Vol. 16 No. 1 (January - June 2026)

วารสารวิเทศศึกษา
มหาวิทยาลัยสงขลานครินทร์
Journal of International Studies
Prince of Songkla University

ความกลัวและพฤติกรรมการป้องกันของนักท่องเที่ยวชาวจีนต่อโรคไข้เลือดออก: การประยุกต์ใช้ทฤษฎีแรงจูงใจในการป้องกัน

ธนวัฒน์ เอกวัฒนพล[1] ปรารถนา กาลเนาวกุล[2] พรพิษณุ พรหมศิวะพัลลภ[3] และคณพศ กาลเนาวกุล[4*]

[1]คณะการบริการและการท่องเที่ยว มหาวิทยาลัยสงขลานครินทร์ T.aekwattanaphol@outlook.com

[2]คณะวิเทศศึกษา มหาวิทยาลัยสงขลานครินทร์ prathana.k@phuket.psu.ac.th

[3]คณะการบริการและการท่องเที่ยว มหาวิทยาลัยสงขลานครินทร์ pornpisanu.p@phuket.psu.ac.th

[4]คณะการบริการและการท่องเที่ยว มหาวิทยาลัยสงขลานครินทร์ kanapot.k@phuket.psu.ac.th

Chinese Tourists' Dengue-Related Fear and Protective Behaviors: A Protection Motivation Theory Approach

Thanawat Aekwattanaphol [1*], Prathana Kannaovakun[2], Pornpisanu Promsivapallop[3] and Kanapot Kalnaovakul[4]

[1]Faculty of Hospitality and Tourism, Prince of Songkla University, T.aekwattanaphol@outlook.com

[2]Faculty of International Studies, Prince of Songkla University, prathana.k@phuket.psu.ac.th

[3]Faculty of Hospitality and Tourism, Prince of Songkla University, pornpisanu.p@phuket.psu.ac.th

[4]Faculty of Hospitality and Tourism, Prince of Songkla University, kanapot.k@phuket.psu.ac.th

Article Info

Article Type: *Research Articles*

Article History:

Received November 26, 2025

Revised January 24, 2026

Accepted January 29, 2026

คำสำคัญ

โรคไข้เลือดออก, กรอบแนวคิดทฤษฎีแรงจูงใจในการป้องกัน (PMT), นักท่องเที่ยวชาวจีน, ภูเก็ต, ความเสี่ยงด้านสุขภาพของแหล่งท่องเที่ยว, การท่องเที่ยว, ความตั้งใจในการเดินทางท่องเที่ยวภายใต้บริบทของความเสี่ยงด้านสุขภาพ

Keywords:

Dengue fever, Protection Motivation Theory, Chinese tourist, Phuket, Destination health risk, Tourism, Intention to visit in the context of health risk

บทคัดย่อ

งานวิจัยนี้ประยุกต์ใช้กรอบแนวคิดทฤษฎีแรงจูงใจในการป้องกัน (Protection Motivation Theory: PMT) ฉบับขยาย เพื่อศึกษาว่านักท่องเที่ยวต่างชาติมีการรับรู้ความเสี่ยงด้านสุขภาพจากโรคไข้เลือดออกและพฤติกรรมการป้องกันตนเองระหว่างการเดินทางอย่างไร งานวิจัยมีวัตถุประสงค์เพื่อศึกษาผลของปัจจัยตามทฤษฎีแรงจูงใจในการป้องกัน (Protection Motivation Theory: PMT) ที่มีต่อความกลัวและแรงจูงใจในการป้องกันโรคไข้เลือดออก ตลอดจนประเมินบทบาทการเป็นตัวแปรคั่นกลางของความกลัว แบบจำลองที่เสนอได้บูรณาการทั้งกระบวนการประเมินทางปัญญา ได้แก่ การประเมินภัยคุกคามและการประเมินการรับมือ ร่วมกับการตอบสนองทางอารมณ์โดยเฉพาะความกลัว เพื่ออธิบายแรงจูงใจในการป้องกันของนักท่องเที่ยวอย่างครอบคลุม การเก็บรวบรวมข้อมูลดำเนินการผ่านแบบสอบถามเชิงโครงสร้างจากนักท่องเที่ยวชาวจีน จำนวน 431 คน ที่แหล่งท่องเที่ยวที่สำคัญในจังหวัดภูเก็ต แบบสอบถามได้วัดตัวแปรหลักของทฤษฎี PMT ได้แก่ การรับรู้ความเปราะบาง การรับรู้ความรุนแรง ประสิทธิผลของการตอบสนอง ประสิทธิภาพตนเอง ต้นทุนของการตอบสนอง ความกลัวต่อโรคไข้เลือดออก และแรงจูงใจในการป้องกัน จากนั้นใช้แบบจำลองสมการเชิงโครงสร้าง (SEM) วิเคราะห์ความสัมพันธ์ระหว่างตัวแปรและตรวจสอบบทบาทการเป็นตัวกลางของความกลัว ผลการวิเคราะห์แสดงให้เห็นว่าส่วนใหญ่ของสมมติฐานที่ตั้งไว้ได้รับการสนับสนุน ซึ่งยืนยันถึงความเหมาะสมของทฤษฎี PMT ในการอธิบายพฤติกรรมการป้องกันด้านสุขภาพในบริบทการท่องเที่ยว อย่างไรก็ตาม พบว่าสมมติฐานบางข้อ ได้แก่ การรับรู้ความรุนแรง ต้นทุนของการตอบสนอง ประสิทธิผลของการตอบสนอง และประสิทธิภาพตนเอง ไม่มีนัยสำคัญทางสถิติ แสดงให้เห็นว่ามิติของทฤษฎี PMT มิได้มีอิทธิพลเท่ากันต่อกระบวนการทางอารมณ์และแรงจูงใจของนักท่องเที่ยว งานวิจัยยังได้อภิปรายถึงนัยเชิงทฤษฎีและแนวทางการประยุกต์ใช้ในทางปฏิบัติ

Abstract

This research adopts an extended Protection Motivation Theory (PMT) framework to explore how international tourists perceive the health risk of dengue fever and engage in protective actions during their travels. Specifically, this research aims to examine the effects of PMT factors on fear and protection motivation related to dengue fever, as well as to assess the mediating role of fear. The proposed model integrates both cognitive components which are

threat and coping appraisals, and the affective response of fear to provide a holistic explanation of tourists' protection motivation. Data were collected through a structured questionnaire administered to 431 Chinese tourists at key tourist attractions in Phuket, Thailand. The survey captured core PMT constructs, including perceived vulnerability, perceived severity, response efficacy, self-efficacy, response cost, fear of dengue fever, and protection motivation. Structural Equation Modeling (SEM) was applied to examine the interrelationships among these variables and to test the mediating role of fear. The analysis demonstrated that most hypothesized relationships were supported, confirming the applicability of PMT in predicting health-related behavioral intentions in tourism settings. Nevertheless, four hypotheses, including concerning perceived severity, response cost, response efficacy, and self-efficacy, were found to be non-significant, indicating that the influence of PMT components varies across emotional and motivational pathways. Theoretical and managerial implications are also discussed.

* Corresponding author: Kanapot Kalnaovakul
E-mail address: kanapot.k@phuket.psu.ac.th

1. Introduction

Dengue fever has emerged as a major travel-related infectious disease, becoming one of the leading causes of fever among travelers returning from abroad and serving as an early indicator of emerging outbreaks in endemic regions. It is identified as the second most common pathogen responsible for febrile illness among travelers, particularly those returning from Southeast Asia (Farber & Taylor, 2023). International tourists, especially those from countries where dengue is rare, often perceive heightened health risks when visiting dengue-prone destinations. Such concerns can significantly influence travel decisions and behaviors, including the adoption of preventive measures (Tan & Lee, 2022). Understanding the factors shaping tourists' responses to health threats like dengue is therefore critical for developing effective public health interventions and sustaining tourism resilience in affected regions. Although research on travelers' health risk perceptions has expanded during global health crises such as COVID-19 (Ryu et al., 2023), tourists' responses to persistent endemic threats like dengue fever remain underexplored.

