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BEHAVIOURAL PERCEPTION TOWARDS MALARIA HEALTH INSURANCE WITH OUTDOOR MOSQUITOES' COMMUNITY FUMIGATION IN KWARA STATE, NIGERIA

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Abstract
Malaria is a preventable disease caused by female Anopheles mosquitoes, which has made the use of insecticide-treated mosquito nets (ITNs) and the use of indoor residual spraying (IRS) a common practice among households in this part of the world. Despite these practices, the incidence of mosquito infection remains undefeated. In consideration of this demeanour, this study seeks to examine the behavioural perception towards malaria health insurance with outdoor mosquitoes' community fumigation in Kwara State, Nigeria. A total of 30 individual in-depth interviews were performed with selected stakeholders in two local governments with the highest incidence of malaria in the state. The study employed the theory of reasoned action and planned behaviour by Ajzen and Fishbein (1975 to develop a thematic method of analysis employed in the study with the use of NVivo software. The result indicates that the majority of the respondents showed positive attitudes, while the majority of them perceived that the program would be effective in eradicating mosquitoes and reducing the incidence of malaria in the community. It was recommended that the Nigerian government and private parastatals should improve and facilitate the establishment of malaria health insurance with routine outdoor mosquito community fumigation, with proper inclusion in the national malaria elimination program.

Keywords*:* Malaria Prevention, Behavioral Perception, Health Insurance for Malaria and Community Mosquito Fumigation
Jel code: I12, I13, I18, O55

1. Introduction
Malaria has remained a significant public health morbidity in many developing countries around the world. WHO (2022) reported that Nigeria alone recorded nearly 27% of global malaria confirmed cases, while accounting for 31% of deaths around the globe. Malaria contributes significantly to socioeconomic burden and health challenges experienced in Nigeria, especially among the low-income and middle-income households. It exerts their income through out-of-pocket expenditure (OOPE) on health, which leaves them poverty-stricken and deformity in children leading to premature death (Affiah et al., 2022; Onwujekwe et al., 2014).

Numerous malaria projects are ongoing as a response to the prevalence of the disease and a convergence toward Universal Health Coverage (UHC). The National Malaria Elimination Program (NMEP) saddles the responsibility of

distributing Seasonal Malaria Chemoprevention (SMC), long-lasting insecticidal nets (LLINs) and early diagnosis of malaria through the distribution and use of Rapid Diagnostic Test (RDT) kits to ensure complete eradication of malaria disease in Nigeria. This activity has led to significant reductions of malaria incidences in recent years, but the infection of the mosquito parasite persists due to a lack of source reduction practices.

The establishment of the National Health Insurance Scheme (NHIS) in 1999 aimed to ensure that Nigerian citizens have access to affordable healthcare services while targeting different groups in the country. NHIS was limited in several ways, which led to the establishment of the National Health Insurance Authority (NHIA) in 2022 by the Nigerian government in response to the shortcomings of NHIS (Amoo et al., 2017; Njoku et al., 2023). Despite the improvement in the NHIA, ongoing funding and logistical challenges limit effective service delivery, thereby reducing citizens' willingness to subscribe to the scheme (Ipinnimo et al., 2022).

The commonest practice of mosquito control in Nigeria has been traced to the use of insecticide-treated bed nets (ITNs), coupled with indoor residual spray (IRS), among families that can afford it. These methods have proven to some extent effective in controlling indoor mosquitoes, while no attention is paid to the sources of these mosquito breeding sites. Malaria health insurance with community fumigation has not yet been practised and implemented into our health insurance scheme to date, which is the method that has been explored and implemented in developed countries such as Europe and America to eradicate mosquitoes successfully (Piperaki & Daikos, 2016).

Despite the significant health challenges and financial burden associated to incidence of malaria in Nigeria (Onwujekwe et al., 2014), traditional prevention method remains widely practised among the people. However, approaches such as integrating malaria health insurance with outdoor mosquito community fumigation is yet to be explored in this part of the world. This approach will provide financial protection against sudden illness related to malaria while reducing mosquito populations in many communities.

