

การรับรู้และพฤติกรรมการป้องกันตนเองต่อผู้ล่วงละองขนาดเล็กของแรงงานข้ามชาติชาวเมียนมา

ศิริวรรณ กันติสินธุ์, ปร.ด.^{1, 3, 4*} อิชาเบล กิลเบิร์ตลัน, วท.ม.² ฐานกรรณ์ เรือนใจ, ส.ด.¹ ณิชารัศมี ปัญจพริวัณน์, วท.ม.^{1, 3}
วันที่รับ: 9 ตุลาคม 2568 วันที่แก้ไข: 19 ธันวาคม 2568 วันที่ตอบรับ: 23 ธันวาคม 2568

บทคัดย่อ

การสัมผัสผู้ล่วงละองขนาดเล็กไม่เกิน 2.5 ไมครอนเป็นระยะเวลานานอาจส่งผลกระทบต่อสุขภาพทั้งโรคทางเดินหายใจ โรคหัวใจและหลอดเลือด และอาจนำไปสู่การเสียชีวิตก่อนวัยอันควรได้ การวิจัยเชิงพรรณนาหาความสัมพันธ์ศึกษาดูแล นี้ มีวัตถุประสงค์เพื่อศึกษาการรับรู้เกี่ยวกับผู้ล่วงละองขนาดเล็กและพฤติกรรมการป้องกันตนเองของแรงงานข้ามชาติชาวเมียนมาในจังหวัดเชียงราย โดยใช้กรอบแนวคิดแบบจำลองความเชื่อด้านสุขภาพกลุ่มตัวอย่างเป็นแรงงานข้ามชาติชาวเมียนมา จำนวน 118 คน เครื่องมือวัดประกอบด้วย แบบสอบถามข้อมูลทั่วไปแบบสอบถามการรับรู้เกี่ยวกับผู้ล่วงละองขนาดเล็ก 4 ด้าน ได้แก่ การรับรู้โอกาสเสี่ยงต่อการสัมผัส การรับรู้ความรุนแรง การรับรู้ประโยชน์ของการป้องกันตนเอง และอุปสรรคต่อการป้องกันตนเองจากผู้ล่วงละองขนาดเล็ก และแบบสอบถามพฤติกรรมการป้องกันตนเองจากผู้ล่วงละองขนาดเล็ก ทดสอบค่าความเชื่อมั่นโดยมีค่าสัมประสิทธิ์效果系数 ของครอนบัค เท่ากับ .79 และ .81 ตามลำดับ วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนาและสัมประสิทธิ์สหสัมพันธ์ของสเปียร์แมน ผลการวิจัย พบว่า กลุ่มตัวอย่างมีการรับรู้โอกาสเสี่ยงต่อการสัมผัส ($\bar{X}=21.53, SD=3.26$) การรับรู้ความรุนแรง ($\bar{X}=21.14, SD=3.71$) การรับรู้ประโยชน์ของการป้องกันตนเอง ($\bar{X}=21.54, SD=2.99$) และการรับรู้อุปสรรคต่อการป้องกันตนเองจากผู้ล่วงละองขนาดเล็ก ($\bar{X}=17.18, SD=2.99$) อยู่ในระดับสูง ส่วนพฤติกรรมการป้องกันตนเองอยู่ในระดับปานกลาง ($\bar{X}=3.46, SD=1.28$) นอกจากนี้ พบว่า การรับรู้โอกาสเสี่ยงต่อการสัมผัสมีความสัมพันธ์เชิงบวกในระดับต่ำกับพฤติกรรมการป้องกันตนเองอย่างมีนัยสำคัญทางสถิติ ($r_s=0.281, p<.001$) ดังนั้นการส่งเสริมการรับรู้โอกาสเสี่ยงต่อการสัมผัสผู้ล่วงละองขนาดเล็กที่ดีอาจทำให้กลุ่มตัวอย่างมีพฤติกรรมการป้องกันตนเองจากผู้ล่วงละองขนาดเล็กดีขึ้น

คำสำคัญ: แรงงานข้ามชาติชาวเมียนมา, การรับรู้ด้านสุขภาพ, พฤติกรรมการป้องกันตนเอง, ผู้ล่วงละองขนาดเล็ก

วิจัยการป้องกันตนเองต่อผู้ล่วงละองขนาดเล็กของแรงงานข้ามชาติชาวเมียนมา

พะเยา

¹ อาจารย์, สำนักวิชาชีวทัศนศาสตร์สุขภาพ มหาวิทยาลัยแม่ฟ้าหลวง

² นักศึกษามหาบัณฑิต, ภาควิชาระบบดิจิทัล มหาวิทยาลัยมิชิแกน

³ กลุ่มวิจัยเชิงพื้นที่สุขภาพของชุมชนชายขอบ, มหาวิทยาลัยแม่ฟ้าหลวง

⁴ กลุ่มวิจัยเชิงพื้นที่สุขภาพของชุมชนชายขอบ, มหาวิทยาลัยแม่ฟ้าหลวง

* ผู้ติดต่อหลัก อีเมล siriwkan.kan@mfu.ac.th

Perceptions and self-protective behaviors against fine particulate matter among Myanmar migrant workers