Chinese outbound tourists represent the largest tourism market segment worldwide and offer a valuable context for examining behavioral responses to dengue risk. Many Chinese travelers originate from temperate or non-tropical provinces such as Beijing, Tianjin, Heilongjiang, Sichuan, and Shaanxi—where dengue transmission is rare due to limited local endemicity (Ni et al., 2024; Yue et al., 2022). As a result, many Chinese tourists have limited experience with dengue transmission, prevention, or symptom recognition. This lack of prior exposure may heighten perceived vulnerability, reduce confidence in self-protection, or generate uncertainty regarding the effectiveness of preventive measures when traveling to tropical destinations. Conversely, some travelers may underestimate dengue risk due to optimism bias or the belief that tropical diseases primarily affect local populations rather than international visitors (Tan & Lee, 2022). These divergent risk perceptions make Chinese outbound tourists an ideal population for testing Protection Motivation Theory (PMT), particularly in examining how perceived vulnerability, severity, and coping appraisals influence fear responses and motivation to adopt protective behaviors among travelers with minimal exposure to dengue-endemic environments.

Previous health risk research has drawn on multiple theoretical frameworks, including the Health Belief Model (HBM) (Suess et al., 2022), the Extended Parallel Process Model (EPPM) (Narimani et al., 2023), and Protection Motivation Theory (PMT) (Balla & Hagger, 2025). Within tourism health risk research, PMT has been most widely adopted due to its strong explanatory power, particularly in pandemic contexts. Studies applying PMT have examined destination

health risks associated with COVID-19 (Alam et al., 2023; Bęben et al., 2019), influenza A/H1N (Sharifirad et al., 2014), as well as other health threats such as rabies (Wang et al., 2019) and air pollution (Ruan et al., 2020).

Despite this growing literature, two key gaps remain. First, tourists are typically treated as a homogeneous group, limiting understanding of how cultural factors shape health risk perceptions and protective responses. This limitation is particularly salient for culturally distinct segments such as Chinese tourists, whose interpretation of health information and responses to perceived risks may differ significantly (Bi et al., 2021). Second, fear has received limited attention as a core psychological mechanism influencing tourists' perceptions and behaviors during destination health crises, resulting in an incomplete understanding of travel decision-making during pandemics.

To address these gaps, the present study examines Chinese tourists' fear and protective behaviors in response to dengue fever, thereby extending the application of Protection Motivation Theory in tourism health research. Originally proposed by Rogers (1975) and rooted in the Health Belief Model (Seow et al., 2022), PMT offers a robust framework for explaining how individuals appraise health threats and adopt protective behaviors. It involves two main cognitive processes: Threat Appraisal, which considers perceived vulnerability and severity of the health threat, and Coping Appraisal, which evaluates the effectiveness of protective measures (response efficacy), confidence in performing these measures (self-efficacy), and perceived barriers (response cost) (Floyd et al., 2000; Rogers, 1983). Together, these processes shape the motivation to engage in protective behaviors.

Recognizing that emotions also influence health decisions, this study extends PMT by incorporating fear of dengue fever as a mediating factor. Fear can either encourage or discourage protective behaviors depending on how it interacts with threat and coping assessments (Jarumaneerat et al., 2023; Luo & Lam, 2020). While PMT has been applied to understand travelers' health risk perceptions during pandemics (e.g. Chua et al., 2021), its use in studying ongoing endemic threats like dengue fever in tourism is limited. Therefore, in order to help fulfil this academic gap, this study attempts to achieve three objectives. The first objective is to investigate the effects of Protection Motivation Theory (PMT) factors on fear of dengue fever. Secondly, the study aims to investigate the effects of Protection Motivation Theory (PMT) factors on protection motivation toward dengue fever. Thirdly, the research aims to examine the mediation role of dengue fever fear between the influencing factors and protection motivation.

The study is expected to offer both theoretical and practical contributions. Theoretically, it extends PMT by integrating fear as a mediator, offering a deeper understanding of how cognition and emotion together influence protective behaviors. In addition, the study contributes to the existing body of knowledge by providing in-depth insights into the fear responses and protective behaviours of a specific group of Chinese tourists, who possess a distinct cultural background. Practically, the findings will help public health authorities, destination managers, and policymakers design effective communication and preventive strategies to reduce dengue risks and enhance tourist safety. Ultimately, the research aims to support sustainable tourism management in dengue-endemic areas, balancing public health concerns with the needs of the tourism industry.

2. Dengue Fever and Tourism

Dengue fever remains a significant health risk in Thailand, with ongoing implications for international tourism. Recent studies confirm persistent dengue transmission across the country, including major tourism regions, with seasonal peaks during the rainy months reinforcing Thailand's endemic status (Saita et al., 2022). Although dengue dynamics fluctuated during the COVID-19 period, evidence indicates continued risk to international travelers, who often lack prior

immunity and awareness of preventive measures (Grobusch et al., 2025). Recent macroeconomic analyses further demonstrate that dengue outbreaks can negatively affect tourism demand and economic performance in endemic countries, highlighting the vulnerability of tourism-dependent destinations such as Thailand to vector-borne disease risks (Marczell et al., 2024).

In response, Thai government bodies play a central role in dengue risk management through coordinated surveillance, vector control, and public communication. The Department of Disease Control under the Ministry of Public Health implements nationwide larval surveillance and geographically targeted vector control using digital monitoring systems to identify high-risk areas (Sahavechaphan et al., 2024). These efforts support localized interventions in communities and destinations frequented by tourists. In addition, Thailand's participation in regional dengue prevention initiatives reflects a multisectoral approach that integrates public health governance, community engagement, and risk communication. Overall, recent literature emphasizes that effective dengue management in tourism contexts depends on sustained governmental capacity, policy coordination, and proactive communication to mitigate health risks and maintain destination attractiveness.

3. Protection Motivation Theory (PMT)

Protection Motivation Theory (PMT), introduced by Rogers (1975, 1983), is a prominent social-psychological framework used to predict behavioral intention in response to perceived health threats. The theory posits that individuals' motivation to protect themselves (Protection Motivation) is a function of two key cognitive appraisal processes: Threat Appraisal and Coping Appraisal. PMT has been extensively applied in public health to examine behaviors related to infectious diseases, health risk management, and the intention to vaccinate (Bae & Chang, 2021; Prasetyo et al., 2020). More recently, scholars have applied PMT in tourism research to understand how travelers perceive health risks and engage in protective behaviors in response to pandemics and emerging infectious diseases (Ryu et al., 2023).

However, while PMT has been instrumental in understanding health-related behaviors in acute global crises such as COVID-19, its application to endemic and persistent health risks, such as dengue fever, in tourism contexts remains underexplored. Given the cyclical and ongoing nature of dengue outbreaks in regions like Southeast Asia, it is critical to examine how PMT constructs apply to tourists navigating these risks during holiday travel (Tan & Lee, 2022). Furthermore, a complete model must incorporate affective factors, as behavioral intention may not fully translate into action when emotions, particularly fear, are involved (Milne et al., 2000).

3.1 Threat Appraisal and Tourists' Risk Perception

Threat appraisal, comprising Perceived Vulnerability (PV) and Perceived Severity (PS), serves as the initial cognitive trigger for protection motivation. These two constructs are essential for understanding tourists' health-related decisions, particularly when traveling to endemic regions.

Perceived Vulnerability reflects individuals' subjective beliefs about their personal susceptibility to the dengue threat. In tourism, travelers from non-endemic regions, such as Chinese tourists, may experience varying degrees of vulnerability, from a heightened sense of risk due to unfamiliarity, to a low sense of risk due to optimism bias (Kock et al., 2020). Studies confirm that a higher perceived vulnerability motivates tourists to alter travel plans or seek protective measures (Chua et al., 2021; Zheng, 2021).