Research on households' knowledge, attitude and perception towards malaria health insurance with outdoor mosquitoes' community fumigation (MHI-OMCF) is vital to determine its role, importance and how the program should be structured and implemented in our communities. Very few studies have been directed and published on the attitude, knowledge and perception of households towards MHI-OMCF in our communities. Additionally, existing research has not yet established whether attitude, knowledge and households' perception affect MHI-OMCF. The perceived success of this program is essential in reducing the financial burden associated with the treatment and prevention of malaria. An individual in-depth interview will be used for this qualitative analysis.

The paper is organised into five sections. Following the introductory part in Section 1, Section 2 examines relevant articles on knowledge, attitudes and perception of households towards MHI-OMCF. The methodology adopted in the study is explained in Section 3, while Section 4 presents the results and discusses the findings. Lastly, Section 5 highlights conclusions based on the findings and offers recommendations for policy purposes.

2. Literature Review

Conceptual Review

1. *Anopheles gambiae* is widely regarded as the most efficient malaria vector in sub-Saharan Africa. Its epidemiological importance stems from its strong anthropophilic behaviour, high susceptibility to *Plasmodium falciparum*, and preference for biting humans during nighttime hours when people are typically asleep (Gillies & De Meillon, 1968; Service, 2012). The species thrives in temporary, sun-lit water bodies such as puddles and tyre tracks, which are common in rural and peri-urban African environments. *Anopheles gambiae* often rests indoors after feeding, it has historically been highly responsive to indoor residual spraying (IRS) and insecticide-treated nets (ITNs). However, increasing insecticide resistance and behavioural adaptation have reduced the long-term effectiveness of exclusively indoor-focused control strategies (WHO, 2023).

2. *Anopheles coluzzii,* classified as the M molecular form of *Anopheles gambiae*, *Anopheles coluzzii* has been recognised as a distinct species with ecological characteristics that differentiate it from *Anopheles gambiae* (Coetzee et al., 2013). *Anopheles coluzzii* is commonly associated with permanent breeding sites, including irrigated agricultural zones and urban water bodies. This ecological flexibility allows it to persist in environments undergoing rapid urbanisation. The species contributes significantly to malaria transmission in West Africa and exhibits both indoor and outdoor biting behaviour, complicating control efforts and underscoring the need for community-level and outdoor interventions, such as larval source management and space fumigation (Takken & Knols, 2009).

3. Malaria Vector Control Strategies: Malaria vector control remains a cornerstone of global malaria prevention efforts and is primarily aimed at reducing human vector contact and suppressing mosquito populations. Over the past decades, vector control strategies have relied heavily on indoor-focused interventions, particularly insecticide-treated nets (ITNs) and indoor residual spraying (IRS). While these approaches have contributed significantly to reductions in malaria transmission, growing evidence suggests that their effectiveness is increasingly constrained by behavioural adaptation of mosquito vectors, insecticide resistance, and contextual socio-environmental factors (WHO, 2023).

4. Implications for Malaria Control Strategy: The diversity of malaria-transmitting *Anopheles* species demonstrates that malaria transmission is ecologically and behaviourally complex. Species-specific differences in feeding behaviour, breeding habitats and resting preferences necessitate integrated vector management approaches. In settings where dominant vectors exhibit outdoor biting or resting behaviour, reliance on indoor interventions alone is insufficient. This reinforces the relevance of outdoor community fumigation and community-based preventive strategies, particularly when integrated with financial protection mechanisms such as malaria health insurance with outdoor mosquito community fumigation.

Theoretical Review

1. The Theory of Planned Behaviour (TPB), postulated by Fishbein and Ajzen (1975), posits that an individual's intention to perform a behaviour is shaped by three key determinants: attitude toward the behaviour, subjective norms and perceived behavioural control. In the context of malaria prevention, TPB suggests that households' willingness to participate in insurance schemes that include community fumigation is influenced by their beliefs about the benefits of the intervention, social expectations from family and community, and their perceived capacity to engage in subscription or payment. By focusing on these determinants, TPB allows researchers to explore not only whether individuals intend to adopt preventive measures but also the underlying psychological and social factors that shape households' intentions.

