"It's effective but should I bother?" A study of personal protection measures against malaria in urban India

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Abstract:

Objectives: Malaria affects millions of people in urban and rural India every year. This study addresses two main gaps in current research: 1) attitudes towards personal protective strategies against Malaria among urban populations; and 2) understanding of the extent to which urban health information seeking preferences shape preventive behaviors.

Study design: Cross-sectional face-to-face surveys using stratified sampling design.

Methods: A 60-minute survey was carried out to 1,000 middle-of-pyramid (MOP) population in five main cities in India by trained interviewers. Variables assessed included perceived effectiveness and actual practice of 14 scientific and indigenous personal protection methods, Malaria-related attitudes (susceptibility, severity and response efficacy) and health information seeking preferences.

Results: Actual practice of Malaria preventive behaviors was found to be significantly lower than the perceived effectiveness of each of the fourteen scientific and indigenous methods. Television, newspapers, and mobile phones were reported as the top three preferred media for seeking public health information. Lastly, perceived susceptibility, response efficacy, and health-related media use were found to play significant roles in predicting actual practice behaviors.

Conclusions: Our study highlights a need for health authorities to focus on translating positive attitudes to actual practice of preventive behaviors. Communication efforts may focus on the use of TV, newspapers and mobile phones for greater reach and efficacy. Other implications for Malaria prevention programs are discussed.

**“It’s effective but should I bother?” A study of personal protection measures against
Malaria in Urban India**

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Abstract

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INTRODUCTION

Despite substantial improvements in prevalence rates over the past 20 years¹, Malaria continues to affect vast populations in sub-tropical countries such as India and Vietnam. Latest estimates show that India records about 9.75 million malaria cases every year with more than 40,000 lives lost annually². As malaria is widely perceived to be a rural disease³⁻⁵, research on prevention of urban malaria is relatively scant⁶. This is surprising given that urban areas contribute to approximately 15% of the malaria burden in India⁷. The gradual surge of malaria in cities like Mumbai, New Delhi and Chennai has been partly attributed to migration from rural to urban areas and the haphazard and unplanned expansions of cities and towns⁸. As a result, congestion and relentless construction activities create fertile breeding grounds and consequently, malaria transmission.

Malaria Prevention Strategies

Strategies to control malaria in urban areas can be broadly divided into those implemented by public health authorities and those practised by individuals (the public). Action by health systems personnel is primarily focused on vector control⁹ which comprises elimination of breeding sites and area treatment through anti-larval efforts and anti-adult mosquito efforts (such as fogging).

With regard to the public directed efforts, individuals carry out a wide range of malaria preventive methods which we categorize into, scientific and unscientific (heretofore referred to as indigenous) personal protection measures or PPMs¹⁰. According

to the UNICEF¹¹, the main PPMs include the use of insecticide-treated mosquito nets (commonly referred to as bednets), use of mosquito coils and body repellents (sprays and lotions), and indoor insecticide spraying. In addition, the WHO¹² recommends eliminating mosquito breeding sites by removing discarded containers, repairing leaks and improving drainage. Wearing long-sleeve shirts and full-length trousers are also often recommended.

Indigenous personal protection methods emerge from socio-cultural norms, notions and mores that remain prevalent in vast swathes of India. For instance, traditional medical practitioners recommend growing a plant called Tulsi (*Ocimum Sanctum* Linn)¹³ whose parts are said to possess preventive and curative powers against malaria. It is also common practice in India to fumigate the house using *dhoop* (or frankincense)¹⁴ that is said to be especially powerful in preventing Malaria. Burning coconut husks or shells continues to be widely used in the developing world despite little evidence of its effectiveness¹⁵. Apart from the relatively recent electric mosquito racquets or bats, incense sticks are often used by travelers to east Africa and used extensively in various parts of India.

Across the various scientific and indigenous PPMs, behavioral scientists have often demonstrated that a range of demographic and psychosocial factors including knowledge and attitudes related to malaria influence the uptake and consistent practice of these behaviors¹⁶. While some studies have examined personal protection strategies against Malaria in specific pockets of semi-urban and rural India^{17,18}, investigations of such practices in urban regions are scant.