Siriwan Kantisin, Ph.D.^{1,3,4*} Isabel Gilbertson, M.Sc.², Thapakorn Ruanjai, Dr. P.H.¹ Nicharuch Panjaphothiwat, M.Sc.^{1,3}

Received: October 9, 2025 Revised: December 19, 2025 Accepted: December 23, 2025

Abstract

Long-term exposure to fine particulate matter with a diameter of less than 2.5 microns (PM2.5) poses significant health risks, including respiratory diseases, cardiovascular diseases, and premature mortality. This cross-sectional descriptive correlational study aimed to examine perceptions of PM2.5 exposure and self-protective behaviors among Myanmar migrant workers in Chiang Rai Province, Thailand, using the Health Belief Model as a framework. This study was conducted with 118 Myanmar migrant workers. The research tools consisted of a personal information questionnaire, perceptions of PM2.5 questionnaire comprising four domains-perceived susceptibility to PM2.5 exposure, perceived severity of PM2.5, perceived benefits of self-protective behaviors, and perceived barriers to self-protective behaviors, and self-protective behaviors against PM2.5 questionnaire. The reliability coefficients (Cronbach's alpha) of the perceptions of PM2.5 and self-protective behaviors against PM2.5 questionnaire were .79 and .81, respectively. Data were analyzed using descriptive statistics and Spearman's rank correlation coefficient. This study indicated high levels of perceived susceptibility ($\bar{X}=21.53$, $SD=3.26$), perceived severity ($\bar{X}=21.14$, $SD=3.71$), perceived benefits ($\bar{X}=21.54$, $SD=2.99$), and perceived barriers to self-protective behaviors ($\bar{X}=17.18$, $SD=2.99$). However, self-protective behaviors were at a moderate level ($\bar{X}=3.46$, $SD=1.28$). Additionally, perceived susceptibility was significantly positively correlated with self-protective behavior ($r_s=0.281$, $p<0.001$). These findings suggest that enhancing perceived susceptibility to PM2.5 exposure may improve self-protective behaviors among Myanmar migrant workers.

Keywords: Myanmar migrant workers, Health perception, Self-protective behaviors, PM2.5

มนตรี

¹ Lecturer, School of Health Science, Mae Fah Luang University, Chiang Rai, Thailand

² Graduated Student, Department of Epidemiology, University of Michigan

³ Urban Safety Innovation Research Group (USIR) School of Health Science, Mae Fah Luang University, Chiang Rai, Thailand

⁴ Area-Based Research and Innovation in Cross-Border Health Care Group, Mae Fah Luang University, Chiang Rai, Thailand

* Corresponding authors, email: siriwan.kan@mfu.ac.th

Introduction

Air pollution is a global environmental problem that causes an estimated 4.2 million deaths each year. In 2019, the World Health Organization (WHO) reported that approximately 89% of an estimated 6.7 million premature deaths attributed to ambient air pollution occurred in low- to middle-income countries, with a significant concentration within Southeast Asia (SEA) and the Western Pacific regions (World Health Organization: WHO, 2024). One of the most dangerous ambient air pollutants to human health is particulate matter. The particulate matter with a diameter of less than 2.5 microns (PM2.5) poses significant short and long-term health risks for the general public and vulnerable populations, including children, pregnant women, the elderly, individuals with preexisting conditions, and migrant workers. Research has consistently shown that long-term PM2.5 exposure, defined as exposure ranging from months to years, is linked to many health problems, including weakened respiratory health and a higher risk of death from cardiovascular and neurological diseases (Kan, 2022).

Globally, SEA is heavily burdened by high PM2.5 concentrations due to a history of rapid and ongoing industrialization, urbanization, and sustained population growth. People in both urban and rural areas of Asia are regularly exposed to annual average PM2.5 concentrations that are much higher than the WHO's guideline. This makes Asia one of the worst places for fine particle air pollution. Long-term exposure in the region has been consistently linked with elevated risks of respiratory diseases, cardiovascular conditions, type 2 diabetes, and other chronic illnesses (Yang et al., 2022). In the northern region of Thailand, PM2.5 exposure causes about 41,372 years lived with disability per 100,000 people and contributes to roughly 0.04% and 0.06% of deaths from lung cancer and cardiopulmonary diseases, respectively (Supasri et al., 2023). Particularly in Chiang Rai Province, where PM2.5 levels frequently exceed safe standards and contribute to increased respiratory and cardiovascular morbidity. Seasonal haze drives substantial healthcare use, with around 130,000 respiratory visits over 2014 - 2018, attributable to smoke particulates. The estimation is 1.3% of total hospital visits for respiratory diseases during the 5-year period, and 20% of those during burning events (Uttajug et al., 2022). Pollution Control Department (PCD) reported that the average concentration of PM2.5 in Chiang Rai Province, Thailand, was recorded at 109 $\mu\text{g}/\text{m}^3$ in March 2023 (Pollution Control Department, 2024), markedly exceeding the WHO guideline value of 15 $\mu\text{g}/\text{m}^3$. During the same year, it was further estimated that the natural mortality rate was 1,107 people per 100,000 (Hermayurisca & Taneepanichskul, 2023). Literature demonstrates that biomass burning, a traditional agricultural practice used to clear land for farming by burning old crops, forests, and grassland, is the primary contributor to elevated PM2.5 levels in Thailand (Mueller et al., 2021). Due to biomass burning being a significant source of emissions, agricultural workers are at elevated risk of long-term PM2.5 exposure and detrimental health outcomes. Moreover, migrant agricultural workers are at especially heightened risk for experiencing occupational adverse health impacts due to their legal and socio-economic vulnerability, which is compounded by dangerous work conditions, low pay, language barriers, and exploitative conditions.