2. Health Belief Model (HBM) propounded by Rosenstock (1974) proposes that health-related behaviour is determined by an individual's perception of susceptibility to a health threat, perceived severity of the threat, perceived benefits of acting and perceived barriers to performing the behaviour. The model also incorporates conditions to action and self-efficacy as factors influencing the likelihood of behaviour change. HBM has been extensively used to explain preventive health behaviours and to guide health promotion interventions.

3. Grossman's Health Capital Model (1972) regards health as a form of human capital that individuals invest in over their lifetime. The model posits that people allocate resources, such as time and money, to maintain and improve their health, balancing the costs and benefits of health-related investments. It has been applied extensively in health economics to explain health demand, preventive behaviour and healthcare utilisation. Decisions about subscribing to malaria insurance or supporting outdoor fumigation initiatives can thus be understood as investments aimed at preserving health and reducing future medical expenditures. This perspective highlights how perceived costs and benefits influence preventive health behaviours

Empirical Review

Kibe et al. (2006) investigate community groups involved with malaria vector control activity in Malindi, Kenya. The purpose of the study is to determine the roles of different community groups in the successful implementation of malaria vector control and assess the level of knowledge about malaria and mosquitoes among the groups. Data for the analysis were obtained from key informant interviews, FGD, and a stakeholder meeting, which made a total of 34 groups of people. The result from the findings shows that Nineteen of the identified groups reported they practised different forms of mosquito control with the intention of reducing the malaria vector. While sixteen of the identified group reported they engage in environmental management activities, such as clearing drains and ditches with the removal of stagnant water to eradicate breeding sites of mosquitoes. The study fails to establish the health impact of malaria vector control in the community due to a lack of assessment of the possible prevalence of malaria in Malindi.

Dambach et al. (2018) examined community perception and acceptance of biological larvicide for malaria mosquito control and prevention in rural Burkina Faso. The researchers engaged in a total of 12 focus group discussions (FGD)

with 12 key informant interviews in 10 rural villages, provided with coverage of various larvicide chemicals for treatments of all breeding sites in their qualitative study. The result indicates that all the respondents were willing to support the program. Likewise, most people showed a willingness to participate and financially support the program. The major limitation observed in the study is that the researcher did not employ behavioural theories in their analysis; the observed characteristics are only specific to rural Burkina Faso, which may not apply to urban areas or areas with different cultural settings.

Van Rooijen et al. (2018) examined the perceptions of healthcare consumers and system informants vis-à-vis the establishment of nationwide health insurance (NHI) in Myanmar. The study employed a qualitative ethnographic design using nine FGDs with 68 healthcare consumers in urban and peri-urban areas of Yangon, Bago, and Mandalay. With six IID Interviews with key informant policymakers and healthcare providers. Purposive and convenience sampling were used to select the participants for the interviews. The analysis was carried out using directed content analysis from predefined themes based on financial capacity, management, stakeholder relations and benefit of the scheme. The results from the findings show that most of the participants are willing to subscribe to NHI. The study is limited by the scope adopted, limiting applicability to only the urban and peri-urban areas in Myanmar.

Yusuf et al. (2019) investigate health insurance knowledge, attitude and uptake of the community-based health insurance scheme (CBHIS) in Lagos, Nigeria. The study used Knowledge, Attitude and Practice (KAP) to model how an individual's knowledge influences their attitudes, which in turn affects their behaviours. The study used a multi-stage sampling method to select 419 respondents from the Ajeromi-Ifelodun community. The study employed descriptive statistics to summarise respondents' levels of knowledge, attitudes, and uptake of CBHIS. The result from the findings indicates that 9% of the respondents have good knowledge about CBHIS while 62% of the respondents had a positive attitude towards health insurance generally. The study focuses on a single suburban area in Lagos state, which may limit the generalizability of the findings to other suburban regions.

In another study by de Sousa Pinto da Fonseca et al. (2020), who investigated the roles and the perceptions of institutions and community in interventions for malaria prevention in two rural districts of Zambezia Province, Mozambique. The study employed the social ecological model to model an individual's behaviour as it is influenced by interpersonal relations, organizational, community and public policy. The study is conducted as a descriptive qualitative analysis involving seventeen in-depth interviews (IDIs) with institutional actors and seven sections of FGDs using snowball sampling until data saturation was reached. The data was analysed thematically using NVivo software. The result of the findings indicates that all the participants demonstrated good knowledge of malaria symptoms, transmission, and prevention methods. The findings also shows that social behavioural changes is an important factor in malaria intervention control and prevention program. The study is limited to two district areas, which may not represent the broader situation of Mozambique.

