3.8	2.8	1.3	1.3
West Karachi	5.6	30	2.5	1.5	0.9	1.9
South Karachi	5.5	30.2	2.5	1.5	0.9	2
Bahawalpur	5.4	38.9	3.3	2.3	1.1	1
Rahim Yar Khan	5.1	42.8	3.7	2.7	1.3	1.6
Muzaffargarh	4.9	42.9	3.7	2.7	1.3	2
Peshawar	4.9	62.1	5.6	4.6	1.8	1.7
Gujranwala	4.6	50.8	4.5	3.5	1.5	1.4
Malir Karachi	4.4	31.9	2.6	1.7	0.9	1.8
Central Karachi	4.4	31.6	2.6	1.6	0.9	1.2
Sargodha	4.4	38.5	3.3	2.3	1.1	1.8
Bahawalnagar	4	40	3.4	2.5	1.2	1.8
Sialkot	3.6	48.4	4.3	3.3	1.4	1.5
Jhang	3.6	36.6	3.1	2.1	1.1	1.5
Gujrat	3.5	38.3	3.3	2.3	1.1	1.6
Bhakkar	3.4	40.4	3.5	2.5	1.2	1.6
Kasur	3.4	50.8	4.5	3.5	1.5	1.2
Khanewal	3.4	40.8	3.5	2.5	1.2	1.8
Vehari	3.3	41	3.5	2.5	1.2	1.4
Attock	3.1	43.3	3.8	2.8	1.3	1.6
Sheikhupura	3	53.1	4.7	3.7	1.6	1.5

Figure 3 · Annual average PM2.5 concentration in Pakistan, 1998-2022

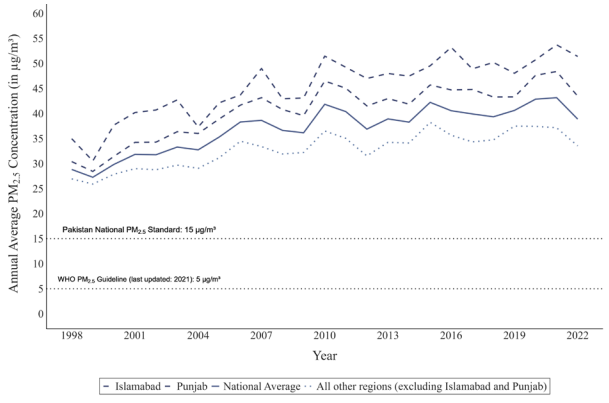
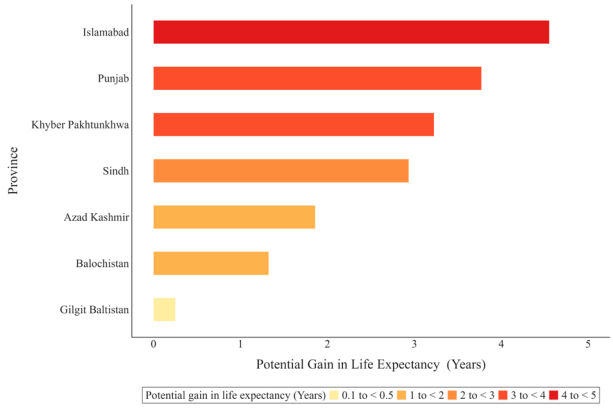


Figure 4 · Potential gain in life expectancy from reducing PM2.5 from 2022 levels to the WHO guideline in all provinces of Pakistan



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 (PM2.5), 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 PM10 reduces life expectancy by 0.64 years. In terms of PM2.5 , this translates to the relationship that an additional 10 µg/m3 of PM2.5 reduces life expectancy by 0.98 years. This metric is then combined with sea-salt and mineral dust removed satellite-derived PM2.5 data. All 2022 annual average PM2.5 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.