An estimated 2.3 million individuals travel from neighboring SEA countries to Thailand to work as migrant workers. Approximately 68% of migrant workers are from Myanmar, 22% are from Cambodia, 10% are from Laos, and 1% are from Vietnam, and find employment through informal

sectors such as domestic service, agriculture, manufacturing, construction, and hospitality. Chiang Rai, the northern province in Thailand, shares a border with Myanmar and is a popular place for migrant Myanmar workers. In 2024, around 6.21% of employers in Chiang Rai are migrant workers, employed in various sectors. Myanmar migrant workers, who often engage in outdoor agricultural labor and have limited access to health services and protective measures, face heightened exposure and vulnerability to these pollutants. Prior research has demonstrated limited health literacy and a high prevalence of adverse health behaviors, such as being a current smoking, regular alcohol consumption, and lack of exercise, among Myanmar migrants workers. Aung et al. (2020) found that a lot of Myanmar migrants engaged in risky behaviors; for example, 26.9% were current smokers, 40.8% usually drank alcohol, and 75.8% did not exercise. This shows that there are significant gaps in health knowledge and preventative practices. Myanmar migrant households have documented excess respiratory symptoms linked to particulate exposures within the home, such as cough, phlegm, and rhinitis (Tharaphy & Chapman, 2018). However, little is known about their perceptions and self-protective behaviors toward PM2.5, which are critical for developing effective public health strategies.

Human behavior is essential in controlling and preventing diseases. Various determinants, such as attitudes, knowledge, and risk perceptions, influence this behavior. However, it is important to recognize that sociodemographic factors also play a significant role in shaping these efforts. Comprehending these determinants and associated behaviors is crucial for creating effective communication and educational strategies to reduce risk (Short & Mollborn, 2015). The study utilizes the Health Belief Model (HBM), a psychological health model that explains and predicts health behaviors using individuals' attitudes and beliefs. Currently, there is limited research on migrant workers' knowledge of PM2.5 in Thailand, especially among the occupational group at greatest risk of long-term exposure. The HBM explains that individuals are likely to take preventative action if they perceive the threat of a health risk to be severe in nature and if they believe they are susceptible. The driving aspect of the model proposes that behavior change is effective if interventions address individual perceptions regarding susceptibility, barriers, and benefits, and interventions generally focus on education, encouragement, and self-efficacy (Jones et al., 2015). Although several studies have examined PM2.5 exposure and related health outcomes in Thailand, there remains a notable gap in understanding the perceptions and behavioral responses of migrant workers. Especially Myanmar migrant workers, who often experience social, linguistic, and occupational disadvantages. Several studies have focused on exposure levels and health outcomes, not psychological and behavioral explanations of self-protective activities in this population. Additionally, there is a lack of application of behavioral theories, such as the HBM, in explaining how migrants' beliefs shape their protective behaviors against PM2.5. To address this gap, the present study applies the HBM to explore how Myanmar migrant workers in Chiang Rai province perceive PM2.5 and their self-protective behaviors to inform policymakers, government officials, and other stakeholders on the PM2.5 understanding of this group. Also, reduce exposure to the pollutant with the ultimate aims of addressing air pollution health inequities and establishing occupational health protections.

Research Objectives

1. To investigate the level of perceptions and self-protective behaviors of Myanmar migrant workers against PM2.5 exposure
2. To investigate the correlation between perceptions and self-protective behaviors

Research framework

The HBM was selected as the theoretical framework for this study because it provides a comprehensive structure for understanding individual decision-making processes regarding health-related behaviors by focusing on the individual's attitudes and beliefs (Rosenstock et al., 1988). PM2.5 exposure is an invisible and often underestimated environmental hazard, and individuals' self-protective behaviors depend largely on their perceptions and beliefs about the associated risks. In this study, the questions were designed in order to test of the HBM constructs (Figure 1). The constructs constitute the individual's perception, including perceived susceptibility to PM2.5 exposure, perceived severity of PM2.5, perceived benefits of self-protective behaviors, and perceived barriers to self-protective behaviors. By applying the HBM, this study can identify specific perception-related factors that influence self-protective behaviors, thus providing evidence to inform targeted, culturally appropriate health promotion interventions.