Perceived Severity concerns the beliefs about the seriousness of the consequences if the threat occurs. For dengue fever, the perceived severity involves the possibility of debilitating symptoms, hospitalization, or even fatal complications. The more severe a tourist perceives the potential outcome of dengue infection, the stronger the psychological arousal, which often translates into greater emotional response (fear) and an enhanced motivation to protect themselves (Rogers,1975; Floyd et al., 2000). Therefore, both Perceived Vulnerability and Perceived Severity are expected to positively influence the emotional response (fear) and the resulting motivation to adopt protective behaviors against dengue fever.

3.2 Coping Appraisal and Protective Behaviors

Coping appraisal is the rational component of PMT, where individuals evaluate their capacity to manage or avoid the threat. This process is crucial because a strong perception of threat will only lead to effective protection motivation if the individual believes they can cope. It includes Response Efficacy (RE), Self-Efficacy (SE), and Response Cost (RC).

Response efficacy refers to an individual's belief that specific protective behaviors, including using DEET (N, N-diethyl-m-toluamide)-based repellents, wearing long-sleeved clothing, or staying in screened accommodations are effective in preventing mosquito bites and dengue infection. When individuals perceive these measures as highly effective, they tend to feel more in control of the situation. Consequently, higher response efficacy often reduces fear, as individuals believe that the threat can be successfully managed through appropriate actions (Rogers, 1983). In other words, response efficacy mitigates the emotional impact of perceived risk by reinforcing confidence in preventive strategies. Numerous studies within Protection Motivation Theory (PMT) have confirmed that higher perceived response efficacy directly increases protection motivation, as individuals believe their efforts will produce tangible results (Rogers, 1983; Ryu et al., 2023).

Self-efficacy represents individuals' confidence in their own ability to perform protective behaviors successfully. In a tourism context, a traveler with high self-efficacy trusts their capacity to consistently apply mosquito repellent, choose safe accommodations, and avoid high-risk environments even amidst distractions. Studies have demonstrated that self-efficacy is a strong determinant of preventive behavior across various health-related contexts (Ryu et al., 2023). When individuals believe in their own capability to take effective preventive measures, they are less likely to experience fear or anxiety toward dengue fever because they perceive themselves as capable of managing the risk. This sense of control and capability significantly enhances one's motivation to engage in protective actions. Prior empirical findings consistently identify self-efficacy as one of the strongest predictors of protection motivation and subsequent behavioral compliance across health and safety contexts (Ryu et al., 2023).

Response cost encompasses the perceived barriers or drawbacks associated with performing protective behaviors, including the financial cost of repellents, their unpleasant odor, or the inconvenience of frequent application. When tourists perceive these protective actions as costly, inconvenient, or uncomfortable, they may become less willing to adopt them (Xiao et al., 2016). These perceived obstacles can heighten the sense of vulnerability and helplessness toward dengue infection, thereby intensifying fear. In this case, high response cost undermines both perceived efficacy and coping confidence, contributing to elevated fear levels. High response cost generates psychological resistance and reduces the likelihood of translating awareness or concern into actual protective behavior (Xiao et al., 2016). Therefore, while response efficacy and self-efficacy enhance motivation, response cost functions as an inhibiting factor.

3.3 Fear and Health Protection Motivation

Although PMT was initially conceived as a cognitive model, there is increasing empirical evidence supporting the vital, dual role of the affective response, Fear, in shaping protective motivation. Fear, in this context, is defined as the negative emotional arousal experienced when exposed to the dengue threat, which can range from mild anxiety to intense dread (Jarmunaeerat et al., 2023).

Fear serves as an emotional amplifier between the cognitive appraisal of the threat and the behavioral response. Fear can heighten risk perception and mobilize mental resources, leading to a strong intention to protect oneself, especially when coupled with high coping efficacy. Conversely, if fear is overwhelming and the individual perceives low coping efficacy (i.e., they believe they cannot avoid or manage the threat), excessive fear can lead to maladaptive responses, such as avoidance, denial, or simply ignoring the threat (Babcicky & Seebauer, 2019).

This study, consistent with an extended PMT framework, positions fear as a mediating factor. The premise is that the cognitive appraisals of the threat (vulnerability, severity) and coping (efficacy, cost) first influence the emotional state (fear of dengue fever), and this emotional state, in turn, influences the final Protection Motivation. Understanding this mediation is critical, as it explains the psychological pathway through which travelers translate objective risk information into a subjective emotional state that ultimately dictates their willingness to protect themselves during their holiday.

4. Study Framework and Hypotheses Development

Based on the review of the literature in PMT and the role of fear in health behavior, this study proposes an extended conceptual model to investigate the protective motivation of Chinese international tourists regarding dengue fever in Phuket.

The framework, as shown in Figure 1, proposes that PMT factors (Perceived Vulnerability, Perceived Severity, Response Efficacy, Self-Efficacy, and Response Cost) influence Protection Motivation through the mediating role of Fear of Dengue Fever.

H1: Perceived vulnerability of dengue fever has a positive effect on fear of dengue fever.

H2: Perceived severity of dengue fever has a positive effect on fear of dengue fever.

H3: Perceived response efficacy has a negative effect on fear of dengue fever.

H4: Perceived self-efficacy has a negative effect on fear of dengue fever.

H5: Perceived response cost has a positive effect on fear of dengue fever.

H6: Perceived vulnerability of dengue fever has a positive effect on protection motivation.

H7: Perceived severity of dengue fever has a positive effect on protection motivation.

H8: Perceived response efficacy has a positive effect on protection motivation.

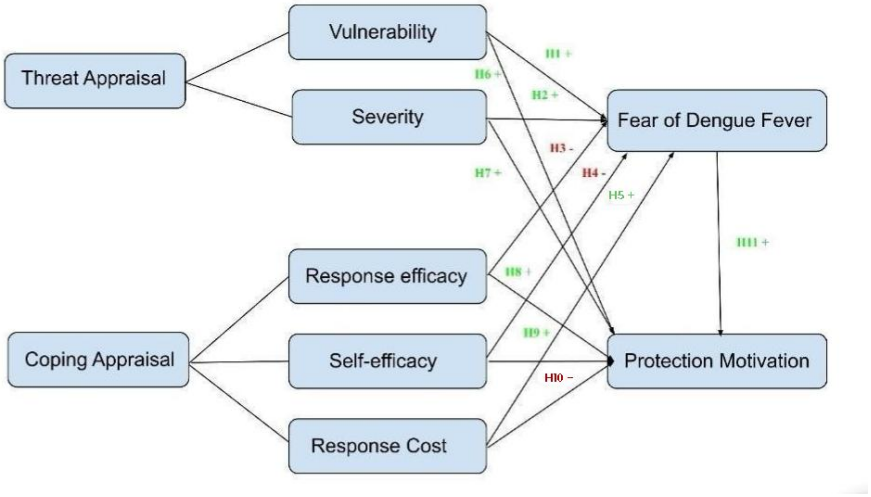
H9: Perceived self-efficacy has a positive effect on protection motivation.

H10: Perceived response cost has a negative effect on protection motivation.

H11: Fear of dengue fever has a positive effect on protection motivation

Figure 1

Study Framework



5. Research Design

This study applies a quantitative research approach. Specifically, it examines whether five latent variables such as perceived vulnerability, perceived severity, response efficacy, self-efficacy, and response cost are correlated with the mediator (fear) and the dependent variable (protection motivation), as outlined in the study framework.

The study focuses on Chinese tourists, who represent the largest group of international visitors to Phuket during the study period. Quantitative research is appropriate because it enables the identification of patterns, hypothesis testing, verification of relationships among variables using numerical data, and the generalization of findings to a broader population. Phuket was selected as the study location because it is a popular, world-renowned tourist destination with direct flights from many Chinese airports. In addition, the destination has experienced recurrent dengue outbreaks.

