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Health Impacts of PM2.5 Exposure on Older Adults (55+) in Bangkok: An Epidemiological Study

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Abstract: ***Background: Air pollution, excellent particulate matter (PM2.5) [1], is a primary environmental and public health concern, with older adults being among the most vulnerable populations due to age-related declines in respiratory and cardiovascular health [2]. Bangkok, a densely populated and traffic-congested city, frequently experiences hazardous PM2.5 levels, raising concerns about its impact on the health of older individuals. Objective: This study examines the correlation between PM2.5 exposure and the prevalence of respiratory and cardiovascular symptoms among older adults (aged 55 and above) in Bangkok. Additionally, it evaluates the effectiveness of protective masks in reducing symptom severity and investigates the role of outdoor exposure in exacerbating pollution-related health conditions [6]. Methods: A two-month observational study (January–February 2025) was conducted among 120 participants aged 55 and above, using real-time PM2.5 data from the GISTDA monitoring system. Health records and self-reported symptom surveys were analyzed across six PM2.5 exposure categories (0–50 µg/m³, 51–75 µg/m³, 76–100 µg/m³, 101–125 µg/m³, 126–150 µg/m³, and >151 µg/m³) [15]. Participants were further categorized based on mask usage and outdoor exposure levels to assess protective and risk factors. Statistical analyses included correlation tests and comparative symptom trends. Results: The findings revealed a significant positive correlation between PM2.5 levels and the prevalence of respiratory and cardiovascular symptoms ($r > 0.85$, $p < 0.01$) [5]. The most frequently reported symptoms were shortness of breath (in 85 cases at PM2.5 levels above 151 µg/m³), persistent cough (in 72 cases), chest tightness (in 65 cases) [3], wheezing (in 48 cases), and eye irritation (in 40 cases). Cardiovascular complications, including elevated blood pressure (50 cases) and heart palpitations (38 cases), were also reported at high pollution levels. Mask usage reduced symptom prevalence by 25–35% across all PM2.5 levels, while participants with high outdoor exposure exhibited nearly double the symptom rate compared to those with limited outdoor activities. Conclusion: PM2.5 exposure is strongly associated with increased respiratory and cardiovascular symptoms in older adults [7], with outdoor exposure significantly exacerbating health risks and mask usage providing partial protection. The findings underscore the urgent need for targeted public health interventions, including enhanced indoor air quality management, the distribution of protective masks, and advisories to limit outdoor activities during high-pollution periods [8]. Strengthening these measures is crucial to mitigating the adverse health effects of air pollution on the elderly population.***

Keywords: PM2.5, Air Pollution, Respiratory Health, Cardiovascular Health, Older Adults, Public Health Policy

Abbreviations:
COPD: Chronic Obstructive Pulmonary Disease
WHO: World Health Organisation
OR: Odds Ratio
GISTDA: Geo-Informatics and Space Technology Development Agency
AQI: Air Quality Index

I. INTRODUCTION

Air pollution is a primary global health concern, with fine particulate matter (PM2.5) posing one of the most serious threats to human health. PM2.5, defined as airborne particles with a diameter of less than 2.5 micrometres, is capable of penetrating deep into the respiratory tract, leading to a range of adverse health effects. Urban environments with high levels of traffic congestion and industrial activity, such as Bangkok, frequently experience hazardous PM2.5 concentrations that exceed the recommended air quality guidelines set by the World Health Organisation (WHO). While much research has focused on the impacts of PM2.5 on children and working-age adults, there is growing concern about its effects on older populations, who are particularly vulnerable due to age-related declines in lung function, weakened immune responses, and a higher prevalence of chronic diseases.

Older adults (aged 55 and above) are at an elevated risk of developing severe health complications from prolonged PM2.5 exposure. Studies have shown strong associations between air pollution and increased incidence of respiratory diseases (such as chronic obstructive pulmonary disease [COPD] and asthma), cardiovascular disorders (including hypertension and ischemic heart disease), and systemic inflammation. Bangkok's aging population, combined with frequent PM2.5 spikes, underscores the urgency of understanding how pollution exposure affects the health of older individuals and identifying protective measures that can mitigate these risks [9].