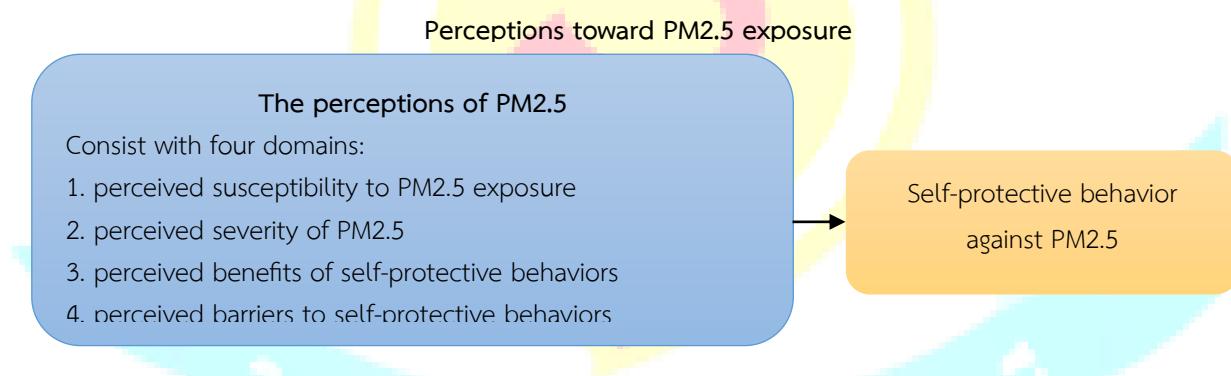


Figure 1 The modified Health Belief Model on self-protective behavior from PM2.5
(modified from Rosenstock et al., 1988)

Research Methodology

Study Design

A cross-sectional descriptive correlational study was conducted from April to May 2024. The study was conducted in Chiang Rai province, Thailand. This province is a hub for migrant workers from Myanmar, with 6,261 migrant workers (Chiangrai Provincial Employment Office, 2022). These migrant workers were purposely selected as the study population.

Population and Sample

After calculating the required sample size using the Krejcie and Morgan formula (Krejcie, & Morgan, 1970) for estimating, a total of 118 Myanmar migrant workers were enrolled. The inclusion criteria were Myanmar migrant workers who had been working in Muang District, Chiang Rai Province, for at least one year, aged over 20 years, and who voluntarily agreed to participate in the research. Exclusion criteria included individuals with communication barriers that prevented them

from completing the interview or questionnaire, and those who were absent from work or unavailable at the time of data collection after three contact attempts.

The workplaces from four sub-districts in Muang Chiang Rai, Ban Du, Ta Sud, Mae Korn, and Rob Wiang were drawn by simple random sampling from each stratified region. The participants were employed in a variety of sectors, including agriculture, merchanting, and construction, and they labored outdoors. The researchers contacted the workplace head to obtain the list of migrant workers. The participants were selected using simple random sampling, with approximately 23 individuals chosen from each sub-district.

Research Instruments

The questionnaire was developed in the Myanmar language using forward-backward translation by a language expert to ensure accuracy. All independent variables were measured as binomial and multi-categorical. The self-protective behavior against PM2.5 was measured on a Likert scale.

The questionnaire consisted of three parts.

Part 1: General information of participants (gender, age, marital status, education, living year in Thailand, occupation, monthly expenses, smoking, and alcohol consumption). Each item consisted of choices and blanks to fill in. This questionnaire was designed based on literature review to gather essential demographic information from participants.

Part 2: The perceptions of PM2.5 were assessed using an assessment scale across four domains: perceived susceptibility to PM2.5 exposure, perceived severity of PM2.5, perceived benefits of self-protective behaviors, and perceived barriers to self-protective behaviors. Each domain consisted of five items, totaling 20 items. Responses were measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). For each domain, the total perception score ranged from 5 to 25. Scores were categorized as follows: 5-7 = low perception, 8-15 = moderate perception, and 16-25 = high perception. This questionnaire was modified from Sirijaroonwong (Sirijaroonwong et al., 2022).

Part 3: Self-protective behavior against PM2.5 was assessed by a 10-item questionnaire about PM2.5 exposure. Each item was evaluated using a five-point Likert scale, with 1 indicating 'never' and 5 indicating "always." The criteria for interpreting the mean scores were as follows: Scores ranging from 1.00 to 2.33 signify a low level of acceptable self-protective activities, 2.34 to 3.66 denote a moderate level, and 3.67 to 5.00 represent a high level of appropriate self-protective behaviors. Its design was informed by a literature review and was modified from Sirijaroonwong (Sirijaroonwong et al., 2022) to relevant with participants.

Instrument Quality Assessment

Content validity was assessed and approved by three public health experts specializing in epidemiology, health promotion, and health behavior. For the perceptions and self-protective behavior assessments, the index of item-objective congruence (IOC) ranged from 0.80 to 0.88 and from 0.79 to 0.90, respectively.

All parts of the questionnaires were originally developed in Thai and subsequently translated into Myanmar using a forward-backward translation method to ensure linguistic and conceptual equivalence. A bilingual translator translated the Thai version into Myanmar, then two

bilingual public health experts who did not know what the original questionnaire was back-translated the Myanmar version into Thai. Inconsistencies between the original and back-translated versions were investigated and corrected by the research team to ensure accuracy and cultural appropriateness.

Then, a pilot test was conducted with 30 migrant workers who did not participate in the final survey to assess internal consistency reliability using Cronbach's alpha. The perception and self-protective behavior assessments had Cronbach's alpha values of .79 and .81, respectively. Minor revisions were made to improve clarity and cultural relevance before the final data collection. Due to language barriers, face-to-face interviews were conducted by trained research assistants fluent in the Myanmar language to facilitate accurate understanding of the questionnaire items.

Ethical Considerations

The experimental protocol no. EC 23168-18 was approved by the Mae Fah Luang University Ethics Committee for Research on Human Subjects on 13 March 2024. Confidentiality was maintained to protect the participants' identities.