5.1 Questionnaire Development

The questionnaire for this study measures the variables depicted in Figure 1. Items were adapted from prior studies, including:

- Perceived vulnerability: three items adapted from Kock et al. (2020).
- Perceived severity: four items adapted from Xiao et al. (2016), Kock et al. (2020).
- Response efficacy: three items adapted from Zheng et al. (2021).
- Self-efficacy: five items adapted from Zheng et al. (2021).
- Response cost: three items adapted from Xiao et al. (2016).
- Fear: five items adapted from Babcicky and Seebauer (2019), Zheng et al. (2021).
- Protection motivation: four items adapted from Van Zomeren et al. (2010).

The questionnaire was initially developed in English based on previous studies and subsequently reviewed by three academic experts using the Index of Item–Objective Congruence (IOC) process. Minor revisions were made in response to the reviewers' comments. The target respondents were Chinese tourists aged 18 years and above. The questionnaire was translated into Chinese and subsequently proofread by a language expert. It was then pre-tested with

a small group of Chinese tourists to ensure clarity, reliability, and cultural appropriateness before large-scale distribution. A screening question, “Have you ever heard about dengue fever?”, was used to ensure that only participants who were aware of dengue fever were included, as these individuals were more likely to have relevant perceptions and concerns. Participation was voluntary, and withdrawal from the survey could be done at any time.

5.2 Data Collection

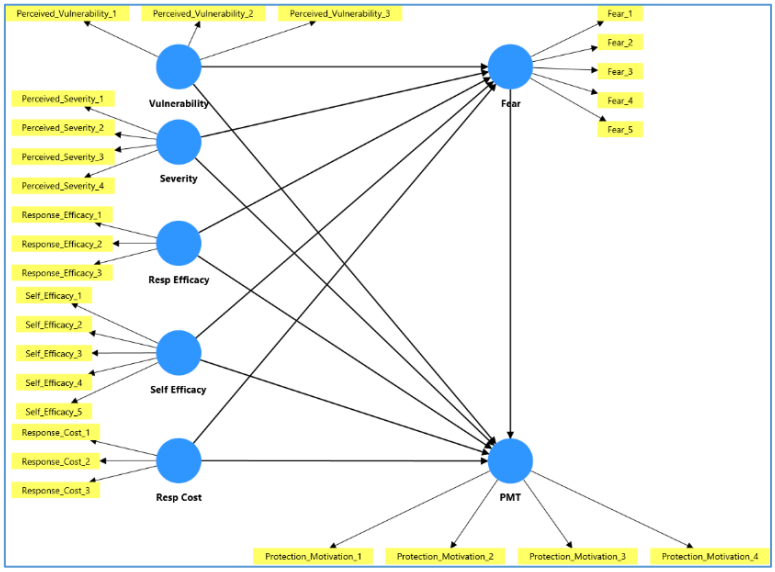
On-site data collection took place in Phuket in June 2024, which coincided with the early rainy season when dengue cases typically rise in Thailand (Ministry of Public Health, 2023). Trained bilingual research assistants would approach tourists, provide a brief explanation of the study, and emphasize anonymity and voluntary participation. According to Sekaran and Bougie (2016), a minimum of 384 respondents was required for statistical significance at a 95% confidence level. To account for potential non-response or incomplete surveys, the study aimed to obtain at least 400 valid responses. Because no official sampling frame exists for international tourists in Phuket, a convenience sampling approach was used. The survey was conducted at different times of the day (morning, afternoon, evening) at a variety of popular sites, including the airport, beaches, attractions, shopping centers, hotels, and cultural landmarks, in order to increase the diversity and representativeness of the sample to the population. In total, 455 respondents participated in the survey. After screening out unusable questionnaires due to incomplete answers, 431 questionnaires were retained for further analysis. Most participants in this study are from non-dengue areas (96.1%), with most of them having never visited Thailand before (60.1%). Among those who had visited Thailand previously (39.9%), some may have experienced dengue fever. Most Chinese tourists in this study are male (49.2%), while females account for 41.9%. More than half of the respondents are between 25 and 44 years old, with 24.8% aged 25–34 and 29.9% aged 35–44. In terms of education, 60.8% of respondents hold a bachelor’s degree, followed by 14.6% with a master’s degree. Furthermore, most respondents are self-employed. The data was then analyzed using Structural Equation Modeling (SEM) to examine the interrelationships among the variables and to test the mediating role of fear.

6. Results

In line with the conceptual framework (Figure 1), the collected data were cleaned to remove missing values and errors, resulting in 431 valid responses for further analysis. The dataset was then imported into SmartPLS version 4 for analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM), as illustrated in Figure 2.

Figure 2

Path model of the study



To ensure the quality, reliability, and validity of the observed variables (indicators) representing latent constructs, which are unobservable concepts such as perceived vulnerability and response cost, the measurement model was assessed prior to evaluating the structural model and drawing inferences about the relationships among constructs. The assessment of the reflective measurement model, as shown in Table 1, confirmed satisfactory reliability (composite reliability), convergent validity (indicator loadings and AVE), discriminant validity (HTMT), and the absence of multicollinearity, as indicated by VIF values ranging from 1.050 to 1.726 for the outer model and from 1.076 to 1.423 for the inner model. The model produced an adjusted R^2 value of 0.411, indicating that approximately 41.1% of the variance in protection motivation is explained by the five exogenous variables: perceived vulnerability, perceived severity, response efficacy, self-efficacy, and response cost, as well as the mediating variable, fear.

Table 1

Reflective measurement model assessment summary

		Convergent Validity		Internal Consistency Reliability			Discriminant Validity
Latent Variables	**Indicators**	**Loadings**	**AVE**	**Cronbach's Alpha**	**rho_A**	**Composite Reliability**	**HTMT**
		> 0.7	**> 0.5**	**0.60 – 0.90**	**0.60 -0.90**	**0.60 -0.90**	**Significantly lower than 0.85**
Perceived Vulnerability	Perceived Vulnerability 1	0.785	0.609	0.359	0.359	0.757	Yes
	Perceived Vulnerability 2	0.776					
Perceived Severity	Perceived Severity 2	0.846	0.625	0.405	0.420	0.768	Yes
	Perceived Severity 3	0.731					

Latent Variables	Indicators	Convergent Validity		Internal Consistency Reliability			Discriminant Validity
		Loadings	AVE	Cronbach's Alpha	rho_A	Composite Reliability	HTMT
		> 0.7	> 0.5	0.60 – 0.90	0.60 -0.90	0.60 -0.90	Significantly lower than 0.85
Response Efficacy	Response Efficacy 2	0.728	0.638	0.442	0.469	0.778	Yes
	Response Efficacy 3	0.864					
Self-Efficacy	Self- Efficacy 2	0.731	0.565	0.619	0.622	0.796	Yes
	Self-Efficacy 4	0.760					
	Self-Efficacy 5	0.764					
Response Cost	Response Cost 1	0.783	0.582	0.641	0.641	0.807	Yes
	Response Cost 2	0.762					
	Response Cost 3	0.743					
Fear	Fear 1	0.740	0.577	0.817	0.818	0.872	Yes
	Fear 2	0.742					
	Fear 3	0.780					
	Fear 4	0.769					
	Fear 5	0.768					
Protection Motivation	Protection Motivation 2	0.756	0.551	0.593	0.593	0.786	Yes

6.1 Model Fit

Unlike covariance-based SEM, variance-based SEM lacks well-established model fit indices. However, the Standardized Root Mean Square Residual (SRMR) is commonly used, with values below 0.08 indicating a good fit. The tested model yielded an SRMR value of 0.079, suggesting an acceptable model fit (Table 2)

