

Pakistan is the world's fourth most polluted country. Air pollution shortens the average Pakistani's life expectancy by 3.8 years, relative to what it would be if the World Health Organization (WHO) guideline of $5 \mu\text{g}/\text{m}^3$ was met.¹ Some areas of Pakistan fare much worse than average, with air pollution shortening lives by almost 7 years in the country's most polluted regions, like Lahore and Peshawar.

KEY TAKE-AWAYS

- All of Pakistan's 228.5 million people live in areas where the annual average particulate pollution level exceeds the WHO guideline. Ninety-eight percent of the population live in areas that exceed the country's own national air quality standard of $15 \mu\text{g}/\text{m}^3$.
- Measured in terms of life expectancy, particulate pollution is the greatest threat to human health in Pakistan, reducing life expectancy by 3.8 years on average. In contrast, child and maternal malnutrition reduces average life expectancy by about 3 years, while smoking reduces average life expectancy by 1.8 months
- Since the early 2000s, average annual particulate pollution has increased by 40 percent, leading to an additional 1.2 years of reduction in average life expectancy.
- The most polluted areas of the country are the provinces of Punjab, Federal Capital Territory, and Sindh, where residents would gain between 3 to 5 years of life expectancy if particulate pollution were permanently reduced to the WHO guideline.
- In Karachi, Pakistan's most populous city, residents would gain 3.1 years from clean air. In Lahore, the country's second most populous city, residents would gain 6.8 years from clean air. In Islamabad, residents stand to gain 4.3 years.

Figure 1 · Potential Gain in Life Expectancy through Permanently Reducing $\text{PM}_{2.5}$ from 2020 Concentration to the WHO Guideline

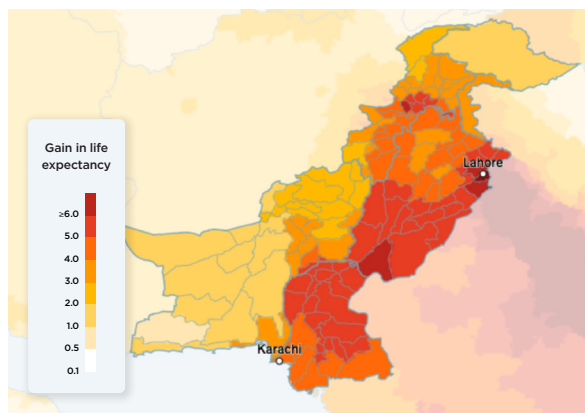
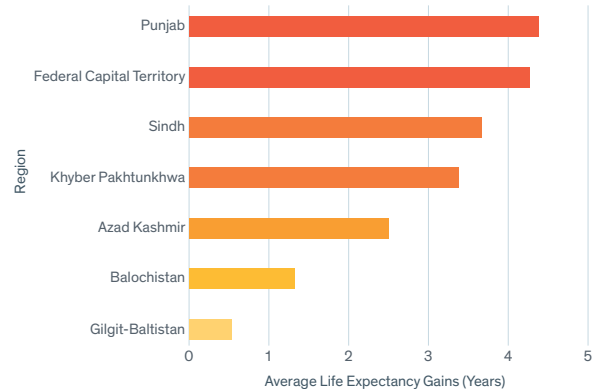


Figure 2 · Potential Gain in Years of Life Expectancy from Reducing $\text{PM}_{2.5}$ to the WHO Guideline in all Major Regions of Pakistan



¹ All average $\text{PM}_{2.5}$ values (measured in micrograms per cubic meter: $\mu\text{g}/\text{m}^3$) are population weighted.

Average PM_{2.5} Concentrations and Potential Life Expectancy Gains in 25 Most Populous Regions of Pakistan

Years of Life Expectancy Gain Through Reducing PM_{2.5} from 2020 Concentration

Region	Population (Millions)	PM _{2.5} Concentration, 2020 (µg/m ³)	To WHO Guideline of 5 µg/m ³	To National Standard of 15 µg/m ³	By 30%
Karachi City	27.2	36.3	3.1	2.1	1.1
Lahore	8.9	74	6.8	5.8	2.2
Faisalabad	6.8	37.8	3.2	2.2	1.1
Rawalpindi	5.6	45.4	4	3	1.3
Multan	5.6	54.6	4.9	3.9	1.6
Bahawalpur	5	51.5	4.6	3.6	1.5
Rahim Yar Khan	4.9	57.9	5.2	4.2	1.7
Muzaffargarh	4.7	55.6	5	4	1.6
Peshawar	4.5	58.4	5.2	4.2	1.7
Gujranwala	4.3	54.5	4.8	3.9	1.6
Sargodha	4.1	37.2	3.1	2.2	1.1
Bahawalnagar	3.7	50.5	4.5	3.5	1.5
Sialkot	3.4	51.6	4.6	3.6	1.5
Jhang	3.4	37.6	3.2	2.2	1.1
Gujrat	3.3	39.1	3.3	2.4	1.1
Bhakkar	3.2	40.4	3.5	2.5	1.2
Khanewal	3.2	48.7	4.3	3.3	1.4
Kasur	3.1	64.6	5.8	4.9	1.9
Vehari	3.1	51.2	4.5	3.5	1.5
Attock	2.9	41.4	3.6	2.6	1.2
Islamabad	2.8	48.5	4.3	3.3	1.4
Okara	2.8	50.6	4.5	3.5	1.5
Chakwal	2.8	35.1	3	2	1
Mianwali	2.7	42.4	3.7	2.7	1.2
Layyah	2.7	46.9	4.1	3.1	1.4

Figure 3 · Life Expectancy Impact of PM_{2.5} and Unassociated Causes/Risks of Death

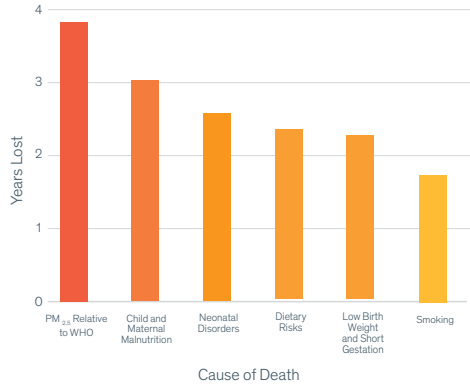
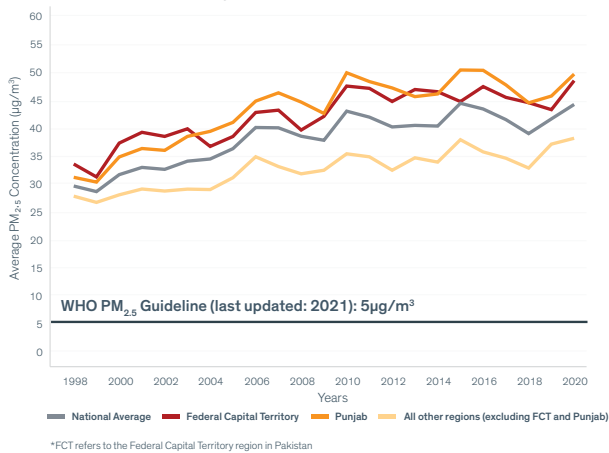


Figure 4 · Average PM_{2.5} Concentration in Pakistan, 1998-2020



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 recent 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, global particulate measurements, yielding unprecedented insight into the true cost of particulate 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 particulates air pollution from other factors that affect health. The more recent of the two studies found that sustained exposure to an additional 10 µg/m³ of PM₁₀ 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. To learn more about the methodology used by the AQLI, visit: aqli.epic.uchicago.edu/about/methodology