Data Collection

Data were gathered from the Myanmar migrant workers between April to May 2024 by the researchers and five trained research assistants who were fluent in the Myanmar language. Prior to data collection, all interviewers received intensive training on the research objectives, interview protocols, and strategies to minimize interviewer bias. This training emphasized maintaining neutrality, avoiding leading questions, and providing standardized explanations when participants sought clarification. Each participant was informed about the study's purposes, voluntary participation, and confidentiality before the interview. To minimize potential response bias and concerns related to employment or social desirability, interviews were conducted in the private area of the participants' workplace without the presence of employers or supervisors. The participants were assured that their responses would not affect their employment status. Participants were encouraged to provide honest answers, and clarification was offered when questions were unclear.

Data Analysis

Data was analyzed by using a computer program for processing the characteristics of the sample group, the perceptions of PM2.5, and self-protective behavior against PM2.5. Descriptive statistics (e.g., frequencies, percentages, mean, and standard deviation) were used to describe the respondents and their responses across various variables. The Kolmogorov-Smirnov test was used to examine the normality of data distribution. The results indicated that the data were not normally distributed ($p < 0.05$); therefore, nonparametric statistics were applied in the analysis. To determine the strength and direction of associations between the perceptions and self-protective behaviors toward PM2.5, Spearman's rank correlation coefficient analysis (r_s) was calculated. Statistical significance was set at $p < 0.05$.

Results

1. General information of participants

Altogether, 118 migrant workers from Myanmar participated in the study, and the mean age of the sample was 38.69 years ($SD = 8.72$), with a range from 21 to 61 years old. There were 53 males (44.90%) and 65 females (55.10%). Most of them graduated from primary school in Myanmar 53 (44.90%). On average, participants had lived in Thailand for ten years. The participants were employed in the agriculture sector (52.54%), and most had no savings (58.50%). Health behaviors such as smoking and drinking status were also measured. In the sample, 16 participants (13.60%) reported smoking, and 33 participants (28.00%) reported alcohol consumption. General information about the participants was shown in Table 1.

Table 1 General characteristics of participants

Characteristic	Frequency (n = 118)	Percentage
Gender		
Male	53	44.90
Female	65	55.10
Age (Years)		
≤30	25	21.19
31 - 40	46	38.98
41 - 50	33	27.97
≥51	14	11.86
$\bar{x} = 38.69, SD = 8.72, \text{Min} = 21, \text{Max} = 61$		
Marital status		
Single	15	12.70
Married	101	85.60
Divorce/Widowed	2	1.70
Education		
None	17	14.40
Primary school	53	44.90
Secondary school	39	33.10
Vocational/College	7	5.90
Bachelor's degree or above	2	1.70
Living years in Thailand (Years)		
≤ 5	21	17.80
6 - 10	45	38.10
11 - 15	39	33.10
≥ 16	13	11.00
$\bar{x} = 10.37, SD = 5.40, \text{Min} = 1, \text{Max} = 30$		
Occupation		
Agriculture	62	52.54
Service	26	22.03
Construction	30	25.43
Monthly expense		
No saving	69	58.50
Saving	39	33.00
Debt	10	8.50

Characteristic	Frequency (n = 118)	Percentage
Smoking		
No	102	86.40
Yes	16	13.60
Alcohol consumption		
No	85	72.00
Yes	33	28.00

2. Perceptions of PM2.5 among Myanmar migrant workers

The results showed that the overall perception of participants toward PM2.5 was at a high level, with a mean of 20.35. When analyzed by domains, perceived benefits had the highest mean of 21.54, followed by perceived susceptibility, perceived severity, and perceived barriers, with mean of 21.53, 21.14, and 17.18, respectively. The perceptions of PM2.5 among participants are as indicated in Table 2.

Table 2 The level of perceptions toward PM2.5 among participants

Perceptions	\bar{x}	SD	Levels
Perceived susceptibility	21.53	3.26	High
Perceived severity	21.14	3.71	High
Perceived benefits	21.54	2.99	High
Perceived barriers	17.18	4.83	High
Overall	20.35	3.70	High

3. Self-protective behavior among participants against PM2.5

The table presents self-protective behaviors across 10 items, yielding an overall mean score of 3.46, which indicates that participants exhibited a moderate appropriate level of self-protective behavior against PM2.5. Certain specific behaviors, including “avoid actions that increase PM2.5 levels, such as open burning of garbage or wood”, “the daily replacement of PM2.5 protective masks”, “secure doors and windows completely whenever outdoor PM2.5 levels exceed the standard level”, and “the constant carrying of a dust protection mask even on days when PM2.5 levels are within acceptable limits” were reported at high appropriate level, with average scores of 4.74, 4.63, 3.84, and 3.82, respectively, as indicated in Table 3.

