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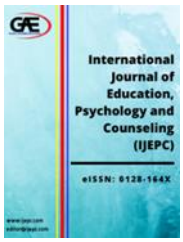


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# EXPLORING WILLINGNESS TO PAY FOR DENGUE VACCINE THROUGH THE HEALTH BELIEF MODEL: A QUALITATIVE VALIDATION STUDY IN PENINSULAR MALAYSIA

Muhammad Fauzannaim Badrul Hisham[1], Ahmad Firdhaus Arham[2*], Jamsari Alias[3], Nur Asmadayana Hasim[4], Noor Sharizad Rusly[5], Muhammad Firdaus Aziz[6]

[1] Pusat Pengajian Citra Universiti, Universiti Kebangsaan Malaysia, Malaysia
Email: p141089@siswa.ukm.edu.my
[2] Pusat Pengajian Citra Universiti, Universiti Kebangsaan Malaysia, Malaysia
Email: benferdaoz@ukm.edu.my
[3] Pusat Pengajian Citra Universiti, Universiti Kebangsaan Malaysia, Malaysia
Email: jamsari@ukm.edu.my
[4] Pusat Pengajian Citra Universiti, Universiti Kebangsaan Malaysia, Malaysia
Institut Islam Hadhari, Universiti Kebangsaan Malaysia, Malaysia
Email: asmadayana@ukm.edu.my
[5] Pusat Pengajian Citra Universiti, Universiti Kebangsaan Malaysia, Malaysia
Email: n.sharizadrusly@ukm.edu.my
[6] Pusat Pengajian Citra Universiti, Universiti Kebangsaan Malaysia, Malaysia
Email: firdaus95aziz@ukm.edu.my
[*] Corresponding Author

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**Abstract:**

Dengue fever continues to pose a serious public health threat in Malaysia, underscoring the need for comprehensive preventive strategies, including vaccination. Previous studies have emphasized the critical role of strategic communication in enhancing vaccine uptake, particularly by addressing concerns related to vaccine safety and affordability. These aspects are especially pertinent for low-income groups, where willingness to pay (WTP) is significantly influenced by economic constraints. Additionally, government subsidies and tiered pricing models have emerged as key determinants of WTP for the dengue vaccine. Socioeconomic and psychological factors also play a crucial role in shaping public attitudes toward vaccination. This study was conducted to explore the willingness to pay for dengue vaccine by the community in Peninsular Malaysia and to validate a proposed behavior model based on the Health Belief Model (HBM), using qualitative data. Focus group discussions (FGDs) were carried out with seven experts, all of whom were experts in science,

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technology and health. The data were transcripted and analyzed thematically. This study found the expert's validation on four prominent factors of HBM that significantly influence the behavior of Willingness to Pay the dengue vaccine. These factors include- perceived severity, self-efficacy, perceived barriers, and cues to action. Understanding these factors is vital for policymakers aiming to design targeted interventions that enhance vaccine uptake. Moreover, health communicators can leverage these insights to develop evidence-based strategies that effectively address public concerns. The study recommends that future research incorporate quantitative methods to validate these findings and build a robust predictive model of WTP for the dengue vaccine in Malaysia, thereby supporting informed policy and communication strategies.

**Keywords:**

Dengue Vaccine, Health Belief Model, Peninsular Malaysia, Psychological Factors, Willingness To Pay

## Introduction

As of April 9, 2025, Peninsular Malaysia has documented an aggregate total of 12,795 dengue cases since December 31, 2023 (iPortal Dengue, Ministry of Health Malaysia). The dengue virus represents a considerable challenge to public health, especially in tropical and subtropical areas, where its propagation is intensified by factors such as urbanization, climate change, and globalization. The World Health Organization approximates that nearly 390 million individuals are affected each year, with 96 million exhibiting clinical manifestations (Ullah, 2024). Dengue fever continues to represent a significant public health concern in Malaysia, particularly in Peninsular regions where accelerated urbanization, climate change, and inadequate vector control measures have exacerbated the proliferation of Aedes mosquitoes Mudin (2015). The data from 2022 to 2024 indicates that dengue fever continues to represent a significant challenge in Peninsular Malaysia, particularly in highly urbanized states. Targeted vector control, community education, and environmental management are imperative in high-risk areas such as Selangor, Johor, and Kuala Lumpur (Taib and Atil, 2023). Simultaneously, maintaining vigilance in states with lower case counts is crucial to avert future outbreaks. Continuous efforts from public health authorities, municipal councils, and community members are essential to mitigate the spread of dengue and lessen its impact on the Malaysian populace. In the absence of a specific antiviral treatment, preventive measures such as vaccination have become increasingly vital in the fight against dengue. Nonetheless, despite the existence of dengue vaccines, including Dengvaxia and TAK-003 (Qdenga), their acceptance remains constrained, particularly within communities in developing nations (Possas et al., 2024). This prompts a pivotal inquiry into the factors that influence individuals' willingness to pay (WTP) for these vaccines.