Table 2

Model Fit – SRMR

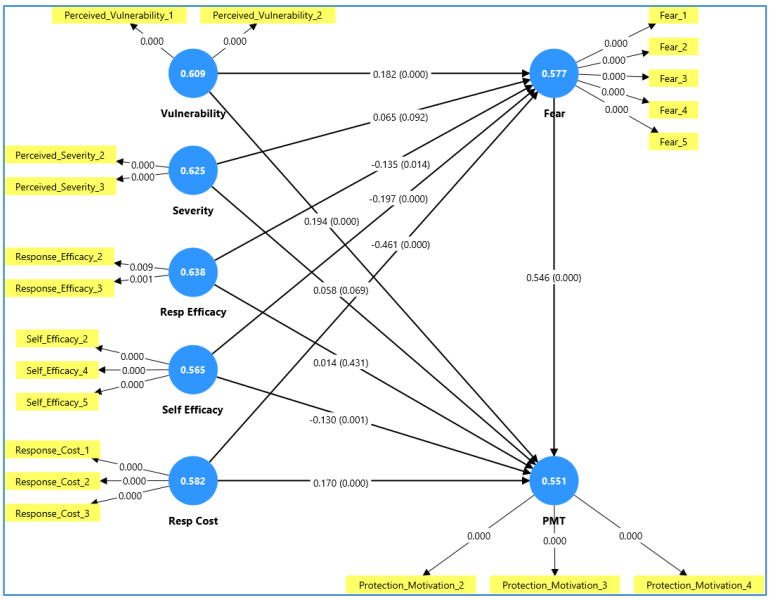
	Saturated model	Estimated model
SRMR	0.079	0.079
d_ULS	1.306	1.306
d_G	0.404	0.404
Chi-square	1065.400	1065.400
NFI	0.447	0.447

6.2 Path analysis

Concerning the final model of the study, the measurement model was first evaluated to assess the reliability and validity of all indicators, followed by an examination of overall model fit. Path analysis was employed to examine the associations between the study variables and levels of protection motivation among Chinese tourists. The results of the model are presented in Figure 3.

Figure 3

Structural Equation Model for the study



The findings (Table 3) indicate several statistically significant direct effects: fear and protection motivation (β = 0.546, p = 0.000), response cost and fear (β = -0.461, p = 0.000), response cost and protection motivation (β = 0.170, p = 0.000), response efficacy and fear (β = -0.135, p = 0.014), self-efficacy and fear (β = -0.197, p = 0.000), self-efficacy and protection motivation (β = -0.130, p = 0.000), perceived vulnerability and fear (β = 0.182, p = 0.000), and perceived vulnerability and protection motivation (β = 0.194, p = 0.000). However, some paths were not statistically significant. These include the relationships between response efficacy and protection motivation (β = 0.014, p = 0.431), perceived severity and fear (β = 0.065, p = 0.092), and perceived severity and protection motivation (β = 0.058, p = 0.069).

It is particularly noteworthy that fear demonstrated a robust and most positive effect on protection motivation (β = 0.546, p = 0.000) in the final model. Fear, acting as a mediating variable, emerged as the primary predictor of protection motivation among Chinese tourists. In general, the results suggest that response cost and perceived vulnerability directly and positively influence protection motivation, whereas response efficacy and perceived severity do not. Additionally, self-efficacy exhibited a negative association with protection motivation.

Table 3

Test for direct effects by controlling mediator

Direct effects	β	T values	P values	Result (p < 0.05)
Fear -> PMT	0.546	12.216	0.000	Sig.
Resp Cost -> Fear	-0.461	11.451	0.000	Sig.
Resp Cost -> PMT	0.170	3.625	0.000	Sig.
Resp Efficacy -> Fear	-0.135	2.204	0.014	Sig.
Resp Efficacy -> PMT	0.014	0.173	0.431	Not sig.
Self-Efficacy -> Fear	-0.197	4.674	0.000	Sig.
Self-Efficacy -> PMT	-0.130	3.003	0.001	Sig.
Severity -> Fear	0.065	1.327	0.092	Not sig.
Severity -> PMT	0.058	1.484	0.069	Not sig.
Vulnerability -> Fear	0.182	4.018	0.000	Sig.
Vulnerability -> PMT	0.194	4.269	0.000	Sig.

The final model indicates that the mediation process involves a single mediating variable, namely fear. The causal influence of the independent variables on the dependent variable (PMT) can be decomposed into two components: (1) direct effects of response cost, response efficacy, self-efficacy, perceived severity, and perceived vulnerability on PMT; and (2) indirect effects of these variables on PMT operating through fear as the mediator. The total effect of each independent variable on PMT is therefore the sum of its direct and indirect effects. Partial mediation is inferred when both the direct and indirect effects are statistically significant in explaining the relationship between the independent and dependent variables, whereas full mediation is established when the indirect effect is significant and the direct effect is no longer significant after the mediator is included in the model.

Regarding indirect effects through the mediator fear, there were statistically significant results that fear mediated the negative relationships between response cost, response efficacy, self-efficacy, and protection motivation, but mediated the positive relationship between perceived vulnerability and protection motivation; on the other hand, it did not mediate the relationship between perceived severity and protection motivation (Table 4). Nevertheless, the analysis of total effects (direct + indirect) presented in Table 5 revealed that relationships exist between latent variables supporting seven hypotheses (H1, H3, H4, H6, H7, H10, H11).

Table 4:

Total indirect effects (through mediator)

Indirect effects	β	T values	P values	Result (p < 0.05)
Resp Cost -> Fear -> PMT	-0.252	7.663	0.000	Sig.
Resp Efficacy -> Fear -> PMT	-0.074	2.146	0.016	Sig.
Self-Efficacy -> Fear -> PMT	-0.107	4.554	0.000	Sig.
Severity -> Fear -> PMT	0.036	1.308	0.096	Not sig.
Vulnerability -> Fear -> PMT	0.099	3.859	0.000	Sig.

Table 5

Test for Hypothesis (Total effects)

Hypothesis (Total effects)	β	T values	P values	Result (p < 0.05)
H11: Fear -> PMT	0.546	12.216	0.000	Supported
H5: Resp Cost -> Fear	-0.461	11.451	0.000	Not supported
H10: Resp Cost -> PMT	-0.081	1.752	0.040	Supported
H3: Resp Efficacy -> Fear	-0.135	2.204	0.014	Supported
H8: Resp Efficacy -> PMT	-0.060	0.872	0.192	Not supported
H4: Self-Efficacy -> Fear	-0.197	4.674	0.000	Supported
H9: Self-Efficacy -> PMT	-0.238	5.210	0.000	Not supported
H2: Severity -> Fear	0.065	1.327	0.092	Not supported
H7: Severity -> PMT	0.094	2.142	0.016	Supported
H1: Vulnerability -> Fear	0.182	4.018	0.000	Supported
H6: Vulnerability -> PMT	0.293	6.096	0.000	Supported

Table 6

Results of mediation analysis

Effects	Path	β	T values	P values	Result
Total	Resp Cost -> PMT	**-0.081**	1.752	0.040	Partially mediated/ supported
Indirect	Resp Cost -> Fear -> PMT	-0.252	7.663	0.000	
Direct	Resp Cost -> PMT	0.170	3.625	0.000	
Total	Resp Efficacy -> PMT	-0.060	0.872	0.192	Fully mediated/ but not supported
Indirect	Resp Efficacy -> Fear -> PMT	-0.074	2.146	0.016	
Direct	Resp Efficacy -> PMT	0.014	0.173	0.431	
Total	Self-Efficacy -> PMT	-0.238	5.210	0.000	Partial mediated/ but not supported
Indirect	Self-Efficacy -> Fear -> PMT	-0.107	4.554	0.000	
Direct	Self-Efficacy -> PMT	-0.130	3.003	0.001	
Total	Severity -> PMT	0.094	2.142	0.016	Not mediate
Indirect	Severity -> Fear -> PMT	0.036	1.308	0.096	
Direct	Severity -> PMT	0.058	1.484	0.069	
Total	Vulnerability -> PMT	0.293	6.096	0.000	Partially mediated/ supported
Indirect	Vulnerability -> Fear -> PMT	0.099	3.859	0.000	
Direct	Vulnerability -> PMT	0.194	4.269	0.000	