Table 3 The level of self-protective behavior against PM2.5

Self-protective behavior	\bar{x}	SD	Levels
1. You wear a PM2.5 protective mask when engaging in outdoor activities during periods of high PM 2.5 levels.	3.35	1.40	Moderate
2. You change your PM2.5 protective mask to a new one every day.	4.63	0.98	High
3. You avoid traveling or engaging in activities in areas with high levels of PM2.5.	2.66	1.73	Moderate
4. You clean your body and clothing immediately after returning from areas where PM2.5 levels exceed the standard limit.	3.15	1.72	Moderate

Self-protective behavior	\bar{x}	SD	Levels
5. You carry a dust protection mask with you at all times, even on days when PM2.5 levels do not exceed the standard limit	3.82	1.53	High
6. You monitor news updates and PM2.5 levels before leaving your residence.	2.64	1.45	Moderate
7. You choose and use dust-protective masks that meet standards, are certified, and are reliable.	2.61	1.53	Moderate
8. You visit a doctor when experiencing abnormal respiratory symptoms and have regular health check-ups.	3.19	1.70	Moderate
9. You avoid actions that elevate PM2.5 levels, such as open burning of garbage or wood.	4.74	0.80	High
10. You close doors and windows tightly every time when outdoor PM2.5 levels exceed the standard limit.	3.84	1.44	High
Overall	3.46	1.28	Moderate

4. The relationship of PM2.5 perceptions and self-perceptive behaviors

The analysis revealed a statistically significant low positive correlation between perceived susceptibility to PM2.5 and self-protective behaviors against PM2.5 ($r_s = 0.281, p < 0.001$). In contrast, perceived severity of PM2.5 was negatively correlated with self-protective behaviors with no significant difference. The correlation between perceptions and self-protective behaviors was shown in Table 4.

Table 4 The correlation between perceptions and self-protective behaviors

Variable	Self-protective behavior (r_s)	p -value
Perceived susceptibility	0.281	0.001**
Perceived severity	-0.21	0.820
Perceived benefits	0.054	0.559
Perceived barriers	0.085	0.358

** $p < 0.001$, r_s represents Spearman's rank correlation coefficient

Discussion

The results can be discussed according to the study objectives as follows.

1. Investigate the level of perceptions and self-protective behaviors of Myanmar migrant workers against PM2.5 exposure

In this study, we explored PM2.5-related perceptions and self-protective behaviors among Myanmar migrant workers in Chiang Rai province, Thailand, using the HBM as a guiding framework. This study found that the participants exhibited a high level of perceived susceptibility to PM2.5 exposure. This observed in our study may be explained by direct experience of respiratory symptoms, frequent exposure to high PM2.5 levels, and targeted community health messaging in Chiang Rai during seasonal haze events. Migrant workers often work in outdoor environments, which may increase their awareness of air pollution risks (Alahmad et al., 2023). For perceived severity of PM2.5, this study found that participants had a high level of perception regarding the severity of PM2.5 health effects, suggesting that they consider PM2.5 as a serious threat to personal

health. This finding is consistent with the HBM, which asserts that beliefs about the seriousness of a health threat enhance motivation for prevention efforts when combined with perceived susceptibility, benefits, and low barriers (Alyafei, 2024). Likewise, the research conducted in China indicated that the perceived severity among middle-aged and elderly living in a highly polluted city highlighted that severe and prominent pollution incidents tend to elevate perceived severity (Chen et al., 2020). Conversely, some studies have reported lower perceived severity in populations with chronic exposure to poor air quality. The systematic study indicated that perceived severity is shaped by factors such as media coverage, visible smog events, local policy responses, socioeconomic status, and prior health experiences. In areas where poor air quality is routine and unremarked, perceived severity may be muted despite high objective exposure (Cori et al., 2020). Migrant workers in Chiang Rai, who often work outdoors and face seasonal haze, may develop strong perceptions of PM2.5 severity due to personal symptoms and local health communication. However, despite high perceived severity, overall self-protection remained moderate, reflecting HBM's principle that concern alone does not ensure action without overcoming barriers and enhancing self-efficacy.

The study revealed that participants exhibited a high level of perceived benefits of self-protective behaviors against PM2.5 exposure. In the context of HBM, perceived benefits refer to an individual's belief in the efficacy of recommended health practices to reduce risk or severity of health threat (Alyafei, 2024). This study aligns with HBM's prediction that perceived benefits can be a strong motivator for adopting health behaviors, particularly when combined with high perceived susceptibility and severity. Similarly, a study reported the high perceived benefit of self-protection among people were more likely to engage in consistent protective behaviors during high PM2.5 period (Sirijaroonwong et al., 2022).

In this study, perceived barriers to self-protective behaviors against PM2.5 got the lowest score of all the perception categories, despite still being rated at a relatively high level. In the HBM framework, perceived barriers refer to an individual's assessment of the obstacles that hinder the adoption of protective behaviors (Alyafei, 2024). Our findings align with another study that have identified significant barriers to air pollution protection, particularly in vulnerable or low-income groups. In 2021, a study reported that South Korean residents recognized mask-wearing as effective but cited discomfort, difficulty breathing, and financial costs as barriers to consistent use (Kim & Kim, 2021). Common barriers reported by migrant workers may include the cost of protective equipment, discomfort when wearing masks for long periods, limited availability of certified masks, and a lack of accessible information in their native language.