Willingness to pay (WTP) constitutes a fundamental construct in health economics, quantifying the monetary valuation that individuals are prepared to allocate for obtaining a healthcare service or preventive intervention (Abbas, Usmani and Imran, 2018). In the context of vaccination, WTP signifies the extent to which an individual values protection against a specific disease and is frequently molded by perceived severity, personal vulnerability, and the economic feasibility of the vaccine. In developing nations such as Malaysia, where healthcare

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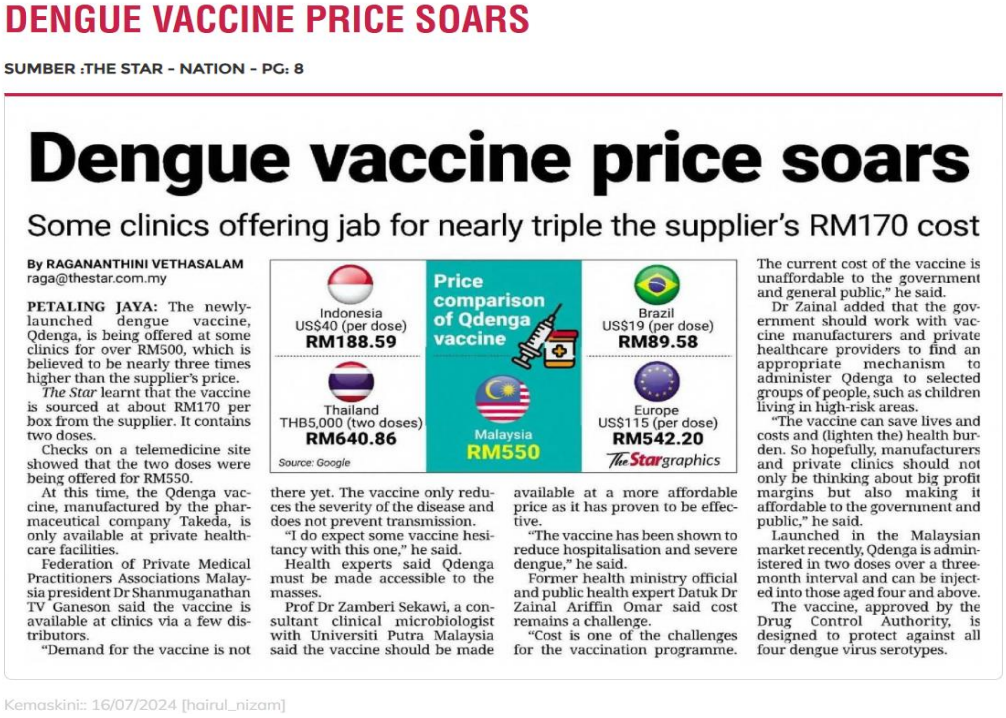
services are typically subsidized, comprehending WTP can assist policymakers in devising optimal pricing and subsidy frameworks that ensure equitable access to healthcare interventions (Lofgren, et al., 2021). The willingness to pay for a health intervention, such as the dengue vaccine, constitutes a multifaceted decision shaped by a complex interaction of socioeconomic and psychological determinants (Harapan et al., 2017) and (Fajar and Harapan, 2017). Previous experiences with the disease, perceived susceptibility, health literacy, income, educational attainment, and trust in healthcare systems may considerably affect public acceptance. Within the Malaysian context, there exists a paucity of research that has comprehensively investigated how these multidimensional factors converge to influence vaccine uptake behavior, particularly from psychological and cultural vantage points.



DENGUE VACCINE PRICE SOARS

SUMBER :THE STAR - NATION - PG: 8

# Dengue vaccine price soars

## Some clinics offering jab for nearly triple the supplier's RM170 cost

By RAGANANTHINI VETHASALAM
raga@thestar.com.my

**PETALING JAYA:** The newly-launched dengue vaccine, Qdenga, is being offered at some clinics for over RM500, which is believed to be nearly three times higher than the supplier's price.

*The Star* learnt that the vaccine is sourced at about RM170 per box from the supplier. It contains two doses.

Checks on a telemedicine site showed that the two doses were being offered for RM550.

At this time, the Qdenga vaccine, manufactured by the pharmaceutical company Takeda, is only available at private healthcare facilities.

Federation of Private Medical Practitioners Associations Malaysia president Dr Shanmuganathan TV Ganeson said the vaccine is available at clinics via a few distributors.

"Demand for the vaccine is not there yet. The vaccine only reduces the severity of the disease and does not prevent transmission.

"I do expect some vaccine hesitancy with this one," he said.

Health experts said Qdenga must be made accessible to the masses.

Prof Dr Zamberi Sekawi, a consultant clinical microbiologist with Universiti Putra Malaysia said the vaccine should be made available at a more affordable price as it has proven to be effective.

"The vaccine has been shown to reduce hospitalisation and severe dengue," he said.

Former health ministry official and public health expert Datuk Dr Zainal Ariffin Omar said cost remains a challenge.

"Cost is one of the challenges for the vaccination programme. The current cost of the vaccine is unaffordable to the government and general public," he said.

Dr Zainal added that the government should work with vaccine manufacturers and private healthcare providers to find an appropriate mechanism to administer Qdenga to selected groups of people, such as children living in high-risk areas.

"The vaccine can save lives and costs and (lighten the) health burden. So hopefully, manufacturers and private clinics should not only be thinking about big profit margins but also making it affordable to the government and public," he said.

Launched in the Malaysian market recently, Qdenga is administered in two doses over a three-month interval and can be injected into those aged four and above.

The vaccine, approved by the Drug Control Authority, is designed to protect against all four dengue virus serotypes.