Diiro et al. (2020) investigated individual willingness to pay for a community-based, eco-friendly malaria vector control strategy in Kenya. The study employed Becker-DeGroot-Marschak (BDM) revealed preference auctions with 204 participants drawn from both rural and urban villages in the study area, to assess whether individuals would financially support the community application of biopesticide to control malaria vectors. The findings reveal that nearly all participants were willing to pay the lowest bid price and that a large majority expressed interest in pooling to support the program. Also, socioeconomic factors were important determining factors for vector control demand. The study, despite collecting rich socioeconomic and attitudinal data, relied primarily on quantitative regression analysis, and did not include qualitative exploration of underlying motivations, beliefs, and cultural factors shaping willingness to contribute communal resources.

Bandzuh et al. (2022) examined community knowledge, attitudes, and practices related to Anopheles mosquito control in East Sumba Island, Indonesia. The study adopted a qualitative design, employing seven focus group discussions and fourteen key informant interviews to capture diverse perspectives on the use of insecticide-treated nets (ITNs). The findings reveal that while awareness of mosquitoes and malaria transmission was generally high, consistent use of ITNs was constrained by practical considerations such as heat discomfort and housing conditions. Importantly, community-based health programs emerged as critical intermediaries in sustaining malaria prevention efforts, particularly through information dissemination, social mobilization and trust building between households and the health system. Despite its contributions, the study is limited by the fact that it does not explore the financial dimensions of malaria prevention, such as households' willingness to contribute financially or participate in the mosquito control structure.

Mader et al. (2024) investigate public perceptions of mosquito-borne diseases and the associated control measures in Northeastern U.S. communities. The data for the study were obtained from focus group discussions with thirty-seven individuals from New Jersey, New York and Massachusetts. Convenience sampling was used to select the participants in the FGDs, guided by a structured script, which was later translated into Spanish for inclusivity. The data was thematically analysed, aligning with the Health Belief Model. The result of the findings indicates that participants lack general knowledge about mosquito control services and felt the need to introduce mosquito control measures in the selected communities. The study was restricted to three Northeastern states, which may not reflect public perceptions in other regions in the U.S.

Richards et al. (2017) examined public perceptions, knowledge, usage and practices regarding mosquito control in North Carolina. The survey for analysis included 1,350 households across urban, suburban, and rural communities in North Carolina. The study adopts frequency tables and bar graphs to analyse and summarise the administered questionnaire, while Chi-square was used to test the significance of the variables employed. The results of the analysis indicate that the majority of the individuals interviewed were willing to pay less than $50 per year for mosquito control, likewise some respondents agreed that mosquito control services should be covered by municipal/county taxes. The result also indicates that differences in socioeconomic factors do not have a significant effect on WTP for the community-based mosquito control program. The major limitation

observed in this study is that it does not address how mosquito control might be incorporated into bundled interventions or risk-pooling arrangements.

Despite the growing body of literature on community engagement and perceptions of malaria prevention, several empirical gaps remain that justify the focus of the present study. Yusuf et al. (2019) investigated health insurance, highlighting the centrality of individual knowledge in shaping attitudes and enrolment decisions in Lagos, Nigeria. Likewise, Kibe et al. (2006), Richards et al. (2017), and de Sousa Pinto da Fonseca et al. (2020) explained how individuals and communities behave towards willingness to pay for disease control, providing insights into the role of community actors, knowledge gaps about malaria control and behavioural determinants of intention to subscribe to malaria control schemes. None explicitly combines community-level malaria interventions with financial protection mechanisms, such as malaria health insurance with outdoor mosquito community fumigation (MHI-OMCF). This justifies the exploration of the qualitative aspects of factors influencing willingness to pay for MHI-OMCF in malaria endemic state in Nigeria.