Despite high levels of risk perception, participants in this study reported moderate overall self-protective behavior with an average of 3.46. The finding found that some protective behaviors such as daily mask replacement, avoiding open burning, and carrying masks got high scores. This means that certain preventive actions are more feasible or culturally integrated. Conversely, behaviors such as checking air quality before leaving home or selecting certified masks scored lower, possibly due to a lack of awareness of reliable information sources or limited market access. When people perceive PM2.5 as harmful, they may not routinely check air-quality data or know which masks are effective. Research showed that self-monitoring behavior (e.g., checking AQI apps)

and correct mask selection increase uptake of protective actions; conversely, limited information channels or language barriers reduce consistent practice among vulnerable groups (Luangwilai et al., 2025). Migrants with limited Thai skills may face challenges in understanding air quality warnings or health advisories, which could influence their ability to respond appropriately.

2. Investigate the correlation between perceptions and self-protective behaviors

In this study, the only perceived susceptibility to PM2.5 was the only HBM construct found to be significant positively correlated with self-protective behavior against PM2.5 ($r_s = 0.281$, $p < 0.001$). Perceived susceptibility plays a crucial role in influencing self-protective behaviors. It refers to an individual's subjective assessment of their likelihood of experiencing a specific health threat, especially PM2.5. This perception significantly affects the adoption of preventive measures or health-promoting behaviors. When individuals believe they are at high risk, they are more likely to engage in behaviors to mitigate that risk. This finding means that participants who perceived themselves as more susceptible to PM2.5-related health risks tended to engage more frequently in self-protective behaviors, such as wearing masks, avoiding outdoor activities, or monitoring air quality. Although the correlation is not strong, it suggests that perceived risk motivates protective action, consistent with the HBM, which posits that higher perceived susceptibility increases the likelihood of adopting preventive behaviors. This finding aligns with the HBM, which suggests that people who recognize their own risk are more likely to participate in preventive behaviors (Chen et al., 2023; Sirijaroonwong et al., 2022) reported high perceived susceptibility to air pollution among people in Bangkok, which was positively associated with intentions to adopt protective measures, such as wearing masks and avoiding outdoor activities on polluted days. Supporting this, a similar study conducted in South Korea and Italy showed that perceived severity helps individuals understand how their perception of a threat (An et al., 2023). Perceived susceptibility plays a crucial role in shaping an individual's assessment of the dangers of PM2.5 and their willingness to adopt preventive measures (Park et al., 2022). This highlights the importance of perceived susceptibility in motivating people to take action against PM2.5. It suggests that public health campaigns aimed at reducing the impact of PM2.5 should focus on effectively communicating the health risks associated with PM2.5 to the public, particularly migrant workers. However, communicating the health risks should address the Thai language barrier in Myanmar migrant workers to improve efficiency.

Recommendations



Recommendations for Applying Research Results

1. The study found that perceived susceptibility showed a significant positive association with self-protective behaviors, highlighting its importance as a key driver of preventive action. These findings suggest that HBM-based interventions should focus on strengthening perceived susceptibility to effectively translate awareness into sustained protective behaviors.
2. Based on the study findings, the Provincial Public Health Office, the Ministry of Labour, and employers should provide regular training and risk communication on PM2.5 exposure. Health communication strategies should address all four domain of Health Belief Model constructs—perceived susceptibility, perceived severity, perceived benefits, and perceived barriers of self-

protective behaviors —and be integrated into occupational health and safety policies to promote sustained self-protective behaviors and reduce environmental health inequities among migrant workers.

Recommendations for Future Study

Further research utilizing a longitudinal design is recommended to observe how PM2.5 seasonal changes impact PM2.5 perceived characteristics and self-protective behavior. Qualitative studies could provide deeper insights into cultural, social, and economic barriers influencing protective behavior among migrant workers. Furthermore, an investigation into the different geographic regions in Thailand should be considered. Research focusing on the regional aspect of PM2.5 could help identify specific regional challenges and tailor air pollution interventions to address the needs of region-specific populations.

Acknowledgements

The authors would like to express our sincere thanks to all of the participants who cooperated in the study. This research was supported by Mae Fah Luang University.

References

Alahmad, B., Al-Hemoud, A., Al-Bouwarthan, M., Khraishah, H., Kamel, M., Akrouf, Q., Wegman, D. H., Bernstein, A. S., & Koutrakis, P. (2023). Extreme heat and work injuries in Kuwait's hot summers. *Occupational and Environmental Medicine*, 80(6), 347-352.
<https://doi.org/10.1136/oemed-2022-108697>

Alyafei A, E.-C. R. (2024, May 19). *The Health Belief Model of Behavior Change*. StatPearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK606120/>

An, S., Schulz, P. J., & Kang, H. (2023). Perceived COVID-19 susceptibility and preventive behaviors: moderating effects of social support in Italy and South Korea. *BMC Public Health*, 23(1), 13.
<https://doi.org/doi:10.3390/ijerph17145108>

Aung, T. N. N., Shirayama, Y., Moolphate, S., Lorga, T., Yuasa, M., & Nyein Aung, M. (2020). Acculturation and its effects on health risk behaviors among Myanmar migrant workers: A cross-sectional survey in Chiang Mai, Northern Thailand. *International Journal of Environmental Research and Public Health*, 17(14), 5108.
<https://doi.org/doi:10.3390/ijerph17145108>

Chen, J., Lin, W., Haiying, W., Heechan, K., Moon-Hyon, H., & Lee, D. G. (2023). Influences of PM2.5 pollution on the public's negative emotions, risk perceptions, and coping behaviors: a cross-national study in China and Korea. *Journal of Risk Research*, 26(4), 367–379.
<https://doi.org/10.1080/13669877.2022.2162106>