According to the mediation analysis result reported in Table 6, total effect revealed that response cost negatively predicts the protection motivation, β = -0.081, $p < 0.05$. Furthermore, the indirect effect showed that fear significantly mediates this relationship β = -0.252, $p < 0.05$. However, response cost has a significant positive direct effect, β = 0.170, $p < 0.05$. Since not only the direct effect between response cost and protection motivation is statistically significant, but

also the indirect effect between response cost and protection motivation, therefore, it can be concluded that fear partially mediates this relationship. Furthermore, response cost was found to negatively predict protection motivation (β = -0.081, $p < 0.05$). Furthermore, the indirect effect indicated that fear significantly mediates this relationship (β = -0.252, $p < 0.05$). However, response cost also exerts a significant positive direct effect (β = 0.170, $p < 0.05$). Since both the direct and indirect effects between response cost and protection motivation are statistically significant, it can be concluded that fear partially mediates this relationship.

In addition, the total effect revealed that self-efficacy negatively predicts protection motivation (β = -0.238, $p < 0.05$). The indirect effect further demonstrated that fear significantly mediates this relationship (β = -0.107, $p < 0.05$). In addition, self-efficacy has a significant negative direct effect (β = -0.130, $p < 0.05$). Since both direct and indirect effects are statistically significant, fear can be concluded to partially mediate this relationship. Moreover, perceived severity significantly predicts protection motivation (β = 0.094, $p < 0.05$). However, the indirect effect did not indicate a significant mediation effect of fear (β = 0.036, $p > 0.05$). Similarly, the direct effect of perceived severity on protection motivation was not significant (β = 0.058, $p > 0.05$). Because both direct and indirect effects are non-significant, this suggests that fear does not mediate the relationship. The total effect further revealed that perceived vulnerability significantly predicts protection motivation (β = 0.293, $p < 0.05$). The indirect effect also indicated that fear significantly mediates this relationship (β = 0.099, $p < 0.05$). Moreover, perceived vulnerability exerts a significant positive direct effect (β = 0.194, $p < 0.05$). Since both direct and indirect effects are statistically significant, it can be concluded that fear partially mediates this relationship.

6.3 Significance of Hypotheses

1) The Roles of Threat and Coping Appraisals in Fear and Motivation.

The analysis demonstrated that perceived vulnerability (H1) exerted a strong positive influence on fear of dengue fever. Tourists who believed they were personally at risk of infection exhibited higher emotional arousal, consistent with earlier findings that highlight personal susceptibility as a key trigger of fear and risk perception in travel health behavior (Kock et al., 2020).

Both response efficacy (H3) and self-efficacy (H4) showed negative relationships with fear, aligning with PMT's theoretical premise that higher coping ability reduces emotional distress (Rogers, 1983). When travelers feel capable of preventing mosquito bites and confident in applying protective measures, their fear levels decline. This reinforces the idea that coping appraisal serves as an emotional buffer, mitigating the psychological impact of perceived threats.

Moreover, response cost (H10) was found to negatively affect protection motivation, indicating that perceptions of inconvenience or discomfort discourage engagement in preventive behavior. This finding aligns with prior PMT-based research showing that perceived barriers can hinder the translation of awareness into protective action (Zheng et al., 2021). Hence, while fear and efficacy influence emotional and cognitive pathways, practical considerations, including cost and convenience, remain critical in shaping tourists' willingness to act.

2) Direct and Mediating Roles of Fear in Protection Motivation

Perceived vulnerability (H6) and perceived severity (H7) both had significant positive impacts on protection motivation, suggesting that tourists who recognize the seriousness and likelihood of dengue infection are more likely to

take preventive measures. These results support PMT's assertion that threat appraisal forms the cognitive foundation of protective intentions (Bae & Chang, 2021; Prasetyo et al., 2020).

Furthermore, fear of dengue fever (H11) was found to significantly enhance protection motivation, confirming its mediating role between cognitive evaluations and behavioral intention. Emotional activation thus acts as a psychological mechanism converting perceived threats into proactive motivation. Moderate fear levels appear to heighten alertness and preparedness, echoing prior findings that adaptive fear can facilitate protection rather than avoidance (Grothmann & Reusswig, 2006; Babcicky & Seebauer, 2019).

Overall, the supported hypotheses reinforce that protection motivation in tourism health behavior is shaped by an interaction between cognitive appraisals of risk and emotional responses, particularly perceived vulnerability and fear.

3) Non-Significance of Hypotheses

While PMT received strong overall support, four hypothesized relationships (H2, H5, H8, and H9) were not significant, suggesting that some theoretical mechanisms may operate differently in tourism environments with the Chinese tourist context.

The lack of a significant relationship between perceived severity and fear suggests that recognizing the seriousness of dengue fever did not necessarily trigger stronger emotional arousal. This may reflect risk habituation, in which tourists acknowledge the severity of dengue but have become desensitized due to repetitive warnings (Witte & Allen, 2000). Moreover, when travelers believe the disease is manageable through simple preventive actions, its perceived seriousness may no longer evoke fear. Cultural tendencies might also contribute, as Chinese tourists, for example, tend to process risk more cognitively than emotionally, leading to lower fear responses (Kock et al., 2020).

Response cost was not significantly associated with fear, implying that perceived inconvenience or expense did not amplify emotional concern. Preventive actions such as applying repellent or wearing suitable clothing may be regarded as minor inconveniences, particularly among financially secure international visitors. Thus, response cost likely functions as a rational, cognitive deterrent rather than an emotional trigger (Milne et al., 2000).

Unexpectedly, the perceived effectiveness of preventive measures did not significantly predict protection motivation. This outcome may be attributed to overconfidence or saturation effects, as tourists might already believe that such measures are effective, leaving little variability in motivation. Additionally, reliance on external control mechanisms (e.g. hotel pest management or local sanitation efforts) might reduce the perceived need for personal action (Rogers, 1983; Babcicky & Seebauer, 2019). It is also possible that fear mediates the effect of response efficacy, making emotional activation a stronger predictor of intention than cognitive belief alone.

Similarly, self-efficacy did not significantly predict protection motivation, indicating that confidence in one's ability to protect oneself did not necessarily lead to behavioral intention. This may occur because tourists perceive limited control over environmental conditions (e.g. mosquito abundance), which diminishes the practical relevance of self-efficacy. Moreover, when high self-efficacy reduces fear excessively, it can also lessen the urgency to act (Rogers, 1983; Babcicky & Seebauer, 2019). In leisure contexts, emotional rather than cognitive drivers may therefore play a more dominant role in shaping protection behaviors.

7. Conclusion and Discussion

This research employed the PMT framework to examine how cognitive appraisals, specifically threat and coping evaluations, and the emotional response of fear influence tourists' motivation to protect themselves from dengue fever in

Phuket. The application of Structural Equation Modeling (SEM) revealed that most hypothesized relationships were statistically significant, confirming the utility of PMT in explaining health-related behavioral intentions within tourism contexts. The results indicate that perceived vulnerability (H1) has a strong positive effect on fear of dengue fever, while response efficacy (H3) and self-efficacy (H4) are negatively associated with fear. These findings are consistent with prior research on consumer behavioral change in the hospitality industry during the COVID-19 pandemic (Kim et al., 2022).

Furthermore, fear of dengue fever significantly increases protection motivation, supporting its mediating role between cognitive appraisals and behavioral intention. This finding aligns with results from the U.S. sample but contrasts with those from the South Korean sample reported in the study of COVID-19 contact-tracing technology by Hong and Cho (2025). The findings also show that perceived vulnerability (H6) and perceived severity (H7) significantly and positively influence protection motivation, indicating that greater awareness of dengue risk and seriousness increases tourists' willingness to adopt preventive behaviors, consistent with Ezati Rad (2021).