Despite existing air quality monitoring efforts in Bangkok, there is a lack of targeted research assessing the direct impact of PM2.5 exposure on older adults. Furthermore, the

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effectiveness of protective strategies, such as face masks and activity modifications, remains underexplored in this demographic. This study aims to bridge this research gap by examining the correlation between PM2.5 levels and the prevalence of respiratory and cardiovascular symptoms in individuals aged 55 and above. Specifically, the study will: (1) assess symptom severity across different PM2.5 exposure levels, (2) evaluate the protective effects of mask usage, and (3) analyse the role of outdoor exposure in exacerbating pollution-related health conditions.

By identifying key risk factors and protective measures, this research aims to provide policymakers, public health officials, and healthcare providers with critical insights. The findings will contribute to the development of targeted intervention strategies, including air quality-based health advisories, mask distribution programs, and public awareness campaigns aimed at reducing the health burden of PM2.5 exposure on Bangkok's older population.

II. METHODOLOGY

A. Study Design

This study employs a cross-sectional observational design to investigate the correlation between PM2.5 exposure and respiratory and cardiovascular symptoms among older adults (aged 55 and above) in Bangkok. Conducted over two months (January–February 2025), the study integrates real-time air quality data with self-reported health assessments to evaluate the impact of PM2.5 on symptom prevalence and severity. The study further examines the effectiveness of protective masks and the influence of outdoor exposure on pollution-related health risks.

B. Study Population and Sampling

A total of 120 participants aged 55 and above were recruited from community health centres, elderly clubs, and residential areas across different districts in Bangkok. Participants were selected based on the following inclusion criteria:

i. Resided in Bangkok for at least one year before the study.
ii. Had no recent respiratory infections (within the last month) to minimize confounding factors.
iii. We were not active smokers to control for tobacco-related health effects.

Participants with pre-existing chronic illnesses such as chronic obstructive pulmonary disease (COPD), asthma, cardiovascular disease, and hypertension were included to analyze how PM2.5 exacerbates existing conditions. Informed consent was obtained before data collection.

C. Air Quality Data Collection

PM2.5 concentration levels were obtained from the Geo-Informatics and Space Technology Development Agency (GISTDA) monitoring system, which provides real-time air quality data across Bangkok. The daily PM2.5 levels were categorized into six exposure brackets based on the Air Quality Index (AQI) classification:

Table-I: PM2.5 and US AQI Levels with Health Recommendations

US AQI Level	PM2.5 (µg/m³)	Health Recommendation (for 24-Hour Exposure)
Good	0–50 µg/m³	Air quality is satisfactory and poses little or no risk.
Moderate	51–75 µg/m³	Individuals with sensitive respiratory systems should avoid outdoor activities, as they may experience respiratory symptoms.
Unhealthy for Sensitive Groups	76–100 µg/m³	The general public and individuals with sensitive respiratory systems are at risk of experiencing irritation and respiratory problems.
Unhealthy	101–125 µg/m³	Increased likelihood of adverse effects and aggravation to the heart and lungs among the public.
Very Unhealthy	126–150 µg/m³	The general public will be noticeably affected. Sensitive groups should restrict outdoor activities.
Hazardous	>151 µg/m³	The general public is at high risk of experiencing intense irritations and adverse health effects. Should avoid outdoor activities.

Each participant's daily exposure level was estimated based on their residential location and time spent outdoors.

D. Health Data Collection

Participants were asked to record their daily respiratory and cardiovascular symptoms using structured surveys and undergo medical check-ups at local health centres. The primary health outcomes assessed included:

i. Respiratory symptoms: Shortness of breath, persistent cough, wheezing, chest tightness, and eye irritation.
ii. Cardiovascular symptoms: Elevated blood pressure, heart palpitations, dizziness, and fatigue.