Chen, Q., Zhang, J., Xu, Y., Sun, H., & Ding, Z. (2020). Associations between individual perceptions of PM2.5 pollution and pulmonary function in Chinese middle-aged and elderly residents. *BMC Public Health*, 20(1), 899. <https://doi.org/10.1186/s12889-020-08713-6>

Chiang Rai Provincial Employment Office. (2022). *Statistical report on migrant workers employed in Chiang Rai Province*. <https://www.doe.go.th/prd/chiangrai> (in Thai)

Cori, L., Donzelli, G., Gorini, F., Bianchi, F., & Curzio, O. (2020). Risk perception of air pollution: A systematic review focused on particulate matter exposure. *International Journal of Environmental Research and Public Health*, 17(17), 6424. <https://doi.org/10.3390/ijerph17176424>

Hermayurisca, F., & Taneepanichskul, N. (2023). Estimation of premature death attributed to short- and long-term PM2.5 exposure in Thailand. *Environmental Monitoring and Assessment*, 195(10), 1176. <https://doi.org/10.1007/s10661-023-11807-4>

Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The health belief model as an explanatory framework in communication research: exploring parallel, serial, and moderated mediation. *Health Communication*, 30(6), 566-576. <https://doi.org/10.1080/10410236.2013.873363>

Kan, H. (2022). World Health Organization air quality guidelines 2021: implication for air pollution control and climate goal in China. *International Journal of Environmental Research and Public Health*, 135(5), 513-515. <https://doi.org/10.1097/cm9.0000000000002014>

Kim, J., & Kim, Y. (2021). What predicts Korean citizens' mask-wearing behaviors? health beliefs and protective behaviors against particulate matter. *Int J Environ Res Public Health*, 18(6). <https://doi.org/10.3390/ijerph18062791>

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607-610. <https://doi.org/10.1177/001316447003000308>

Luangwilai, T., Kunno, J., Manomaipiboon, B., Ruamtaewee, W., & Ong-Artborirak, P. (2025). Risk perception and self-monitoring of particulate matter2.5 (PM2.5) associated with anxiety among general population in Urban Thailand. *Urban Science*, 9(7), 256. <https://doi.org/10.3390/urbansci9070256>

Mueller, W., Vardoulakis, S., Steinle, S., Loh, M., Johnston, H. J., Precha, N., Kliengchuay, W., Sahanavin, N., Nakhapakorn, K., Sillaparassamee, R., Tantrakarnapa, K., & Cherrie, J. W. (2021). A health impact assessment of long-term exposure to particulate air pollution in Thailand. *Environmental Research Letters*, 16(5), 055018. <https://doi.org/10.1088/1748-9326/abe3ba>

Park, J., Park, Y., Yoo, J., Gong, Y., & Yu, J. (2022). Can the perceived risk of particulate matter change people's desires and behavior intentions? *Frontiers in Public Health*, 10, 1035174. <https://doi.org/10.3389/fpubh.2022.1035174>

Pollution Control Department. (2024). Regional air quality and situation reports. <http://air4thai.pcd.go.th/webV3/#/History>

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social Learning Theory and the Health Belief Model. *Health Education Quarterly*, 15(2), 175-183. <https://doi.org/10.1177/109019818801500203>

Short, S. E., & Mollborn, S. (2015). Social determinants and health behaviors: conceptual frames and empirical advances. *Curr Opin Psychol*, 5, 78-84. <https://doi.org/10.1016/j.copsyc.2015.05.002>

Sirijaroonwong, U., Phungkat, Y., Bumprom, P., Thonhkhaimook, B., & Sangsiriwut, N. (2022).

Perception and preventive behavior towards particulate matter among personnel: A case study of an organization in Bangkok. *Journal of Health Sciences and Wellness*, 26(1), 98-107. (in Thai)

Supasri, T., Gheewala, S. H., Macatangay, R., Chakpor, A., & Sedpho, S. (2023). Association between ambient air particulate matter and human health impacts in northern Thailand. *Scientific Reports*, 13(1), 12753. <https://doi.org/10.1038/s41598-023-39930-9>

Tharaphy, & Chapman, R. S. (2018). The effects of household air pollution due to burning of mosquito coils on respiratory problems in Myanmar Migrants in Mae Sot District, Tak Province, Thailand. *Journal of Health Research*, 24(Suppl. 2), 185-190.

Uttajug, A., Ueda, K., Honda, A., & Takano, H. (2022). Estimation of hospital visits for respiratory diseases attributable to PM10 from vegetation fire smoke and health impacts of regulatory intervention in Upper Northern Thailand. *Scientific Reports*, 12(1), 18515. <https://doi.org/10.1038/s41598-022-23388-2>

World Health Organization. (2024, Oct 24). *Ambient (outdoor) air pollution*.

[https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)

Yang, Z., Mahendran, R., Yu, P., Xu, R., Yu, W., Godellawattage, S., Li, S. & Guo, Y. (2022). Health effects of long-term exposure to ambient PM2. 5 in Asia-Pacific: a systematic review of cohort studies. *Current Environmental Health Reports*, 9(2), 130-151. <https://doi.org/10.1007/s40572-022-00344-w>