Price comparison of Qdenga vaccine

Indonesia
US$40 (per dose)
RM188.59

Brazil
US$19 (per dose)
RM89.58

Thailand
THB5,000 (two doses)
RM640.86

Malaysia
RM550

Europe
US$115 (per dose)
RM542.20

Source: Google

The Star graphics

Kemaskini:: 16/07/2024 [hairul_nizam]

**Figure 1: The Star News, 2024 Edited Version by Hairul Nizam, UPM.**

Following the (Arifah et al., 2018) the willingness to pay (WTP) for the dengue vaccination among healthcare professionals encompass perceptions regarding immunization and dengue prevention strategies, which correspond with the Health Belief Model. This theoretical framework posits that individuals' convictions regarding health threats and advantages significantly affect their health-related actions, including WTP. This study intends to address this deficiency by investigating the socioeconomic and psychological determinants that influence the willingness to pay for the dengue vaccine among communities in Peninsular Malaysia. Employing a qualitative approach, this research adopts and expands from Model for Stakeholders' Acceptance to Adopt the Vaccine Dengue by Arham et al.'s (2022) in Malaysia and incorporating additional factors from the Health Belief Model (Rosenstock, 1974), to foster a more comprehensive understanding of vaccine acceptance behavior. The outcomes of this research will contribute to the development of effective, culturally sensitive health communication strategies and policy interventions aimed at enhancing vaccination coverage and mitigating the dengue burden in Peninsular Malaysia.

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## Literature Review

### *Dengue Vaccination in Malaysia*

Malaysia has encountered recurrent dengue epidemics for several decades, characterized by an increase in incidence rates particularly within urban and semi-urban locales where factors such as stagnant water, inadequate waste management, and construction activities create optimal environments for mosquito proliferation (Mudin, 2015) and (Jamil et al. 2021). Notwithstanding governmental initiatives encompassing fogging operations, public awareness campaigns, and community sanitation programs, these strategies have been demonstrably inadequate in mitigating dengue transmission (Cenedesi Júnior et al. 2024). In Peninsular Malaysia, regions including Selangor, Kuala Lumpur and Putrajaya consistently exhibit the highest annual incidence of dengue cases, attributable to their high population density and extensive urbanization (Abas, Shamsuddin and Halim, 2018). However, Selangor and Johor state Johor are identified as major hubs of DENV emergence and spread in Malaysia (Chem et al. 2024). The ongoing escalation of cases has prompted a reinvigorated emphasis on preventive measures, particularly through vaccination efforts. Nevertheless, the public's acceptance of the dengue vaccine remains markedly low. Factors contributing to this situation include apprehensions regarding safety linked to the Dengvaxia controversy, a deficiency in public knowledge, and an absence of coherent vaccination policy enforcement, particularly within economically disadvantaged and high-risk urban areas.

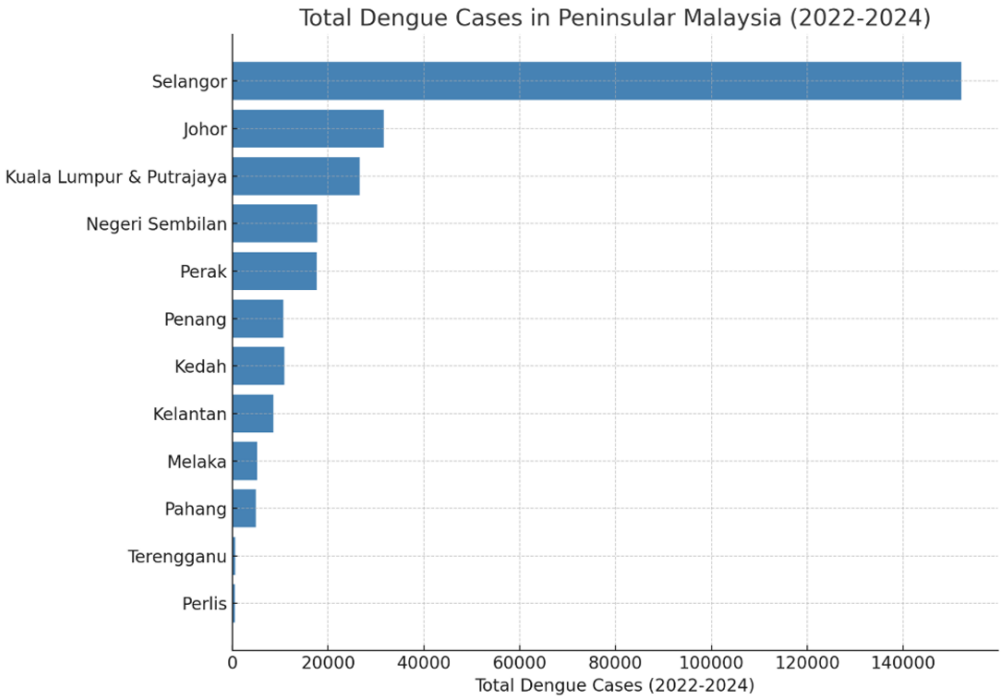


**Table 1: Total Dengue Cases By State In Peninsular Malaysia (2021-2024) by (iDengue Portal, Ministry of Health Malaysia).**

Dengue fever persists as a substantial public health issue in Malaysia, particularly within Peninsular Malaysia, where factors such as urbanization, population density, and climatic conditions facilitate the proliferation of the disease (Mudin, 2015). According to data collected from 2022 to 2024, Selangor reported the highest incidence of dengue cases, significantly

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surpassing that of other states in the region. This report endeavors to examine the distribution of dengue cases throughout Peninsular Malaysia and to discern patterns that may guide future public health initiatives.

Selangor, recognized as the most populous and urbanized state in Malaysia, documented approximately 152,150 cases over the three-year span (iPortal Dengue, Ministry of Health). This figure constitutes nearly fifty percent of all recorded cases nationwide during the same period. The elevated number is likely due to the high population density, swift urban development, and extensive construction activities, which establish optimal breeding environments for Aedes mosquitoes—the primary vectors responsible for dengue transmission (Kolimenakis et al. 2021).