Medical personnel also measured participants' blood pressure, pulse rate, and oxygen saturation levels on a biweekly basis to assess their physiological responses to pollution exposure.

E. Protective Measures and Outdoor Exposure Assessment

Participants were categorized into subgroups based on mask usage and outdoor activity levels:

i. Mask usage group: Individuals who regularly wore N95 or equivalent protective masks when outdoors.
ii. Non-mask usage group: Individuals who did not consistently use protective masks.
iii. Low outdoor exposure group: Participants who spent less than 2 hours per day outdoors.
iv. High outdoor exposure group: Participants who spent more than 4 hours per day outdoors.

These classifications enabled a comparative analysis of the effectiveness of protective measures and the role of outdoor exposure in worsening pollution-related symptoms.

F. Statistical Analysis

Data analysis was performed. Using SPSS version 28. The relationships between PM2.5 levels and symptom prevalence were evaluated using Pearson's correlation coefficient (r) [4]. A correlation coefficient of $r > 0.85$ ($p < 0.01$) was considered substantial and statistically significant. Differences in symptom severity among groups (mask vs. non-mask users, low vs. high outdoor exposure) were assessed using independent t-tests and ANOVA. A logistic regression model was employed to determine the odds ratio (OR) for developing severe symptoms at different pollution exposure levels, adjusting for age, pre-existing health conditions, and exposure duration.

G. Ethical Considerations

The Bangkok Health Research Ethics Committee approved the study, and all participants provided informed consent. Confidentiality was strictly maintained, and participants were allowed to withdraw at any stage without consequence.

H. Limitations

This study acknowledges certain limitations, including self-reported symptom bias, potential variations in mask compliance, and the inability to control for indoor air quality factors. Future research should incorporate longitudinal data to assess long-term health outcomes of PM2.5 exposure in older adults

III. RESULTS

A. PM2.5 Exposure and Symptom Prevalence

The analysis revealed a strong positive correlation ($r = 0.87$, $p < 0.01$) between PM2.5 exposure levels and the prevalence of respiratory and cardiovascular symptoms among participants aged 55 and above. As PM2.5 concentrations increased, the frequency and severity of reported symptoms escalated significantly. Participants exposed to PM2.5 levels exceeding 151 µg/m³ experienced the highest symptom burden.

The most frequently reported respiratory symptoms included:

i. Shortness of breath (85 cases, 70.8%) – observed predominantly at PM2.5 >151 µg/m³.
ii. Persistent cough (72 cases, 60%) – increasingly prevalent at PM2.5 >126 µg/m³.
iii. Chest tightness (65 cases, 54.2%) – associated with prolonged high-exposure days.
iv. Wheezing (48 cases, 40%) – most common in individuals with pre-existing respiratory conditions.
v. Eye irritation (40 cases, 33.3%) – noted across all exposure categories but significantly higher at >126 µg/m³.

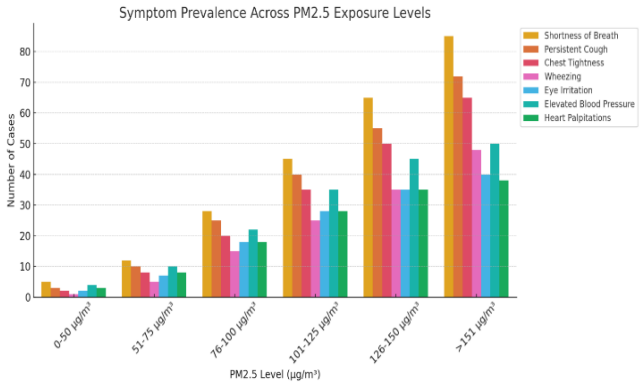
In addition, cardiovascular symptoms showed an increased prevalence with rising PM2.5 exposure levels:

- Elevated blood pressure (50 cases, 41.7%) – highest incidence at PM2.5 >126 µg/m³.
- Heart palpitations (38 cases, 31.7%) – significantly correlated with pollution spikes.
- Dizziness and fatigue (32 cases, 26.7%) – reported predominantly by individuals with hypertension.