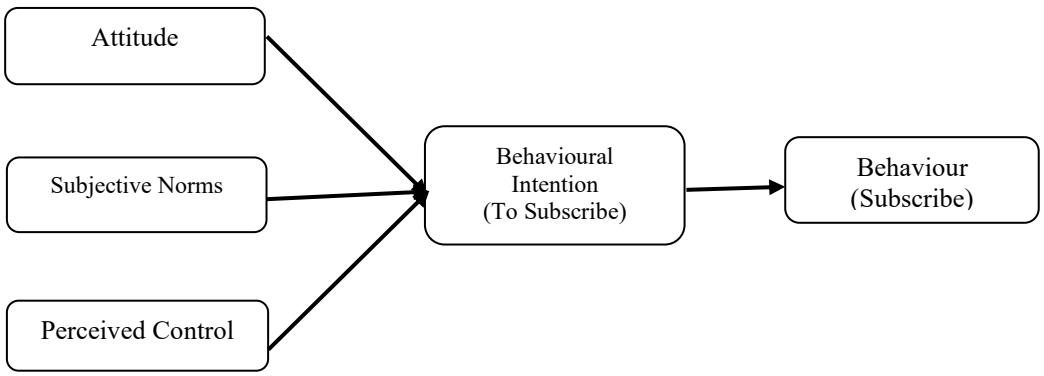
Likewise, Dambach et al. (2018) explored community perceptions and acceptance of biological larvicide in rural Burkina Faso, which focused solely on vector control interventions without linking them to financial protection mechanisms or insurance uptake. While Van Rooijen et al. (2018) examined perceptions of healthcare consumers, highlighting nuanced socio-cultural factors determining acceptance of National Health Insurance. It did not explore malaria-specific interventions or bundled community-level preventive strategies.

Accordingly, the present study addresses these empirical gaps by qualitatively investigating households' willingness to subscribe to malaria health insurance with outdoor mosquito community fumigation in Nigeria. By focusing exclusively on qualitative methods through in-depth interviews. This study provides insights into the behavioural factors that influence acceptance and participation in integrated malaria prevention programs. This approach extends the current literature by bridging community-based malaria prevention, health insurance uptake, and innovative mosquito control interventions, which have not been previously explored in the literature.

3. Methodology

The theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) are closely related theories that explain human behaviour based on psychological and social factors that can be observed based on available information. TRA predicted that human behaviour is driven by behavioural intentions, which are influenced by attitude towards behaviour and subjective norms. TPB extends TRA by including an additional predictor, perceived behavioural control, usually to address situations where individuals do not have complete control over their actions. This theory assumes that individuals make rational decisions based on available information, and their intentions to engage in a specific behaviour are the immediate antecedents of that behaviour (Ajzen & Fishbein, 1975).

The diagram below depicts the relationship of the theory of planned behaviour, as well as its applicability to both the prediction and change of behaviour.



Adapted from Ajzen and Fishbein, 1975.

It has been established that the reason why people perform actions is not only determined by economic factors but also by attitudes, subjective norms and perceived behavioural control, which is outside the scope of economic valuation theories.

This research was based on a qualitative exploratory approach to understanding how human knowledge, attitude, and perception towards MHI-OMCF will affect their decision to subscribe. The study focuses on meanings, interpretations, and subjective and objective understandings rather than numerical data. The data for this study were collected from two senatorial districts located in North and Central Kwara State, Nigeria. The two districts were chosen because they have a long history of malaria prevalence, with whether condition favourable for the female Anopheles mosquitoes. Respondents were randomly selected from two local governments, each from the districts.

In this study, non-probabilistic sampling in line with purposive random sampling was used to select thirty stakeholders from the two local governments. While the data were collected from stakeholders, which comprises of Local Government chairman, community leaders such as Baale and youth leaders, community volunteers, health professionals (Doctors, Nurses, Medical lab scientists and Pharmacists) and primary school teachers, through individual in-depth interviews (IID).

This study adopts Reeves et al. (2013) qualitative ethnographic study design to subjectively and objectively analyse and compare the opinions of different participant groups of people based on their backgrounds, knowledge, attitude and cultural perspectives towards malaria health insurance with outdoor mosquitoes' communal fumigation in Kwara State. The questionnaire for the IID included only questions that could be comprehended by all the participants.