The other related issue we investigate is the preferences of urban Indians with respect to specific communication media from which to seek health information. This issue assumes importance as communication efforts to increase the awareness of malaria among

the general public by informing them about risks and preventive methods have remained relatively static over the past 50 years. Indian health authorities have depended on a combination of traditional mass media (like posters)¹⁹ and interpersonal communication strategies like health workshops to create malaria awareness among the population. Such initiatives are usually launched before or during outbreak season and sometimes conducted in collaboration with civic or business organizations such as the builder's guild. These programmes are typically neither informed by an understanding of knowledge, attitudes and practices related to preventive strategies, nor of health information seeking behaviors among targeted audiences. Further, efforts to evaluate the effectiveness of these campaigns are rare. Spiraling malaria figures even in urban residential zones with high media concentration like Mumbai²⁰ demonstrate the limited impact of existing health communication efforts and suggest the inadequate power of traditional print media alone. In this scenario, the media boom in India both on the broadcast (e.g. television and radio) and digital (e.g. mobile phones) fronts might offer cost-efficient and high reach solutions. While the rise of television in India is well-documented, it is also noteworthy that India is amongst the fastest growing mobile phone markets with a 210-fold increase in subscriptions from 2000 to 2010 and a 62% penetration rate²¹. Despite this, initiatives that use the power of digital media for malaria awareness are almost unknown. This is surprising considering that fact that countries with more scant economic resources, like Kenya, are already on the forefront of using mobile phones for malaria prevention through the use of short messaging services (SMS)²².

Study Focus: In summary, we observe a clear gap in malaria research in India on three main fronts which, if addressed, can inform the future strategies of public health practitioners and policymakers. The first pertains to a lack of understanding of personal protective practices against Malaria among urban Indians. The second is concerned with insights about specific media preferences among urbanites with respect to seeking information on health-related issues. The last, and equally important aspect, relates to an understanding of attitudes towards Malaria among urban Indians and to examine whether these attitudes in concert with media preferences have a bearing on the practice of personal protective behaviors. Our study is guided by three overarching questions:

RQ1: What is the perceived effectiveness of scientific and indigenous methods of personal preventive strategies against Malaria? Is the perceived effectiveness consistent with the actual performance of these methods?

RQ2: What kinds of media do urban Indians prefer to utilize in seeking health information?

RQ3: To what extent can Malaria-related attitudes and media use preferences predict perceived performance of personal protective strategies?

METHODS

Instrument Design: The main questionnaire was arranged in six sections: demographics, media use, community engagement, general health perceptions, Tuberculosis and Malaria. This study examines specific items from the media use and Malaria sections. The Malaria section comprised three main categories of questions (presented in Appendix 1). Attitudes related to Malaria were scored on 5-point Likert (strongly disagree to strongly agree) scales. Specifically, perceived severity was captured through a 2-item scale (e.g. *You feel*

that Malaria is a serious disease) and perceived susceptibility was captured through a 3-item scale (e.g. *Your living conditions put you at risk for Malaria*) adapted from existing scales²³. Perceived effectiveness of 15 different traditional and scientific malaria prevention methods was captured through a 5-point different scale (1 = not effective at all, 5 = highly effective) by asking the respondent: “How effective do you think is each of the methods below in preventing contact with mosquitoes?” In terms of behavioral performance, we requested respondents to rate their frequency of practicing each of these 15 methods on a 5-point scale (1 = never, 5 = always). To focus on key tactics, the regression analysis focused on the three most frequently used scientific and indigenous methods. In terms of health information seeking, we asked respondents how likely they were to seek public health information from three different kinds of media sources: print (newspapers, magazines, posters/pamphlets), broadcast (radio and TV) and digital (Internet via computers and mobile phones). The questionnaires were first drafted in English and subsequently translated into local languages by expert on-field translators who worked with the research team on finalizing the questionnaires after multiple rounds of vetting and cross-checking. This study was part of a larger project commissioned to understand characteristics of the middle-of-pyramid (MOP) population in India, one of which was related to health.