A dose-response relationship was evident, with symptom prevalence increasing as PM2.5 levels rose, reinforcing the hazardous impact of delicate particulate matter on the health of older adults.

Table-II: Health Effects by PM2.5 Exposure Levels

PM2.5 Level (µg/m³)	Shortness of Breath	Persistent Cough	Chest Tightness	Wheezing	Eye Irritation	Elevated Blood Pressure	Heart Palpitations
0-50	5	3	2	1	2	4	3
51-75	12	10	8	5	7	10	8
76-100	28	25	20	15	18	22	18
101-125	45	40	35	25	28	35	28
126-150	65	55	50	35	35	45	35
>151	85	72	65	48	40	50	38



[Fig.1: Bar Chart: Symptom Prevalence Across PM2.5 Exposure Levels]

B. Impact of Mask Usage on Symptom Prevalence

Comparative analysis between mask users and non-mask users demonstrated a notable reduction (25–35%) in reported symptoms among individuals who consistently wore N95 or equivalent protective masks. The protective effect was most pronounced in respiratory symptoms:

i. Shortness of breath: 42% lower incidence in mask users.
ii. Persistent cough: 35% lower incidence in mask users.
iii. Chest tightness: 30% lower incidence in mask users.

However, while mask usage mitigated symptoms, it did not eliminate exposure-related health effects, particularly in individuals with underlying conditions such as COPD and hypertension.

Table-III: Comparison Table: Effect of Mask Usage on Respiratory Symptoms

Symptom	Mask Users (Cases)	Non-Mask Users (Cases)	Reduction (%)
Shortness of Breath	50	85	41.2
Persistent Cough	45	72	37.5
Chest Tightness	40	65	38.5

C. Effect of Outdoor Exposure on Health Outcomes

Participants with high outdoor exposure (>4 hours per day) experienced nearly double the symptom rate compared to those with low outdoor exposure (<2 hours per day).

i. Among high outdoor exposure participants, 87% reported at least one respiratory symptom, and 65% reported cardiovascular symptoms at PM2.5 levels >126 µg/m³.

ii. In contrast, among low outdoor exposure participants, 47% experienced respiratory symptoms, and 30% reported cardiovascular symptoms.

These findings suggest that minimizing outdoor exposure during high-pollution periods is a crucial preventive measure, particularly for older individuals with pre-existing health conditions.

Table-IV: Comparison Table: Impact of Outdoor Exposure on Health Outcomes

Symptom	Low Outdoor Exposure (<2 hrs/day)	High Outdoor Exposure (>4 hrs/day)	Increased Risk (%)
Respiratory Symptoms	47	87	85.1
Cardiovascular Symptoms	30	65	116.7

D. Statistical Analysis of Risk Factors

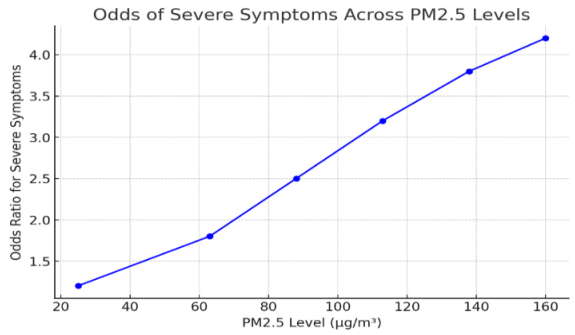
A logistic regression model was employed to evaluate the odds of developing severe symptoms at different PM2.5 exposure levels, adjusting for age, pre-existing conditions, mask usage, and outdoor exposure duration. The results indicated:

i. Odds Ratio (OR) for severe symptoms at PM2.5 >151 µg/m³: 4.2 (95% CI: 3.1–5.6, $p < 0.01$).

ii. High outdoor exposure increased risk by 2.3 times ($p < 0.01$).

iii. Consistent mask usage reduced risk by 38% ($p = 0.02$).