The questionnaire for the IID was designed thematically following TRA and TPB as an open-ended format related to the key aspects of the theory, while the questionnaire designed for the sociodemographic analysis follows the (Mitchell & Carson, 1990) methodology for contingent valuation questionnaire design. The questions are arranged thematically following knowledge, attitudes, subjective

norms and perceived behavioural intention to determine willingness to subscribe to malarial health insurance with outdoor mosquitoes' communal fumigation, followed by sociodemographic information. The interview was conducted in five different languages (English, Yoruba, Nupe, Hausa and Barkobaru).

Before the start of the interviews, the participants were introduced to the scheme using the videotape designed to provide detailed information about the scheme. We sought their permission for voice-recording during the interview. The trained researchers were those who understood the language of the prospective interviewees, which made it easier to communicate and get the desired outcome from the interview section.

The transcribing was done in the English language, and coding was carried out using the TRA and TPB themes and analysed using NVivo software. This analysis starts with the key themes (knowledge, attitudes, subjective norms and perceived behavioural intention) as guidance for initial codes. Then most frequently repeated words formed the basis of the synthesis for our results. SPSS was used to analyse the sociodemographic aspects of the paper to understand how it affects willingness to pay for MHI-OMCF.

4. Results and Discussion of Findings

The results are presented based on knowledge, attitudes, subjective norms and perceived behavioural intention to determine willingness to subscribe to malaria health insurance with outdoor mosquitoes' communal fumigation, and lastly, sociodemographic analysis results were presented and interpreted.

Knowledge about mosquitoes causing malaria:

All respondents acknowledged that mosquitoes are caused by stagnant water, which, when it bites the human body, leads to malaria. According to one key individual who was interviewed, "We know that mosquitoes cause uncomplicated malaria when treated early before it leads to complicated cases of untreated malaria'' (Kaiama local government chairman).

Another key informant interviewee attested and described how mosquitoes peak during the rainy season, quoting "As we are now in rainy seasons, we find mosquitoes to be on the increase, our children have started showing symptoms of malaria since the rain has started, which is an indication that mosquitoes are on the increase" (One woman informant interviewed).

The respondents have a uniform response to understanding how mosquitoes cause malaria and use preventive methods such as ITNs and IRS. The locals also explain how they keep the bushes clean and keep their surroundings clean. This strong knowledge displayed by the participants suggests that the participants are readily open to adopting MHI-OMCF, since they adopt different methods to reduce both indoor and outdoor mosquitoes to lower the risk of malaria in their households and the community at large**.**

Prior information on the existence of MHI-OMCF:

Most of the respondents have no prior knowledge of the MHI-OMCF before the interview. Many admitted not to have heard about the program. For instance, one woman said, "*I have never heard of insurance covering mosquito spraying, only normal health insurance*". Another man confused it with the routine distribution

of drugs by the government programs. One man noted that "*We get mosquito nets from the government, and they sometimes distribute malaria drugs and ensure children under five takes immunization, but no one told me about this combined scheme*".

This near-blank state of awareness suggests that MHI-OMCF would be perceived as a new initiative in the community. This means that initial reactions will depend on the information provided to the community. However, it also implies that no imprinted negative opinions exist about the program. Comparing this outcome with (Onwujekwe et al., 2014), 75% of households in Nigeria have shown strong latent interest in health insurance if provided with appropriate information and awareness.

Attitude towards the MHI-OMFC:

i. Perceived health benefits of MHI-OMCF in the community. Many participants were eager about the potential benefits of the scheme in reducing mosquitoes and malaria in the community. The two community leaders were enthused and remarked, "*If the community is sprayed, it will keep mosquitoes away, and our whole community will get sick less often*".

One of the community leaders recounted events when he grew up in Kano, that the government then released fog into the atmosphere to eradicate pests and insects disturbing the community. We will be free of insects six months after the fogging activities.