Sampling Design: We conducted a cross-sectional survey in five large Indian cities chosen in terms of urban agglomeration: New Delhi, Mumbai, Chennai, Kolkata and Hyderabad. We chose 20 urban wards through systematic random sampling, where the first ward was chosen arbitrarily and each successive ward chosen at a fixed interval. This interval was determined by dividing the total number of valid wards by the required number of wards. We then identified slum settlements from middle-to-higher income settlements through

thematic mapping and further clustered the middle-income settlements into five areas: north, south, east, west and central. Two households were selected from each cluster, arriving at a total of 10 samples per ward and further, 200 samples per city.

We employed Kish Grid, a method commonly used in large-scale sample surveys, to identify respondents. This technique uses equal-probability sampling for selecting cases at random when more than one case is found to be eligible for inclusion at a sampled address or household. Consistent with the inclusion criteria, only members aged 18 and above were captured in our Kish Grid procedure.

Interviewer Training: Interviewers in all the five cities underwent a day-long briefing and training session. As part of these sessions, the interviewers read out the questions, and highlighted queries and concerns along the way. They were then split into groups for role-play (interviewer and interviewee). These strategies helped the trainer to assess the interviewer's speaking abilities in terms of enunciation, pronunciation, voice and tone. A project supervisor attended each briefing session to ensure consistency in the understanding of the study across board. Each city had three field supervisors and one zonal coordinator.

Survey Administration: The 60-minute survey was administered during the period March – June 2012 by five teams of interviewers, one for each city. Each team consisted of five to eight interviewers and one or two fieldwork supervisors. The data collection in each city was overseen by a project coordinator who was connected to the project headquarters in Kolkata. The interviews were conducted in one of six languages – Bengali, English, Hindi, Marathi, Tamil and Telugu – based on the respondents' preference. Interviewers used the words and definitions in the survey while asking all questions or providing explanations while responding to participants' questions. In situations where certain words or examples

were unfamiliar to the local setting, the interviewer elaborated on them but only using the examples provided within the questionnaire. None of the Malaria-related questions involved a prompt.

University's IRB policy did not cover international data collection at the time when the survey was conducted. However, the data collection protocol followed international ethical standards. The interviewers explained the scope and purpose of the study to each participant before inquiring about their willingness to participate in the survey. If the respondent was unwilling, their response was treated as "no", and the interviewers moved to the next respondent as per the stratified sampling strategy.

RESULTS

Sample Description (Table 1): Distributed equally across each of the five cities, we surveyed a total of 1,000 respondents of which 46% were men and 54% women as shown in Table 1. Nearly 36% of respondents were 30 years of age or younger, and approximately 44% between 31-50 years old. A vast majority of our sample was married (79%) while nearly 58% had obtained secondary or pre-university education. About 40% of respondents reported a monthly household income of INR 10-20,000 (USD 187-374). Overall, our sample was generally reflective of the Indian urban population.

(insert Table 1 around here)

Media Use (Table 2): Table 2 details the results pertaining to media use. Considered individually, respondents reported television as the most preferred medium for seeking public health information ($M = 4.46$, $SD = 0.58$) followed by newspapers ($M = 3.91$, $SD =$

1.02) and mobile phones ($M = 3.59$, $SD = 1.26$). By contrast, radio seemed the least preferred medium for public health information ($M = 2.84$, $SD = 1.32$).

(insert Table 2 around here)

Gaps in Behavioral Performance (Table 3): We asked respondents to rate perceived effectiveness as well as frequency of performing 15 different scientific and indigenous methods of prevention. Table 3 shows the results. Among scientific methods, we found that *sleeping under mosquito nets* was found to be most effective ($M = 4.36$, $SD = 0.71$) followed by the *use of mosquito repellents* ($M = 4.25$, $SD = 0.76$) and draining stagnant water ($M = 4.16$, $SD = 0.90$). The corresponding frequency of practicing these behaviors was significantly lower for *sleeping under mosquito nets* ($M = 3.12$, $SD = 1.54$), using *mosquito repellents* ($M = 4.00$, $SD = 1.10$) and *draining stagnant water* ($M = 3.46$, $SD = 1.51$). Among indigenous practices, respondents perceived *using insect killer bats/racquets* ($M = 3.94$, $SD = 0.97$) as most effective followed by *burning anti-mosquito incense* ($M = 3.52$, $SD = 1.30$) and *burning trash around the house* ($M = 3.28$, $SD = 1.33$). Similar to scientific methods, the corresponding practices were low for *using insect killer bats* ($M = 2.97$, $SD = 1.39$), *using anti-mosquito incense* ($M = 2.56$, $SD = 1.57$) and *burning trash around the house* ($M = 3.28$, $SD = 1.33$). In summary, the actual practice of Malaria preventive behaviors was significantly lower than the perceived effectiveness of each of the scientific and indigenous methods.