Other states exhibiting a notable number of cases include Johor (31,612 cases), Kuala Lumpur and Putrajaya (26,563 cases), and Negeri Sembilan (17,656 cases). These regions also showcase significant levels of urban advancement and population mobility, which may further contribute to the continuous transmission of the virus. Moderate case counts were observed in states such as Perak (17,624 cases), Kedah (10,831 cases), and Penang (10,656 cases). Although these areas do not experience the same population density as Selangor or Kuala Lumpur, urban centers like Ipoh, Alor Setar, and George Town have encountered frequent outbreaks historically, indicating that localized factors such as 4 sanitation practices, community awareness, and vector control measures may be influential (Lee, 1994). On the lower end of the scale are Kelantan (8,522 cases), Melaka (5,249 cases), and Pahang (4,908 cases). Despite their smaller populations and predominantly rural landscapes, these states are not exempt from dengue outbreaks. The case numbers, although comparatively lower, still signify a public health concern that necessitates ongoing monitoring and intervention.

Terengganu and Perlis recorded the lowest figures among Peninsular states, with 597 and 484 cases, respectively. These states benefit from smaller populations and potentially more efficacious local control measures. However, underreporting or delayed diagnosis in more rural settings may also be contributing factors. In conclusion, the data from 2022 to 2024 indicates that dengue fever continues to represent a significant challenge in Peninsular Malaysia, particularly in highly urbanized states. Targeted vector control, vaccination, community education, and environmental management are imperative in high risk areas such as Selangor, Johor, and Kuala Lumpur (Taib and Atil, 2023) & . Simultaneously, maintaining vigilance in states with lower case counts is crucial to avert future outbreaks. Continuous efforts from public health authorities, municipal councils, and community members are essential to mitigate the spread of dengue and lessen its impact on the Malaysian populace.

***Willingness to Pay (WTP) for Health Interventions***

Willingness to pay (WTP) constitutes a fundamental construct in health economics, quantifying the monetary valuation that individuals are prepared to allocate for obtaining a healthcare service or preventive intervention (Abbas, Usmani & Imran, 2018). In the context of vaccination, WTP signifies the extent to which an individual values protection against a specific disease and is frequently molded by perceived severity, personal vulnerability, and the economic feasibility of the vaccine. In developing nations such as Malaysia, where healthcare services are typically subsidized, comprehending WTP can assist policymakers in devising optimal pricing and subsidy frameworks that ensure equitable access to healthcare interventions (Lofgren, et al., 2021). Although WTP investigations have been conducted across

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various health domains globally, scholarly research concentrating on dengue vaccination in Malaysia remains notably limited. The majority of existing studies utilize quantitative survey methodologies, which, while advantageous for statistical evaluation, may fail to encapsulate the intricate beliefs, anxieties, and motivations influencing an individual's willingness to pay (Breidert, Hahsler & Reutterer, 2017). There exists a critical need to examine WTP through a qualitative lens that integrates local sociocultural dynamics, perceptions of healthcare systems, and emotional reactions to disease threats Ratnasari (2023). Gaining insights into these profound psychological and contextual determinants can significantly enhance the pertinence and efficacy of public health strategies concerning vaccine adoption.

***Socioeconomic Determinants of Vaccine Acceptance***

A multitude of studies has delineated significant socioeconomic variables, including income level, educational attainment, and residential location, as pivotal determinants of vaccine acceptance. Individuals possessing elevated income and education levels typically demonstrate 5 enhanced health literacy, culminating in a heightened acceptance of medical innovations (Svendsen et al., 2020). Geographic context, particularly residence in high-risk dengue zones, has also been correlated with an increased perceived necessity for vaccination. Furthermore, the geographical context of residence particularly within high-risk dengue transmission zones constitutes a critical factor in influencing perceptions regarding the necessity of vaccination (Shabadi & Vidya, 2017). Following by (McFee, 2018), individuals residing in areas endemic to dengue also frequently possess direct experiences or significant exposure to the ramifications of the disease, which may amplify their self-efficacy and the urgency for immunization. Nonetheless, even within these high-risk locales, the issue of affordability persists as a considerable impediment. In the absence of adequate governmental intervention or subsidy frameworks, economically disadvantaged households may prioritize immediate financial obligations over the adoption of long-term preventive health strategies, such as vaccination (Essue et al., 2018). Therefore, comprehending these socioeconomic inequalities is imperative for the formulation of equitable vaccine dissemination and pricing strategies. Following by (Sacre et al., 2022) comprehending socioeconomic inequalities is crucial for developing effective interventions to increase vaccine uptake. Understanding factors like socioeconomic status, education, and residence can inform equitable vaccine dissemination and pricing strategies, ultimately improving health outcomes across diverse populations.

***Psychological Drivers and the Health Belief Model (HBM)***

The Health Belief Model (HBM) has been extensively employed to forecast and comprehend health-related behaviors across a multitude of contexts. Its fundamental elements; perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action, offer a valuable framework for analyzing how individuals arrive at decisions concerning preventive health measures (Green & Murphy, 2014). In the realm of dengue, individuals who regard themselves as highly susceptible to infection and who comprehend the potential gravity of the disease are more inclined to appreciate vaccination as a means of protection (Fajar & Harapan, 2017) & (Zamzuri et al., 2022). These psychological constructs frequently surpass even socioeconomic limitations, establishing them as significant determinants of willingness to pay (WTP). Perceived barrier, including apprehensions regarding vaccine safety, potential side effects, or financial implications, may dissuade individuals from pursuing vaccination, even when they recognize its advantages. Conversely, cues to action, such as governmental initiatives, social influence, or a dengue outbreak within one's community can serve as catalysts that inspire individuals to seek vaccination (Morgan et

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al., 2010). Self-efficacy, defined as the confidence in one's capacity to procure and receive the vaccine, also occupies a pivotal role in the ultimate decision-making process (Cadeddu, 2021). By integrating the HBM into the discourse on vaccine acceptance, researchers and policymakers can enhance their understanding and address the psychological barriers that affect WTP among various demographic segments of the population (Tuckerman, Kaufman, & Danchin, 2022).