After a brief discussion on introducing the cost and benefit of the program. *Respondents described possible benefits that could be derived from the scheme, such as a reduction of the mosquitoes' population or possible complete eradication, to ensure that children have fewer cases of fevers, with stronger and healthier children in the community.*

Other respondents also remarked that "*With this program, we would stop spending money on buying indoor residual spray and would not bear the burden of sleeping under a mosquito net during the hot weather. The community will have peace of mind by spending less on treating malaria.* The findings relating to the perceived health benefit of this program are in correspondence with Dambach et al. (2018) refers in their reports that community members showed relief in mosquito nuisance and reduced malarial episodes after the larvicide interventions program in Burkina Faso. In this study, it has been revealed that respondents expected MHI-OMCF to similarly reduce mosquitoes' population and malaria transmission in Kwara State.

ii. Positive economic benefits: Majority of the respondents pointed out that "*Our children often come down with malaria frequently, making us spend a lot on each episode*". *One father recalled, "Early last month alone, I spent so much on medications for my wife and three children". He mentioned that if the insurance policy covers the community and provides care for malaria treatment, we would save a lot.*

Many of the participants saw MHI-OMCF as a form of protection against unforeseen circumstances related to sudden sickness due to mosquito bites. Another man remarked that "*Nobody saves money for sickness because it can*

strike anytime, but this program is like communal insurance savings, where nobody pays the full price for treatment".

This perceived cost-saving relief was a major motivator for willingness to subscribe to the scheme. This also aligns with evidence from (Diiro et al., 2020) that reducing the out-of-pocket burden increases the willingness of people to participate in health-related programs.

Several participants said they would willingly recommend MHI-OMCF to family and friends solely for the economic value. As one teacher said in Asa local government, "*It is better to pay a small premium than lose all my salary on hospital bills*." Therefore, the idea of preventing expenses by pre-paying into MHI-OMCF made people show a positive attitude for enrolment into the scheme. This positive attitude suggests high intrinsic support by participants, as it frequently links these benefits to their willingness to join.

Subjective Norms

Some of the participants said they would follow the advice of local authorities. For example, two male teachers reported that "*If the chief, which is referred to as the 'Baale' and the health worker tell us to join, we will subscribe to it*." This reflects the solid role of community norms in decision-making within the community. Two women who were interviewed respondents mentioned their husbands as the sole decision makers in the family. They make a similar remark that, "*I will seek my husband's permission to subscribe to this scheme even though I know he will not discourage me from subscribing; besides, he will be the one to pay the premium*"

Interpersonal relationships within households and friends also shaped willingness to subscribe to the scheme. Another woman mentioned that she would need her husband's consents saying, *"I cannot decide alone, my husband handles money and makes decisions for us".* In such cases, family approval is important.

A man mentioned that "*My two wives are Nurses, on that note, I empowered them to make health-related decisions for our children. They usually take children to clinics and buy medicine, making them primary health decision-makers, although I fund every penny*".

These findings align with the idea of subjective norms in health theory. This outcome is like with Bandzuh et al. (2022), whose result shows that community health instructors play key roles in disseminating malaria information and shape people's decisions in adopting preventive methods in a particular community in Indonesia. In the context of this work, community leaders' endorsement of MHI-OMCF would create a positive social expectation, which would encourage people to subscribe.

Also, respondents often said they would subscribe to HMI-OMCF if their peers and neighbours enrolled, while encouraging others to subscribe. This is an indication that the overall success of this program hinges on community leaders' endorsement, the role of family members, group discussions, and public participation in the scheme.

Perceived Behavioural Intention to Subscribe

i. Lack of Funds: The primary concern raised by most of the respondents is the lack of funds. Almost everyone agreed that cost could be a barrier to subscribing to the scheme. Many of the respondents recommend that a community pooled fund would be effective in order to cover the premium. A teacher lamented, "*We live hand-to-mouth; sometimes we cannot even buy enough food to eat, which means that a small premium might be too much for us to pay*." Others emphasised that "*The scheme should not be expensive at all if you want us to partake in the scheme*" These thoughts show low perceived control over funds.

