

# An Analysis of Particulate Matter of the Size 2.5 Microns and Public Health in Mae Hong Son, Thailand

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## Abstract

*Air quality has presented itself as a major global issue over the course of the last several decades. Global-scale practices such as seasonal crop burnings release large amounts of particulate matter of the size 2.5 microns (PM<sub>2.5</sub>) or less into the air. As a result, air quality is considered to be hazardous and even toxic during certain times of the year in Southeast Asia. In this study, relationships between seasonal crop burning practices and air quality were investigated for the province and surroundings of Mae Hong Son, Thailand. Four years of monthly air quality data (February-April) were analyzed for long-term trends. Air quality relationships with respiratory illnesses and mortality rates were additionally explored.*

## Introduction

Since the time of the Industrial Revolution, air quality has emerged as a global issue and public health crisis. In recent air quality monitoring studies, conducted by IQAir, Southeast Asia experiences trends of moderate, poor, and hazardous indexes of air quality, which have been noticed to correspond to the periods of seasonal crop burning, as seen in Thailand (IQAir Staff Writers, 2023). Crop burning presents environmental and public health concerns, but these practices are continued as a cost-efficient and less labor-intensive process to clear farming fields for future planting. The burning period lasts from February through April, and these months correspond to the

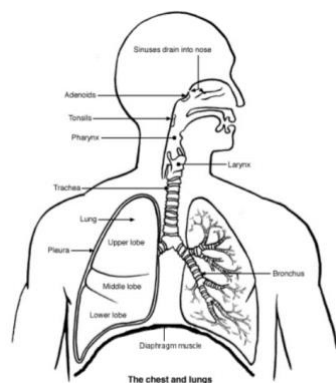
periods of highest air quality indexes (IQAir Staff Writers, 2023). During this time, areas such as the Mae Hong Son province experience air quality indexes exceeding 400 micrograms per cubic meter, which is considered “very unhealthy” (IQAir Staff Writers, 2023).

US AQI Level	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Health Recommendation (for 24 hour exposure)
Good 0-50	0-12.0	Air quality is satisfactory and poses little or no risk.
Moderate 51-100	12.1-35.4	Sensitive individuals should avoid outdoor activities.
Unhealthy for Sensitive Groups 101-150	35.5-55.4	General public and sensitive individuals in particular are at risk to experience irritation and respiratory problems.
Unhealthy 151-200	55.5-150.4	Increased likelihood of adverse effects and respiratory issues among general public.
Very Unhealthy 201-300	150.5-250.4	General public will be noticeably affected. Sensitive groups should restrict outdoor activities.
Hazardous 301+	250.5+	General public at high risk of experiencing strong irritation and adverse health effects. Should avoid outdoor activities.

**Figure 1** is an example of a common AQI used to describe air quality events and the corresponding risk to public health (*First in Air Quality*, n.d.).

### PM2.5 and Public Health

PM2.5 is a measurement estimating the concentration of small particles that have diameters less than or equal to 2.5 micrometers (US EPA, 2016). Due to its size, PM2.5 is transmissible across large areas, making it difficult to study and monitor (“Introduction to Aerosols,” n.d.). In terms of its threats to public health, PM2.5 can be easily inhaled and penetrate deep into the lungs. It can lead to premature death in those with underlying heart or lung disease and can cause severe asthma, irregular heartbeats, decreased lung function, and other respiratory symptoms (US EPA, 2016). Most concern is reflected on PM2.5’s impact on the respiratory system. The respiratory system is divided into two parts, the upper and lower airway passages.



**Figure 2** provides a visualization of the upper and lower airways of the respiratory system, with clear labels demonstrating the location of important components (Tidy, 2018).

Particulate matter that has a diameter greater than ten micrometers tends to settle in the upper airway passages and will predominately impact the nose and throat, leading to coughing, sneezing, running nose,

and other cold-like symptoms. Particulate matter that has a diameter less than five micrometers and as small as 0.003 micrometers will settle in the lower region of the lungs (Government of Canada, 2023). Once particulate matter has entered the respiratory system, these particles can travel throughout the respiratory system by several methods, and if they are small enough, like PM2.5, the particles can penetrate the blood stream, leading to the development of potentially severe health conditions (Government of Canada, 2023).

### Conclusion

In summary, air quality has a significant impact on human health. By studying the Mae Hong Son province of Thailand, with its elevated PM2.5 levels in the months of February through April, it becomes clear that the crop burnings are contributing large amounts of PM2.5 into the surface atmosphere, which is seen through the collection of air quality data used in this research. The AQI levels experienced in this region pose great concern for public health. Although PM2.5 commonly can cause cold symptoms, without receiving medical treatment, PM2.5 can cause long-term health complications and even death. Looking beyond the scope of this research, there needs to be greater response and mitigation efforts for the amount of PM2.5 released into the atmosphere and a broadened awareness for the quality of air that is being experienced across the globe.

## References

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