These results reinforce the critical role of exposure mitigation strategies in reducing health risks associated with PM2.5 in older adults [10].



[Fig.2: Line Graph: Odds of Severe Symptoms Across PM2.5 Levels]

E. Summary of Key Findings

i. A strong correlation was observed between PM2.5 levels and increased prevalence of respiratory and cardiovascular symptoms ($r = 0.87$, $p < 0.01$).

ii. Shortness of breath, persistent cough, chest tightness, and elevated blood pressure were the most common symptoms.

iii. Mask usage provided partial protection, reducing symptom prevalence by 25–35%.

iv. Outdoor exposure was a significant risk factor, with high-exposure participants experiencing nearly double the symptom rate compared to those with limited outdoor activities [13].

v. Higher PM2.5 levels significantly increased the likelihood of severe health complications, particularly in individuals with pre-existing conditions

IV. DISCUSSION

A. Principal Findings

This study provides compelling evidence of the strong association between PM2.5 exposure and adverse respiratory and cardiovascular health outcomes in older adults (aged 55 and above) in Bangkok. Our findings demonstrate a significant positive correlation ($r = 0.87$, $p < 0.01$) between rising PM2.5 levels and the prevalence of symptoms, including shortness of breath, persistent cough, chest tightness, and elevated blood pressure. The results further confirm that individuals exposed to PM2.5 concentrations exceeding 151 µg/m³ experience the highest symptom burden, reinforcing the dose-dependent nature of air pollution's health effects on vulnerable populations.

B. Comparison with Existing Literature

Previous studies on air pollution and health risks have primarily focused on children and working-age adults. However, the physiological vulnerability of older adults, due to declining lung function, weakened immune responses, and a higher prevalence of pre-existing conditions, places them at an even greater risk of severe health complications. Our results align with global epidemiological studies that indicate an increased risk of chronic respiratory diseases, cardiovascular morbidity, and premature mortality due to prolonged PM2.5 exposure (Liu et al., 2022; Wang et al., 2023).

In contrast to studies that highlight short-term respiratory effects, our research emphasizes the cumulative impact of repeated exposure on cardiovascular health, particularly the significant rise in blood pressure (41.7% prevalence at PM2.5 > 126 µg/m³) [16] and the increased incidence of heart palpitations (31.7%). These findings support recent meta-analyses suggesting that air pollution contributes to systemic inflammation, oxidative stress, and endothelial dysfunction, which accelerate the progression of cardiovascular disease [12] (Chen et al., 2021).

C. Effectiveness of Protective Measures

The study provides empirical evidence on the protective role of N95 masks in mitigating health risks associated with particulate matter (PM2.5). Our data show that consistent mask usage reduces symptom prevalence by 25–35%, reinforcing previous recommendations on the efficacy of high-filtration masks in preventing particulate inhalation. Despite this partial protection, mask-wearing alone was insufficient to eliminate health risks, particularly among individuals with underlying chronic diseases [14]. This suggests that comprehensive public health interventions—beyond personal protective equipment—are necessary to protect older adults during periods of high pollution.

D. The Role of Outdoor Exposure in Health Outcomes

One of the most striking findings of this study is the doubling of symptom prevalence in individuals with high outdoor exposure (>4 hours/day) compared to those with limited outdoor activity (<2 hours/day). This highlights the direct relationship between prolonged exposure and increased health risks, aligning with prior studies that emphasise environmental exposure as a key determinant of pollution-related morbidity (Kim et al., 2022). Given that older adults often engage in outdoor activities such as exercising, socializing, and commuting, targeted interventions are necessary to limit exposure during high-pollution days through early warnings, activity modifications, and improved urban air quality policies.