However, four hypotheses (H2, H5, H8, and H9) were not supported, indicating that not all theoretical dimensions of PMT exert an equivalent influence on tourists' emotional and motivational processes. Response cost (H5) was not significantly related to fear, suggesting that perceived inconvenience or expense did not heighten emotional concern, consistent with Kim et al. (2022). Response efficacy (H8) did not significantly predict protection motivation, contrasting with prior studies (Ezati Rad, 2021; Williams, 2015). Self-efficacy (H9) was also not a significant predictor of protection motivation, indicating that confidence in one's ability to take preventive actions did not necessarily translate into behavioral intention, contrary to earlier findings (Ezati Rad, 2021; Williams, 2015).

7.1 Theoretical Implications

The findings strengthen the dual-process conceptualization of PMT, where cognitive evaluations and affective reactions jointly influence protective behavior. Affective elements, particularly fear and perceived vulnerability, emerged in this study as stronger predictors of protection motivation than purely cognitive constructs involving perceived severity, efficacy, or cost. This suggests that in familiar but persistent health risks like dengue fever, tourists rely more on emotional cues than rational assessments when forming intentions to protect themselves.

The results also demonstrate PMT's contextual adaptability. While the theory effectively predicts behavior during acute crises (e.g. pandemics), its mechanisms operate differently in endemic or routine-risk situations, where emotional habituation and perceived environmental control may alter traditional pathways.

7.2 Practical Implications

The significant direct effects and mediating role identified in the study model, as discussed in the previous section, highlight, from both managerial and public health perspectives, the importance of developing communication strategies that effectively integrate emotional appeal with factual accuracy. Rather than focusing solely on the severity of dengue or the effectiveness of preventive measures, health communication should aim to foster a personal connection to the issue among travelers. For example, messages may emphasize that travelers to tropical destinations are commonly exposed to comparable health risks, while also highlighting that adopting simple preventive measures can substantially reduce these risks. Such balanced messaging can generate a sense of manageable concern and encourage proactive behavior without inducing excessive fear, which is identified as a key variable contributing to protection motivation in the study model.

From both managerial and public health perspectives, the results emphasize the importance of developing communication strategies that effectively combine emotional appeal with factual accuracy. Rather than focusing solely on the severity of dengue or the effectiveness of preventive measures, health communication should aim to help travelers develop a personal connection to the issue. For instance, messages could emphasize that travelers to tropical destinations are frequently exposed to comparable health risks. However, adopting simple preventive measures can substantially decrease these risks. Such balanced messaging can evoke a sense of manageable concern and encourage proactive behavior without inducing fear.

For hotel managers, reducing the response costs for guests to take protective actions is key. This can be achieved by offering insect repellents or repellent-infused amenities, ensuring rooms are equipped with screened windows or air conditioning, maintaining visible mosquito-control programs, and designing outdoor spaces to eliminate potential breeding areas. Displaying clear, multilingual health and safety information can also strengthen guests' confidence in the property's preventive measures.

For destination managers, a coordinated approach is needed to maintain a safe and sustainable environment. This includes area-wide mosquito control initiatives, consistent health communication across tourism touchpoints, enhanced drainage and waste management infrastructure, and active collaboration with local communities. Joint efforts between hospitality operators and public authorities can improve traveler trust, reinforce health security, and enhance the overall image of the destination.

7.3 Limitations and Recommendations for Future Research

This study has several limitations that should be considered when interpreting its findings. First, the data were collected during a period when Phuket was not experiencing a dengue fever outbreak. Consequently, tourists' perceived threat levels and protection motivation may have been lower than during periods of heightened disease transmission. Future research could therefore collect data during or immediately following outbreak periods to more accurately capture tourists' real-time risk perceptions and behavioral responses.

Second, the sample consisted exclusively of Chinese tourists. Although this group represents a major market segment in Phuket, it does not reflect the full diversity of international visitors. This limitation may constrain the generalizability of the findings to tourists from other cultural and demographic backgrounds. Future studies are encouraged to include participants from multiple nationalities and cultural contexts to enhance external validity and to provide comparative insights into cross-cultural differences in health risk perception and protection motivation.

References

Alam, S. S., Masukujjaman, M., Omar, N. A., Mohamed Makhbul, Z. K., & Helmi Ali, M. (2023). Protection motivation and travel intention after the COVID-19 vaccination: Fear and risk perception. *Journal of Quality Assurance in Hospitality & Tourism*, *24*(6), 930-956. https://doi.org/10.1080/1528008X.2022.2089948

Babcicky, P., & Seebauer, S. (2019). Unpacking protection motivation theory: Evidence for a separate protective and non-protective route in private flood mitigation behavior. *Journal of Risk Research*, *22*(12), 1503–1521. https://doi.org/10.1080/13669877.2018.1485175

Bae, S. Y., & Chang, P. J. (2021). The effect of coronavirus disease-19 (COVID-19) risk perception on behavioural intention towards 'untact' tourism in South Korea during the first wave of the pandemic (March 2020). *Current issues in Tourism, 24*(7), 1017-1035. DOI: 10.1080/13683500.2020.1798895

Balla, J., & Hagger, M. S. (2025). Protection motivation theory and health behaviour: conceptual review, discussion of limitations, and recommendations for best practice and future research. *Health Psychology Review*, *19*(1), 145-171. https://doi.org/10.1080/17437199.2024.2413011

Bęben, R., Kuczamer-Kłopotowska, S., Młynkowiak-Stawarz, A., & Półbrat, I. (2021). Tourist behavioral intentions during the covid-19 pandemic. The role of reactance, perceived risk and protection motivation. *Journal of Environmental Management & Tourism*, *12*(8), 2129-2147. https://journals.aserspublishing.eu/jemt/article/view/6657

Bi, X., Zhang, Q., Fan, K., Tang, S., Guan, H., & Liu, C. (2021). Risk culture and COVID-19 protective behaviors: A cross-sectional survey of residents in China. *Frontiers in Public Health, 9*, 686705. https://doi.org/10.3389/fpubh.2021.686705

Chua, B. L., Al-Ansi, A., Lee, M. J., & Han, H. (2021). Impact of health risk perception on avoidance of international travel in the wake of a pandemic. *Current Issues in Tourism*, 24(7), 985-1002.

Ezati Rad, R., Mohseni, S., Kamalzadeh Takhti, H., Hassani Azad, M., Shahabi, N., Aghamolaei, T., & Norozian, F. (2021). Application of the protection motivation theory for predicting COVID-19 preventive behaviors in Hormozgan, Iran: a cross-sectional study. *BMC Public Health, 21*(1), 466. https://doi.org/10.1186/s12889-021-10500-w

Farber, R., & Taylor, A. (2023). Global health diplomacy and commodified health care: health tourism in Malaysia and Thailand. *Studies in Comparative International Development*, *58*(3), 484-510. https://doi.org/10.1007/s12116-023-09406-y

Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, *30*(2), 407–429. https://doi.org/10.1111/j.1559-1816.2000.tb02323.x

Grobusch, M. P., Díaz-Menéndez, M., Bittencourt de Gomensoro, E., Mächler, C., & Milovanović, B. (2025). The burden of dengue fever in travellers: A systematic literature review. *New Microbes and New Infections*, 67, 101631, https://doi.org/10.1016/j.nmni.2025.101631

Grothmann, T., & Reusswig, F. (2006). People at risk of flooding: Why some residents take precautionary action while others do not. *Natural hazards*, 38(1), 101-120.