### *Cultural and Religious Factors*

Cultural and religious convictions are profoundly interconnected with health behaviors within Malaysia's diverse ethnic society (Kamarzaman et al., 2024). In numerous communities, choices pertaining to medical treatment, encompassing vaccination, are not derived exclusively from scientific rationale but are rather swayed by spiritual values, religious doctrines, and traditional customs. For example, certain individuals may ponder the permissibility of vaccines 6 (halal) or their congruence with religious practices. This consideration holds particular significance within predominantly Muslim demographics, where the notion of religious permissibility markedly influences public endorsement of medical interventions (Aboul-Enein et al., 2025). Consequently, misinformation or an absence of religious guidance regarding vaccination may serve as an impediment to vaccine adoption (Andrew, 2022). Arham et al. (2022) presented a stakeholder acceptance model that incorporates these sociocultural elements into a more comprehensive framework of health behavior. Their model underscores the significance of religiosity, confidence in pivotal stakeholders (such as governmental authorities, healthcare professionals, and pharmaceutical enterprises), and societal perceptions towards technology. These facets enhance the Health Belief Model by introducing a culturally contextual dimension to vaccine acceptance theory. In Malaysia, where trust in governmental and health institutions may fluctuate across various communities, these elements are vital in shaping not only attitudes but also willingness to pay (WTP) for health innovations such as the dengue vaccine (Shafie et al., 2023). Therefore, the incorporation of cultural and religious considerations into public health strategies is imperative for fostering extensive and inclusive vaccine acceptance.

## Methods and Material

### *Participants*

This study took place in Peninsular Malaysia between May 2024 until December 2024. The FGDs were conducted on 7 June 2024 and involved 7 experts. The selection of the experts pertains to individuals who are regarded as having a vested interest in the domains of science and health. The experts comprise science, technology and health in Malaysia. The aggregate number of experts is seven. Consequently, the sample size employed in this study adheres to the requisite sample size criteria for the Focus Group Discussion (FGD) methodology. Additionally, the experts were selected to validate the four factors from the well established model, Health Belief Model (Rosenstock, 1974). The conceptual framework of the study humbly drew inspiration from (Amin and Hashim, 2015) model of stakeholders' attitudes concerning genetically modified Aedes mosquitoes, which also relied on (Fishbein & Ajzen, 1975). The model was thoughtfully developed by gathering a list of the predictor elements that may influence opinions related to the fogging technique. By exploring (Arham et al. 2022) and Health Belief Model (Rosenstock, 1974), researcher can make an improvement in Exploring Willingness to Pay for Dengue Vaccine Through The Health Belief Model: A Qualitative

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Validation Study in Peninsular Malaysia. To ensure anonymity, the personal details of every participant were removed and each was assigned a code, as shown in Table 3.

***Data Collection***

All experts were contacted by email or telephone prior to the FGDs to obtain their consent. The FGDs were conducted in Ruang Aktiv Room, Faculty of Science & Technology, Universiti Kebangsaan Malaysia (UKM). The experts were asked to deliberate and respond to open-ended and semi-structured questions to elicit as much information as possible. Each discussion lasted between 2 and 3 hours. All discussions and interviews were recorded using video camera, handwritten notes, and email transaction logs.

***Data Analysis & Research Process***

All data was transcribed verbatim. Transcribing the recordings manually enabled the researchers to acquire familiarity and deeper insight into the data (Corden and Sainsbuury 2006). The transcribed data was analysed using thematic analysis, which captures the views, emotions, experiences, and concerns from the experts. Once the raw data were transcribed and cleaned, the improvements and analysis results for Exploring Willingness To Pay For Dengue Vaccine Through The Health Belief Model: A Qualitative Validation Study In Peninsular Malaysia. This is important to ensure that the basis for the formation of the attitude model is organized and easy to understand by future researchers. The researcher conducted a focus group discussion (FGD) to validate and suggest improvements to the Arham model through the HBM model. This meets critical requirements for producing and maintaining an acceptable consolidated version of the core principles that can be systematically determined (Canibano and Mora, 2000).

| **Research process by (Nyumba et al. 2018)** | |
|---|---|
| Research Design | |
| Identify Research Objectives | - Identify the purpose of the FGD.<br>- Develop key questions (FGD Protocol Document).<br>- Obtain ethics clearance. |
| Identify and Recruit FGD Participants | - Ensure homogeneous participant composition.<br>- Develop questions based on expertise, education, and language.<br>- Determine number of participants (4–15 per session).<br>- Assign moderator and assistant. |
| Identify Suitable Location | - Choose an accessible, quiet, and properly sized venue.<br>- Arrange necessary materials (recording devices, consent forms, name tags). |
| Data Collection | |
| Pre-Session Preparation | - Familiarize with the script, group dynamics, seating arrangements, equipment setup.<br>- Record timing for each session. |

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| | |
|---|---|
| Facilitation During Discussion | - Begin with introductions, consent, and discussion rules.<br>- Record and observe discussions.<br>- Follow up on incomplete answers.<br>- Summarize the session and confirm participant presence. |
| Analysis | |
| Options Include | - Ranking lists.<br>- Coding key ideas and themes.<br>- Content analysis of discussions and dialogue. |
| Results and Reporting | |
| Identify Target Users | - Academic experts<br>- Policymakers and practitioners<br>- Study participants |