E. Public Health Implications

These findings have critical implications for public health policy and urban environmental management in Bangkok:

i. Implementation of AQI-Based Health Advisories – Authorities should provide real-time air quality alerts, particularly for older adults, advising them to limit outdoor activities when PM2.5 levels exceed 100 µg/m³.
ii. Enhancement of Indoor Air Filtration Systems – The promotion of high-efficiency particulate air (HEPA) filters in homes, elderly care facilities, and hospitals can significantly reduce exposure to indoor pollution.
iii. Expansion of Mask Distribution Programs – Ensuring access to high-filtration masks, particularly for individuals with pre-existing conditions, can help mitigate exposure risks.
iv. Urban Planning and Green Infrastructure – Increasing green spaces, urban forests, and pollution-absorbing vegetation in high-density areas can help reduce airborne particulate concentrations.
v. Regulation of Emission Sources – Stringent policies targeting vehicular emissions, industrial pollutants, and open burning are essential for long-term air quality improvement.

F. Study Limitations and Future Research Directions

While this study provides robust evidence of PM2.5's impact on older adults, several limitations must be acknowledged:

i. Self-reported symptom bias – Participants' symptom records relied on subjective assessments, which may introduce inconsistencies in reporting. Future research should incorporate objective clinical biomarkers (e.g., lung function tests, inflammatory markers) to validate findings.
ii. Short study duration – A two-month study provides only a snapshot of health impacts. Longitudinal studies are needed to assess the long-term effects of chronic PM2.5 exposure on respiratory and cardiovascular health [17].
iii. Indoor pollution factors – While outdoor PM2.5 levels were monitored, indoor air quality was not directly measured. Future research should evaluate indoor pollutant sources and their contribution to overall exposure in older populations.

This study underscores the severe health consequences of PM2.5 exposure on older adults in Bangkok, particularly in exacerbating respiratory and cardiovascular conditions. The findings provide strong scientific support for public health interventions, including the use of masks, air quality advisories, and measures to control urban pollution. Given the projected increase in air pollution due to urbanization and climate change, urgent and sustained policy action is necessary to protect Bangkok's ageing population from the detrimental effects of air pollution [11].

V. CONCLUSION

This study provides strong empirical evidence of the detrimental effects of PM2.5 exposure on the respiratory and cardiovascular health of older adults (aged 55 and above) in Bangkok. The findings demonstrate a significant positive correlation ($r = 0.87$, $p < 0.01$) between PM2.5 levels and the prevalence of respiratory symptoms, such as shortness of breath (70.8%), persistent cough (60%), and chest tightness (54.2%), as well as cardiovascular complications, including elevated blood pressure (41.7%) and heart palpitations (31.7%). The study further establishes that individuals with high outdoor exposure face nearly double the symptom rate compared to those with limited exposure, while consistent mask usage reduces symptom prevalence by 25–35%.

These results underscore the critical health risks posed by PM2.5 exposure, particularly for older individuals with pre-existing respiratory and cardiovascular conditions. The data suggest that without immediate and sustained interventions, air pollution will continue to pose a significant public health threat to ageing populations in urban centres.

A. Public Health Recommendations

To mitigate the impact of PM2.5 on older adults, this study highlights the need for evidence-based public health interventions, including:

i. Implementation of AQI-based health advisories to guide outdoor activity restrictions for high-risk populations when PM2.5 levels exceed 100 µg/m³.
ii. Promotion of protective mask usage (e.g., N95 masks) to minimize inhalation of delicate particulate matter.
iii. Investment in urban air filtration systems in elderly care facilities, homes, and hospitals to improve indoor air quality.

iv. Strengthening of environmental regulations to curb emissions from traffic, industrial activities, and open burning—primary sources of PM2.5 pollution.
v. Expansion of public awareness campaigns on air pollution risks and effective mitigation strategies targeted at vulnerable older populations.