Hong, S. J., & Cho, H. (2025). Extending and testing protection motivation theory in the context of COVID-19 contact-tracing technology: A comparison of South Korea and the United States. *Health Communication, 40*(11), 2240-2253. https://doi.org/10.1080/10410236.2024.2447107

Jarumaneerat, T., Rabiul, M. K., Prideaux, B., & Promsivapallop, P. (2023). Pandemic travel fear, travel intention, and self-protection intention of Chinese residents: An application of protection motivation theory. *Asia Pacific Journal of Tourism Research*, *28*(9), 1019-1030. https://doi.org/10.1080/10941665.2023.2282982

Kim, J., Yang, K., Min, J., & White, B. (2022). Hope, fear, and consumer behavioral change amid COVID‐19: Application of protection motivation theory. *International Journal of Consumer Studies*, 46(2), 558-574. https://doi.org/10.1111/ijcs.12700

Kock, F., Nørfelt, A., Josiassen, A., Assaf, A. G., & Tsionas, M. G. (2020). Understanding the COVID-19 tourist psyche: The evolutionary tourism paradigm. *Annals of Tourism Research*, 85, 103053. https://doi.org/10.1016/j.annals.2020.103053

Luo, J. M., & Lam, C. F. (2020). Travel anxiety, risk attitude and travel intentions towards "travel bubble" destinations in Hong Kong: Effect of the fear of COVID-19. *International Journal of Environmental Research and Public Health*, 17(21), 7859. https://doi.org/10.3390/ijerph17217859

Marczell, K., García, E., Roiz, J., Sachdev, R., Towle, P., Shen, J., Sruamsiri, R., Mendes da Silva, B., & Hanley, R. (2024). The macroeconomic impact of a dengue outbreak: Case studies from Thailand and Brazil. *PLOS Neglected Tropical Diseases*, *18*(6), e0012201. https://doi.org/10.1371/journal.pntd.0012201

Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health-related behavior: A meta-analytic review of Protection Motivation Theory. *Journal of Applied Social Psychology*, *30*, 106–143. https://doi.org/10.1111/j.1559-1816.2000.tb02308.x

Ministry of Public Health. (2023). *Annual epidemiological surveillance report 2023*. Bureau of Epidemiology, Department of Disease Control, Ministry of Public Health, Thailand.

Narimani, S., Mozaffari, N., Soola, A. H., Nasiri, R., Omidi, T., Sedri, N., & Tavan, A. (2023). Risk communication and risk perception along with its influencing factors in Covid-19 disease: focusing on the extended parallel process model. *International Journal of Disaster Risk Reduction*, *86*, 103547. https://doi.org/10.1016/j.ijdrr.2023.103547

Ni, H., Cai, X., Ren, J., Dai, T., Zhou, J., Lin, J., Wang, Li., Wang, L., Pei, S., Yao, Y., Xu, T., Xiao, L., Liu, X., & Guo, P. (2024). Epidemiological characteristics and transmission dynamics of dengue fever in China. *Nature Communications, 15*(1). https://doi.org/10.1038/s41467-024-52460-w

Prasetyo, Y. T., Castillo, A. M., Salonga, L. J., Sia, J. A., & Seneta, J. A. (2020). Factors affecting perceived effectiveness of COVID-19 prevention measures among Filipinos during Enhanced Community Quarantine in Luzon, Philippines: Integrating Protection Motivation Theory and extended Theory of Planned Behavior. *International Journal of Infectious Diseases*, *99*, 312–323. https://doi.org/10.1016/j.ijid.2020.07.074

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology*, *91*(1), 93–114. https://doi.org/10.1080/00223980.1975.9915803

Rogers, R. W. (1983). Cognitive and psychological processes in fear appeals and attitude change: A revised theory of protection motivation. In J. T. Cacioppo & R. Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153–176). The Guilford Press.

Ruan, W., Kang, S., & Song, H. (2020). Applying protection motivation theory to understand international tourists' behavioural intentions under the threat of air pollution: A case of Beijing, China. *Current Issues in Tourism*, *23*(16), 2027-2041. DOI: 10.1080/13683500.2020.1743242

Ryu, K., Jarumaneerat, T., Promsivapallop, P., & Kim, M. (2023). What influences restaurant dining out and diners' self-protective intention during the COVID-19 pandemic: Applying the Protection Motivation Theory. *International Journal of Hospitality Management, 109*, 103400. https://doi.org/10.1016/j.ijhm.2022.103400

Sahavechaphan, N., Chatrattikorn, A., Rattananen, M., Sadakorn, P., Areechokchai, D., & Iamsirithaworn, S. (2024). Identifying villages and breeding habitats for dengue transmission in Thailand: Insights from long-term larval surveys. *BMC Infectious Diseases*, *24*, 523. https://doi.org/10.1186/s12879-024-09398-7

Saita, S., Maeakhian, S., & Silawan, T. (2022). Temporal variations and spatial clusters of dengue in Thailand: Longitudinal study before and during the coronavirus disease (covid-19) pandemic. *Tropical Medicine and Infectious Disease*, *7*(8), 171. https://doi.org/10.3390/tropicalmed7080171

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach* (7th ed.). John Wiley & Sons.

Seow, A. N., Choong, Y. O., Choong, C. K., & Moorthy, K. (2022). Health tourism: Behavioural intention and protection motivation theory. *Tourism Review*, *77*(2), 376-393. https://doi.org/10.1108/TR-11-2020-0546

Sharifirad, G., Yarmohammadi, P., Sharifabad, M. A. M., & Rahaei, Z. (2014). Determination of preventive behaviors for pandemic influenza A/H1N1 based on protection motivation theory among female high school students in Isfahan, Iran. *Journal of Education and Health Promotion*, *3*(1), *7*, 36-41. DOI: 10.4103/2277-9531.127556

Suess, C., Maddock, J. E., Dogru, T., Mody, M., & Lee, S. (2022). Using the Health Belief Model to examine travelers' willingness to vaccinate and support for vaccination requirements prior to travel. *Tourism Management*, *88*, 104405. https://doi.org/10.1016/j.tourman.2021.104405

Tan, C. H., & Lee, S. N. (2022). The impact of international tourist arrivals on economic growth under dengue fever risk in Malaysia. *Journal of Economics and Sustainability, 4*(2), 27-39. http://doi.org/10.32890/jes2022.4.2.3

Van Zomeren, M., Spears, R., & Leach, C. W. (2010). Experimental evidence for a dual pathway model analysis of coping with the climate crisis. *Journal of Environmental Psychology*, *30*(4), 339-346. https://doi.org/10.1016/j.jenvp.2010.02.006

Wang, J., Liu-Lastres, B., Ritchie, B. W., & Mills, D. J. (2019). Travellers' self-protections against health risks: An application of the full Protection Motivation Theory. *Annals of Tourism Research*, *78*, 102743. DOI: 10.1016/j.annals.2019.102743

Williams, L., Rasmussen, S., Kleczkowski, A., Maharaj, S., & Cairns, N. (2015). Protection motivation theory and social distancing behaviour in response to a simulated infectious disease epidemic. *Psychology, Health & Medicine*, *20*(7), 832–837. https://doi.org/10.1080/13548506.2015.1028946

Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior*, *27*(5), 591-615. https://doi.org/10.1177/109019810002700506

Xiao, H., Peng, M., Yan, H., Gao, M., Li, J., Yu, B., ... & Li, S. (2016). An instrument based on protection motivation theory to predict Chinese adolescents' intention to engage in protective behaviors against schistosomiasis. *Global health research and policy*, 1(1), 15.

Yue, Y., Liu, Q., Liu, X., Zhao, N., & Yin, W. (2022). Dengue fever in mainland China, 2005–2020: a descriptive analysis of dengue cases and Aedes data. *International Journal of Environmental Research and Public Health*, *19*(7), 3910. https://doi.org/10.3390/ijerph19073910

Zheng, D., Luo, Q., & Ritchie, B. W. (2021). Afraid to travel after Covid-19? Self-protection, coping and resilience against pandemic 'travel fear'. *Tourism Management, 83*, 104261. https://doi.org/10.1016/j.tourman.2020.104261