**Table 2: Research Process**

| Participant Number | Designation | Institution |
|---|---|---|
| P1 | Research Officer (Molecular Diagnostics & Protein). | Pathology Department, Kuala Lumpur Hospital. |
| P2 | Head of Physical Medicine. | Physics Unit, Department of Nuclear Medicine, Kuala Lumpur Hospital. |
| P3 | Science Officer (Chemistry). | Department of Chemistry, Faculty of Science, University of Malaya. |
| P4 | Clinical Scientist (Microbiology). | Segamat Hospital. |
| P5 | Science Officer & Senior Assistant Director General. | Accreditation Division, Department of Standards Malaysia. |
| P6 | Science Officer (Microbiology). | Pathology Department, Sultanah Bahiyah Hospital. |
| P7 | Science Officer (Biomedical). | Pathology Department, Cyberjaya Hospital |

**Table 3: Profiles Of Participants**

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## Results

Overall, the FGDs ended positively. The experts shared many common values and, except for a few smaller details, agreed on all principal matters. Four key constructs from the Health Belief Model were identified by the experts as being closely aligned with individuals' willingness to pay (WTP) for dengue vaccines. These include perceived severity, self-efficacy, perceived barriers, and cues to action. Each of these factors plays a significant role in shaping attitudes toward vaccination, influencing both the perceived value of the vaccine and the likelihood of financial commitment toward its uptake. Their conclusions were based on their professional and expert views of science, technology and research. They also appreciated the improvement from the Health Belief Model and how we are able to demonstrate the vaccine dengue acceptance towards the willingness to pay in peninsular Malaysia and strongly supported the idea of embedding them into the proposed community's behaviors in peninsular Malaysia.

## Perceived Severity

The recognition of the severity of dengue fever possesses the capacity to motivate individuals to pursue vaccination. A thorough understanding of the perils associated with dengue is significantly more efficacious in enhancing awareness than mere public knowledge concerning the dengue vaccine.

### *Awareness Of The Dangers Of Dengue Disease*

In the opinion of P4, "Awareness in terms of knowledge, if the public lacks awareness, they remain oblivious to the fact that dengue is indeed perilous." (P4). The assertion made by P4 was further corroborated by P5, "They possess considerable knowledge about dengue, as they know. However, when it comes to treatment, there are numerous options available now; if they really comprehend the severity of dengue and the pain it inflicts, they know the vaccine to safeguard themselves from harm." (P5).

### *Knowledge About Dengue And Vaccines*

Once again, according to P4, "I do not believe that the vaccine holds significant importance once an individual grasps the nature of the disease (dengue). They will seek the medicinal intervention (vaccine)." (P4).

### *Impact On Health*

P5 additionally commented and supported the discussion by stating, "Observe the detrimental impact that dengue has." (P5).

When an individual experiences the affliction of dengue, the person is likely to pursue vaccination as a precautionary measure to avert future occurrences of the disease. All validity experts concurred with the assertions made by P4 and P5. The research conducted by Duong et al. (2024) underscored that thorough awareness of the disease's severity can catalyze community-oriented preventive measures. Consequently, the study by Mulakoli, Ongeso and Musembi (2024) posits that enhancing public knowledge regarding dengue and its concomitant risks is vital for fostering vaccine acceptance. By amplifying awareness, the public can attain a better comprehension of the significance of vaccination as a preventive strategy against dengue fever. Disseminating this knowledge is imperative to enhance public health responses to outbreaks, as an informed populace is more inclined to engage in vaccination initiatives.

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Initiatives pertaining to the dengue vaccine hinge upon cooperation and innovation to efficiently combat the virus in endemic regions.

**Self-efficacy**

The efficacy of the vaccine against all dengue serotypes significantly influences favorable perceptions towards its administration.

***Protection From All Serotypes***

As articulated by P5, "Ideally, we aspire for a vaccine that encompasses all serotypes, do we not?" (P5) He further asserts, "Because if we do not receive it, the situation will undoubtedly deteriorate, potentially escalating to the severity of hemorrhagic dengue fever, would it not?" (P5).

***Confidence In The Vaccine***

"It represents an attitude. However, empirical evidence must precede it. If it remains unsubstantiated, what rationale exists for attempting this vaccine? Thus, it is imperative to alter individuals' perceptions or apprehensions." (P2).

***Experience With The Vaccine***

As noted by P1, "I believe there is a necessity for awareness initiatives regarding the experiences of individuals who have contracted dengue; they should serve as influencers among those who have never encountered it. Only then will the latter comprehend whether they are afflicted or not." (P1).

All validity experts unanimously concurred with the recommendations and perspectives of validity experts P1, P2, and P5. Consequently, it is essential to comprehend these self-efficacy factors to evaluate the degree to which public awareness of vaccine efficacy will influence health outcomes. Thus, according to the research conducted by Saadatian-Elahi et al. (2016), it is underscored that grasping the self-efficacy in relation to vaccines is crucial for assessing public awareness and attitudes towards vaccination. These factors possess the potential to affect individuals' decisions regarding vaccine acceptance, as apprehensions concerning safety, efficacy, and possible adverse effects may hinder their willingness to be vaccinated. By addressing these perceptions, public health initiatives can enhance educational efforts directed at the populace, ultimately fostering vaccine acceptance and improving overall health outcomes Braun & Fischer (2024). Acknowledging and alleviating these concerns is vital for optimizing the public health impact of vaccines.