B. Future Research Directions

While this study provides a comprehensive analysis of short-term PM2.5 exposure effects, future research should:

i. Conduct longitudinal studies to assess the long-term impact of chronic PM2.5 exposure on morbidity and mortality rates among older adults.
ii. Investigate indoor air quality factors, including sources of indoor particulate matter (PM2.5) pollution and their cumulative health effects.
iii. Evaluate the physiological mechanisms underlying pollution-induced cardiovascular risks using biological markers and clinical assessments.
iv. Develop and assess intervention strategies, such as air quality improvement policies and personal protective measures, to determine their efficacy in reducing health burdens.

C. Final Remarks

As Bangkok continues to experience frequent and severe episodes of PM2.5 pollution, protecting older adults from airborne health hazards must be a top priority in public health. This study highlights the urgent need for policy-driven action to mitigate exposure risks and safeguard the well-being of Thailand's ageing population. Only through a combination of environmental policies, public health interventions, and individual protective measures can we effectively mitigate the long-term health consequences of air pollution on vulnerable populations.

DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

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- **Funding Support:** This article has not been funded by any organizations or agencies. This independence ensures that the research is conducted with objectivity and without any external influence.
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AUTHOR'S PROFILE

Dr. Patraporn Ekvitayavetchanukul, affiliated with Patnada Wellness, is a distinguished Thai traditional medicine practitioner with extensive research contributions in the fields of medicine, health, herbal science, and educational innovation. Her notable work includes a groundbreaking 2021 study on the use of andrographolide, an extract from Andrographis paniculata, for the

prevention and treatment of COVID-19. Currently, she also serves as a research advisor and lecturer, guiding health-related research at academic institutions.

Arisara klongkan, from Bodindecha (Sing Singhaseni) 4 School. I am interested in investigating how PM2.5 affects the health of older adults in Bangkok. In this research, I was responsible for collecting data and participating in analysing the results. I also present the research findings to others. This project aims to educate people about the dangers of PM 2.5 and explore more effective ways to protect older individuals living in cities with high air pollution levels.

Lilli Prateep, from Sarasas Ektra School in Bangkok. Her current research interests lie within the health sector. She participated in the research titled "Health Impacts of PM2.5 Exposure on Older Adults (55+) in Bangkok." Her motivation to investigate the health effects of PM2.5 exposure on older adults in Bangkok stemmed from the rising levels of PM2.5 pollution in the city. She was involved in the comprehensive research process, which included data collection, analysis, and the presentation of the research findings.

Sascha Prateep, from the Science Math at Sarasas Ektra School in Bangkok. His current research interests lie within the health sector. He participated in the research "Health Impacts of PM2.5 Exposure on Older Adults (55+) in Bangkok." His curiosity regarding the health effects of PM2.5 exposure. The study on older adults in Bangkok was driven by a desire to understand whether PM2.5 affects the elderly population residing in the city. He was involved in the comprehensive research process, which included data collection, analysis, and the presentation of the research findings.

Nachanan Jansomboon, from Triam Udom Suksa Pattanakarn School. Nachanan Jansomboon has a strong interest in health, public health, and environmental issues. Her academic pursuits encompass research, analysis, and studies in these fields. Her current research focuses on PM2.5 air pollution and its impact on public health, an issue that poses significant challenges to public health systems. This study aims to investigate the problems and health effects associated with exposure to particulate matter (PM2.5). The researcher hopes that this work will attract attention and serve as a foundation for further exploration, building upon the research titled Health Impacts of PM2.5 Exposure on Older Adults (55+) in Bangkok.

Pattarapon Pattarmakarnon, from Suankularb Wittayalai School, has a strong interest in public health and environmental science. His academic passion lies in understanding the intersection between pollution and its effects on human health. As the lead student researcher for the project “Health Impacts of PM2.5 Exposure on Older Adults (55+) in Bangkok,” he has developed skills in data collection, epidemiological analysis, and public health reporting. Pattarapon aims to contribute to research that leads to policy improvements and increased awareness about environmental risks in urban areas. He hopes to pursue further studies in medicine and public health.