AQLI Air Quality Life Index® | Thailand Fact Sheet

The average Thai resident could live 1.8 years longer if particulate concentrations in Thailand were permanently reduced to meet the World Health Organization (WHO) guideline of 5 µg/m³.[1,2] In the most polluted parts of the country in the Chiang Rai and Phayao provinces, individuals could gain more than 3.5 years of life expectancy (Figure 1).

KEY TAKE-AWAYS

- Particulate pollution is the biggest threat to life expectancy in Thailand. While particulate pollution takes 1.8 years off the life of the average Thai resident, tobacco, dietary risks, and transport injuries take off 1.7 years, 1.2 years, and 11.5 months, respectively (Figure 2).
- In 2023, the annual-average $PM_{2.5}$ concentration in Thailand was 23.1 µg/m³, 7 percent higher compared to 2022. All of Thailand's 69.5 million people lived in areas where the annual average particulate pollution level exceeded the WHO guideline.
- The 25 most polluted municipalities in Thailand are located in the provinces of Chiang Rai, Phayao, and Nan. In each of these regions, residents could live more than 3.3 years longer on average if the current levels of particulate pollution were reduced to meet the WHO guideline.
- In the Northern provinces of Thailand—plagued by forest fire episodes and often considered among the most polluted regions in the world—an average resident could lose 2.7 years of their life expectancy if the current pollution levels persist.[3]
- In the most populous provinces of the country—Bangkok Metropolis, Nakhon Ratchasima, and Samut Prakan—13.9 million residents or 20 percent of Thailand's population could, on average, gain 1.6 years of life expectancy by breathing air that meets the WHO guideline (Figure 3).
- Relative to 1998, average annual particulate concentrations in 2023 went up by 15.5 percent, reducing life expectancy by 3.6 months. During that time, particulate pollution increased the most in Southern Thailand, with a 46 percent increase (Figure 4).[4]
- More than 98 percent of Thailand's population lives in regions that don't meet the country's national standard of 15 µg/m³. If pollution levels in these regions were brought down to meet the country's standard, the average life expectancy of individuals living in these regions would go up by 9.8 months, adding 55.6 million years of life to Thailand's population.

Figure 1 · Potential gain in life expectancy from permanently reducing $PM_{2.5}$ from the 2023 concentration to the WHO guideline

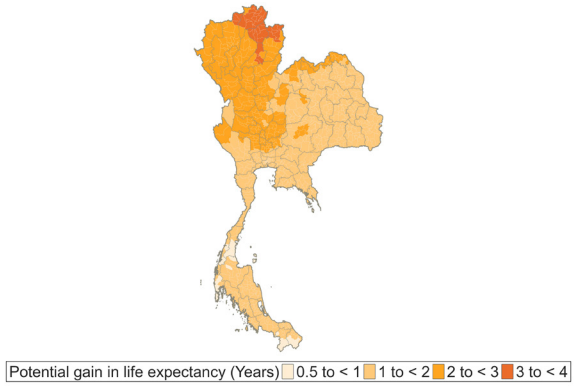
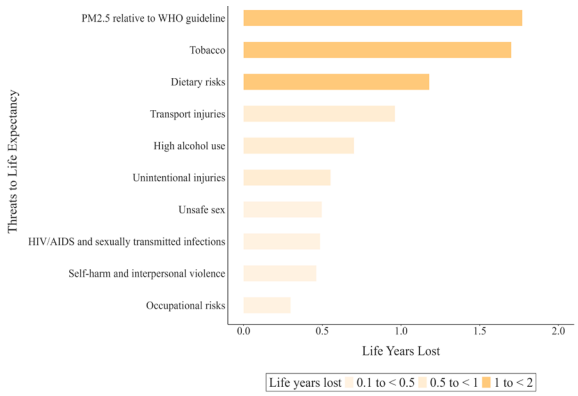


Figure 2 · Top 10 external threats to life expectancy in Thailand



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 (2023 PM2.5 concentrations) data.

1 This data is based on the data used in AQLI Annual Update 2025 and considers $PM_{2.5}$ concentrations for 2023. dataset. All annual average $PM_{2.5}$ values (measured in micrograms per cubic meter: µg/m³) are population weighted.