**Perceived Barriers**

Negative perceptions of barriers that individuals perceive may hinder their willingness to receive vaccination. This issue can be addressed through the implementation of effective communication strategies aimed at instilling confidence within the community.

***Barriers To Vaccine Acceptance***

In accordance with the insights and recommendations put forth by P3, "Perceived barriers frequently resemble an individual's unfavorable viewpoint on a certain matter. Consequently, this can be altered through proficient methods such as instilling confidence in the vaccine." (P3). Moreover, "In contemporary society, numerous individuals disseminate negative information, leading others to occasionally believe such claims. Thus, it is crucial to ascertain

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whether Malaysians harbor these perceptions. If such perceptions exist and are relevant, it is imperative that we take appropriate action." (P3) "Yes, I believe that perceived barriers, perceived severity, and risk are vital for us to comprehend the level of perception and the sentiments of individuals regarding vaccine acceptance." (P6).

All validity experts concurred with the recommendations and endorsements from P3 and P6 pertaining to the factors of perceived barriers. Perceived barriers have been recognized as a pivotal determinant of health behavior, significantly influencing individuals' decisions to partake in preventive measures, such as vaccination (Sulistyo and Sulistyowati, 2024). Consequently, as stated by Vanderslott et al. (2022), to alleviate perceived severity, governmental institutions ought to engage with communities to gain an understanding of their experiences and concerns, rather than merely attributing hesitance to ignorance. This necessitates the promotion of transparent communication, the establishment of trust, and the addressing of structural determinants of vaccine uptake, which can assist in alleviating fear and enhancing public confidence in vaccination initiatives.

**Cues to Action**

Indicators that prompt action encompass governmental policies and the collective experience with governmental directives, both of which are crucial in fostering vaccination initiatives.

***Policies***

P6 articulated and asserted that, "Enforcement is more robust. That is the rationale behind the establishment of Act 342 (Prevention and Control of Infectious Diseases Act)" (P6).

***Action By The Government***

"Confidence is paramount; only then can we implement enforcement, correct? The government must educate the populace regarding vaccines, employing all available channels, not solely social media, and must reach out to rural communities" (P2).

***Experience With Government Directives***

According to P2, "Government directives necessitate compliance from all staff, who must also exemplify appropriate behavior to cultivate trust regarding vaccine acceptance" (P2) & (P7)

Consequently, effective and robust policies may serve to provide additional motivation for the community to embrace vaccination with heightened confidence. All validity experts concurred and unequivocally endorsed the recommendations and perspectives presented by P2 and P6.

| Construct | Themes | Key Insights from Experts | Supporting Literature |
|---|---|---|---|
| **Perceived Severity** | - Awareness of the dangers of dengue disease<br>- Knowledge about dengue & vaccine<br>- Impact on health | - Public awareness of the dangers of dengue is essential to motivate vaccine uptake (P4, P5).<br>- They will understand vaccine once they understands dengue disease. They'll just go for the vaccine anyway. (P4) | - Duong et al. (2024).<br>- Mulakoli et al. (2024). |

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| | | | |
|---|---|---|---|
| **Self-efficacy** | - Protection from all serotypes<br>- Confidence in vaccine<br>- Experience with the vaccine | - Belief in comprehensive vaccine coverage (P5).<br>- Evidence-based promotion needed to counter hesitancy (P2).<br>- Peer influence and personal experience drive acceptance (P1). | - Saadatian-Elahi et al. (2016).<br>- Braun & Fischer (2024) |
| **Perceived Barriers** | - Barriers to vaccine acceptance | - Negative beliefs can be changed via confident messaging and community engagement (P3, P6).<br>- Government must understand and address real community concerns (P6) | - Sulistyo and Sulistyowati (2024).<br>- Vanderslott et al. (2022). |
| **Cues to Action** | - Government policy enforcement<br>- Action by the government<br>- Experience with government directives | - Strong policy (e.g., Act 342) and consistent government action inspire public confidence (P2, P6).<br>- All staff follow government rules and act right to build trust in vaccines. (P2,P7) | - Shafie et al. (2023).<br>- Anwar et al. (2023). - Torresi et al. (2013). |

**Table 4: Summary Of Main Findings Based On Health Belief Model Constructs.**

In conclusion, all validity experts proposed 4 factors pertinent to the investigation of developing a model that elucidates attitudes and willingness to pay for dengue vaccination within the community in Peninsular Malaysia. Furthermore, all experts concurred that by enhancing the indicators for action, the community would experience an amplified sense of reassurance. According to the research conducted by Shafie et al. (2023), trust in the healthcare system and governmental institutions plays a pivotal role in the acceptance of vaccines. National health authorities are urged to elevate awareness regarding the benefits of dengue vaccination and to prepare for the expedited introduction of the vaccine following regulatory endorsement. Elevated trust is closely associated with an increased willingness to receive the vaccine, as noted by Torresi et al. (2013). According to the findings of Anwar et al. (2023), mass media assumes a significant role in vaccination initiatives by shaping public attitudes, disseminating precise information, and countering misinformation. It serves as a platform for health campaigns, addressing vaccine hesitancy and promoting confidence in vaccines. Additionally, the media can unify communities through awareness endeavors, while also providing updates on statistics and the safety of vaccinations. However, it is imperative that the information disseminated originates from credible sources to mitigate the proliferation of conspiracy theories and myths that could hinder vaccination efforts.