One farmer interviewed in Kaiama said, "Farming is seasonal, which means we only have money when crops yield is good, whereas there are periods when crops do not yield well in farm, which means we cannot afford to pay in those periods". The headmistress of Afon Primary School said, "*If joining the scheme means it will reduce my hospital bills, then I can afford 5000 naira*." This is an indication that occupation and income play an important role in perceived behavioural intention to subscribe. In summary, the key determinant is financial capacity, which must be duly considered before setting a premium price; otherwise, even positive attitudes will not translate to desired action.

ii. Practical Factors: Interviewees also worried about practical issues that could impede joining the scheme. A teacher asked, "*If they fumigate during school period, does that mean we would not go out and miss a school day?*" Others mentioned the distance to the hospital. "*Our area is far from the hospital. What if the transport cost prevents us from going to the hospital when we fall sick? Signing up might mean we would have to trek to the hospital for treatment, that itself is difficult*".

These practical factors affect PBC by deciding to subscribe seem hard; the participants therefore suggest that mobile transport should be made available at stations for the enrolees, and fumigation timing should be flexible.

iii. Access to information: Another key factor was understanding the program's details. Many respondents acknowledged they would only join the scheme once they fully understood how it works. One respondent asked, "*How exactly does this fumigation work, and is it safe for human health? How is malaria insurance different from normal health insurance*?"

Lack of proper information would create a barrier, which indicates the need for strong informational support. Interestingly, when we explained that insecticides are safe when applied at an appropriate dose, most participants seemed reassured. Also, the WHO recommends very low concentrations of insecticides for fumigation that do not harm humans.

In general, better education about MHI-OMCF processes, risks, and benefits was seen as very crucial. When people know what to expect, they feel more empowered to decide and follow through. In summary, reducing costs, good logistics and lack of information barriers would greatly boost participants' sense of control, making them more likely to subscribe to MHI-OMC.

4.6 Willingness to Subscribe to MHI-OMCF

From the analysis, it can be observed that willingness to subscribe varied across themes. The most motivated who are willing to subscribe were those expressing both positive attitudes and subjective norms. Several participants said they would willingly participate and recommend MHI-OMCF to family, friends and neighbours, indicating strong intent to subscribe to MHI-OMCF.

These instances follow the TRA and TPB predictions that a positive attitude is important for decision-making participants, and perceived support by others has a strong effect on intentions to subscribe. Conversely, those who expressed doubts and likewise faced barriers were less certain to subscribe. Like one woman said, "*I would need my husband's consent before I can subscribe*". Overall, about two-thirds of respondents expressed willingness to enrol under the right conditions, such as affordable fees, effective information dissemination, a large part of community coverage and placement of good logistics. Most participants indicated they would recommend MHI OMCF to others if they believed in its effectiveness.

5. Summary, Conclusion and Recommendations

This study investigates knowledge, attitude and perception of households towards malaria health insurance with outdoor mosquitoes' community fumigation in Kwara State and establishes that people have a good knowledge about how mosquitoes breed and how it causes malaria in the community. People generally show content with the program and a positive attitude towards fumigation programs. The pattern of responses across themes indicates that participants with adequate knowledge, positive attitudes, subjective norms, and manageable barriers in terms of finance translate to a stronger intention to adopt MHI-OMCF.

In light of the above findings, the Nigerian government should implement strategies such as awareness campaigns to boost communities' knowledge about malaria causes and the possible introduction of routine community fumigation with education on proper health safety and guidance during the periods of fumigation. Awareness should be carried out through trusted channels, highlight benefits, especially the economic aspect, address safety concerns, and reduce practical barriers of MHI-OMCF. By doing so, they can align community attitudes, perceptions and subjective norms to favourably enhance perceived behavioural control, which, according to theory, will increase actual enrolment and recommendation of the MHI-OMCF in the country. The Nigerian government and private parastatals should improve and facilitate the establishment of malaria health insurance with routine outdoor mosquito community fumigation with proper inclusion in the national malaria elimination program, to achieve the universal health coverage objectives in Nigeria. Overall, Larger households intended to join if subsidies were available, and government and private parastatals should provide the services at minimal cost.

Although this study has added to the body of knowledge through the adoption of community fumigations with malaria health insurance, which differs from evaluating the acceptance of general health insurance explored by previous authors, this study is limited to only Kwara State, and as such, the result generalization might be limited. Therefore, future research on the topic should focus on exploring more urban and rural communities in Nigeria.

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