2 World Health Organization. WHO Global Air Quality Guidelines: Particulate Matter ($PM_{2.5}$ and PM_{10}), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide. Geneva: World Health Organization, 2021. https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf?sequence=1

3 Northern Thailand are defined as provinces in this file: https://docs.google.com/spreadsheets/d/16_nRAwCqO4K_4TyJQ0xiSN-jpEshEkJnWmx2Bq8BJWA/edit#gid=0

4 Northern, Northeastern, Central and Southern Thailand are defined as provinces listed in the following file: https://docs.google.com/spreadsheets/d/16_nRAwCqO4K_4TyJQ0xiSN-jpEshEkJnWmx2Bq8BJWA/edit#gid=0

Potential life expectancy impacts of particulate pollution reduction in the 25 most polluted municipalities of Thailand

State/Province	Municipality	Population	Annual average $PM_{2.5}$ concentration in 2023 (in µg/m³)	Potential gain in life expectancy from reducing $PM_{2.5}$ concentrations from 2023 levels to WHO $PM_{2.5}$ guideline of 5 µg/m³ (in years)	Potential gain in life expectancy from reducing $PM_{2.5}$ concentrations from 2023 levels to Thailand's national standard of 15 µg/m³ (in years)
Chiang Rai	Phan	126,305	43.2	3.7	2.8
Chiang Rai	Wiang Chai	44,298	43	3.7	2.7
Chiang Rai	Khun Tan	32,541	42.6	3.7	2.7
Chiang Rai	Pa Daet	24,870	42.5	3.7	2.7
Chiang Rai	Muang Chiang Rai	206,291	42.4	3.7	2.7
Chiang Rai	Mae Sai	77,343	42.3	3.7	2.7
Chiang Rai	Mae Lao	24,178	42	3.6	2.6
Chiang Rai	Phaya Mengrai	41,555	41.7	3.6	2.6
Phayao	Mae Chai	31,346	41.6	3.6	2.6
Chiang Rai	Thoeng	79,750	41.5	3.6	2.6
Chiang Rai	Chiang Saen	45,897	41.4	3.6	2.6
Chiang Rai	Chiang Khong	63,549	41.3	3.6	2.6
Phayao	Chun	43,772	41.3	3.6	2.6
Chiang Rai	Mae Chan	118,847	41.1	3.5	2.6
Phayao	K. Phu Kam Yao	17,552	41	3.5	2.5
Phayao	Chiang Kham	69,738	40.7	3.5	2.5
Phayao	K. Phu Sang	26,127	40.6	3.5	2.5
Chiang Rai	K. Wieng Chiang	26,579	40.4	3.5	2.5
Chiang Rai	Wieng Kaen	29,898	40.2	3.4	2.5
Chiang Rai	K. Doi Luang	21,631	39.8	3.4	2.4
Nan	Chiang Klang	26,911	39.5	3.4	2.4
Phayao	Dok Kham Tai	63,434	39.4	3.4	2.4
Nan	Thung Chang	15,456	39.4	3.4	2.4
Phayao	Muang Phayao	104,958	38.9	3.3	2.3
Nan	Song Kwae	10,213	38.7	3.3	2.3

Figure 3 · Potential gain in life expectancy from reducing $PM_{2.5}$ from 2023 levels to the WHO guideline in the 10 most populous provinces of Thailand

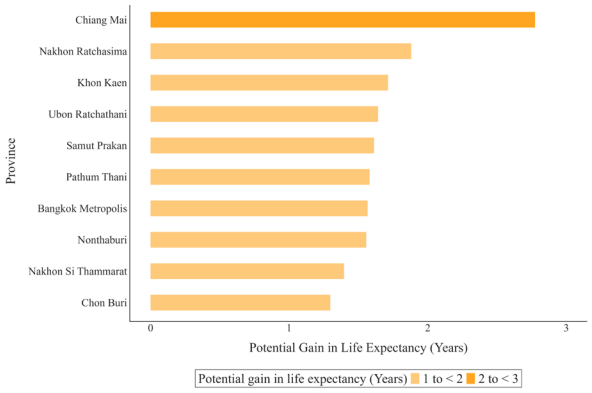
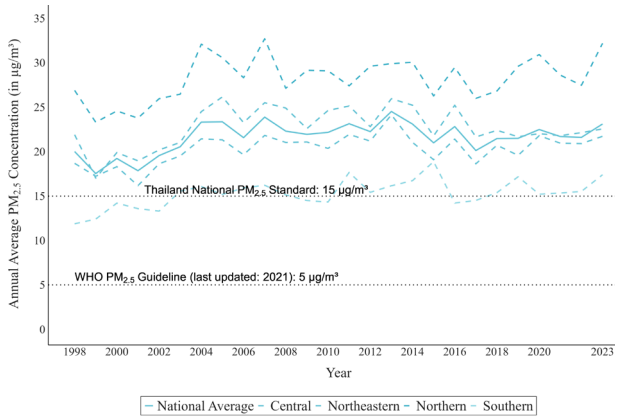


Figure 4 · Annual average $PM_{2.5}$ concentrations, 1998-2023



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 PM2.5, 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 PM2.5 data. All 2023 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 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/#V5.GL.05.02. To learn more deeply about the methodology used by the AQLI, visit: aqli.epic.uchicago.edu/about/methodology.