## Discussion

The outcomes derived from this research yield significant insights into the intricate relationship between socioeconomic and psychological factors that govern the willingness to pay (WTP) for the dengue vaccine in Peninsular Malaysia. Through the focus group discussions (FGDs) conducted with experts in the fields of science, technology and health, it became apparent that

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the acceptance of the vaccine and the financial commitment required are influenced not by a solitary factor, but rather by a multifaceted array of determinants, which encompass attitudes, perceived risks and benefits, socioeconomic conditions, cultural norms, and psychological preparedness. These findings serve to validate and refine Health Belief Model (HBM) Rosenstock's (1974), thereby offering a more comprehensive framework for understanding the acceptance of the dengue vaccine.

From a psychological perspective, elements such as perceived severity, self-efficacy, barriers, and cues to action were identified as critical determinants shaping vaccine-related decisions. Awareness of the potential severity associated with dengue, encompassing its life-threatening complications, heightened vaccine motivation among participants (Angel and Reyes-del Valle, 2013). Similarly, confidence in one's ability to procure and afford the vaccine (self-efficacy) and reassurance stemming from governmental policies and campaigns (cues to action) bolstered positive health behaviors (Baumer-Mouradian et al. 2024). The convergence of these findings with the Health Belief Model (HBM) indicates that psychological readiness serves as a potent catalyst for preventive health behavior, frequently transcending economic limitations.

Perceived barriers such as vaccine misinformation, social stigma, and insufficient educational resources were recognized as substantial impediments. The experts underscored the escalating role of digital platforms in disseminating both accurate and misleading information, thereby accentuating the necessity for strategic health communication that is specifically tailored to distinct demographic groups (Odongo, 2024). A multitude of studies has delineated significant socioeconomic variables, including income level, educational attainment, and residential location, as pivotal determinants of vaccine acceptance. Individuals possessing elevated income and education levels typically demonstrate enhanced health literacy, culminating in a heightened acceptance of medical innovations (Svendsen et al. 2020). Geographic context, particularly residence in high-risk dengue zones, has also been correlated with an increased perceived necessity for vaccination. Furthermore, the geographical context of residence, particularly within high-risk dengue transmission zones, constitutes a critical factor in influencing perceptions regarding the necessity of vaccination (Shabadi and Vidya, 2017). Following by (McFee, 2018), individuals residing in areas endemic to dengue also frequently possess direct experiences or significant exposure to the ramifications of the disease, which may amplify their self-efficacy and the urgency for immunization. Nonetheless, even within these high-risk locales, the issue of affordability persists as a considerable impediment. In the absence of adequate governmental intervention or subsidy frameworks, economically disadvantaged households may prioritize immediate financial obligations over the adoption of long-term preventive health strategies, such as vaccination (Essue et al. 2018). Therefore, comprehending these socioeconomic inequalities is imperative for the formulation of equitable vaccine dissemination and pricing strategies. Following by (Sacre et al., 2022) comprehending socioeconomic inequalities is crucial for developing effective interventions to increase vaccine uptake. Understanding factors like socioeconomic status, education, and residence can inform equitable vaccine dissemination and pricing strategies, ultimately improving health outcomes across diverse populations.

The findings indicate that the objectives of this study was conducted to explore the willingness to pay for dengue vaccine by the community in Peninsular Malaysia and to validate a proposed behavior model based on the Health Belief Model (HBM). The experts offered unequivocal and consistent endorsement for these four constructs as fundamental components that affect

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vaccine acceptance and the willingness to pay. For example, perceived severity, exemplified by an understanding of the risks and repercussions associated with dengue was identified as a substantial motivator for individuals to contemplate vaccination. Likewise, self-efficacy, particularly the confidence in the vaccine's efficacy against all serotypes, surfaced as a critical facilitator of favorable health behaviors. Perceived barriers, encompassing misinformation and a lack of trust, were underscored as significant obstacles that could be mitigated through the implementation of effective communication strategies. Ultimately, cues to action, such as governmental policies and outreach initiatives, were regarded as essential in catalyzing vaccine uptake, particularly within rural populations. Through the validation process, this study not only corroborated the significance of the HBM within this context but also illustrated the model's practical utility in shaping interventions at the community level and enhancing health communication strategies. The insights provided by experts offered valuable perspectives on how these constructs could be integrated into public health policies to stimulate proactive behaviors in dengue prevention.

Nevertheless, the study is not devoid of its limitations. A prominent limitation is the dependence on expert opinions, which, while insightful, may not comprehensively represent the perspectives or experiences of the wider population. Furthermore, the geographical scope of the study was confined to Peninsular Malaysia, and the results may not be entirely generalizable to East Malaysia (Sabah, Sarawak & Labuan). This research aims to understand specific socioeconomics and attitudes in the context of peninsular Malaysia, where dengue is more prevalent and frequently reported Selvarajoo et al. (2020). Focusing the study on the peninsular also allows for a more in-depth analysis of the factors that influence attitudes and willingness to pay by the community in that area. Peninsular Malaysia also has a larger population and is the centre of economic and social activity in the country.The qualitative nature of the research also constrains its capacity to quantify the strength of associations between the identified constructs and WTP, thereby necessitating that future investigations employ quantitative or mixed-method approaches. Additionally, given that the dengue vaccine remains relatively nascent in the Malaysian market, actual public perceptions and behaviors may shift as the vaccine becomes more accessible.

In summary, this study adeptly identified pivotal behavioral constructs impacting willingness to pay for dengue vaccination and reaffirmed the relevance of the Health Belief Model in informing these findings. It establishes a groundwork for subsequent research and policy initiatives, particularly in the formulation of effective communication and intervention strategies that address public apprehensions and foster vaccine acceptance. Future research endeavors should aim to empirically validate the proposed model across a more diverse demographic to ascertain its applicability and efficacy in practical settings.

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