(insert Table 3 around here)

Determinants of Malaria Preventive Behaviors: Multiple linear regression analyses were used to analyze the models of actual practice of top three frequently used methods.

Demographics information, including gender, age, highest educational level, and monthly

household income was included in block 1, while perceived severity, perceived susceptibility, and perceived response efficacy were added in block 2. Media usage (broadcast, print, and digital) was added in the final block to predict the actual practice behaviors.

Among scientific methods of prevention, perceived susceptibility ($\beta = 0.13$) and response efficacy ($\beta = 0.48$) significantly contributed to a model explaining 6% of the variance in sleeping under mosquito nets. Including health-related media use significantly improved the predictability of the model to 29% with all three media contributing significantly to the model. A model including health attitudes and media health-related media use explains 25% of the variance in draining stagnant water behavior while a model without the latter explains a meager 1%. Again, perceived susceptibility was positively associated with behavioral performance. In contrast, health-related attitudes alone explain 17% of the variance in spraying insecticides on walls with health-related media use adding only 1% to its explanatory power. In this case, perceived response efficacy was positively associated with greater use of mosquito repellents and contributed significantly to the model.

(insert Table 4 around here)

Among indigenous methods of prevention, health-related attitudes predicted 30% of the variance in growing plants such as Tulsi, and 31% in burning coconut husks. Adding media use variables enhanced the explanatory power of the models to 44% and 49% respectively. The weakest model pertained to the use of insect killer bats/racquets with even the additive model explaining a meager 11% in behavioral variance.

(insert Table 5 around here)

DISCUSSION

Recently, public discourse surrounding vector-borne diseases such as Malaria and Dengue have heightened as the result of a popular Bollywood director's demise²⁴. Television channels broadcasted a senior health official in Mumbai's civic department explaining that they found unattended pools of stagnant water (potential breeding sites) at the director's residential campus and promised swift action to residents in the city²⁵. The incident caused equal panic among residents in New Delhi, a city that has seen a sudden surge in cases this year. In light of these developments, our study offers insights into the complex psychological scenario pertaining to vector-borne disease prevention behaviors and the contribution of health information seeking in explaining the same.

At a broader level, the use of mosquito repellants seemed the most prevalent preventive behavior among urban Indians followed by draining stagnant water and sleeping under mosquito nets. The gap between the perceived effectiveness and actual use of bednets is consistent with previous findings especially in Mumbai²⁶. Overall, we found that indigenous methods were found to be less frequently used possibly as the study was conducted in urban areas. Two findings are of special relevance to health authorities and policymakers: a) inconsistencies in perception of preventive methods vis-à-vis their actual practice (for e.g. sleeping under mosquito nets was perceived to be most effective, but mosquito repellants were most frequently used) and b) actual practice being significantly lower than perceived effectiveness across all 14 preventive methods (Tables 3; figure 1).

These findings point to inadequacies and challenges that confront various levels of the Malaria prevention and control ecosystem in India. At the individual level, research has

shown that the practice of personal protection methods against Malaria is shaped by the interplay of a host of socio-demographic factors^{18,27} – especially relevant in our middle-of-the-pyramid population. For instance, while the use of mosquito bednets might be perceived as most effective, constrained living spaces in cities such as Mumbai might render their use inconvenient forcing people to adopt synthetic repellents such as coils and ointments that can be acquired and applied/placed more conveniently. Alternately, household income and family size could affect the affordability of different kinds of preventive devices and compel individuals to compromise on their preferred choice of preventive method.

At a health systems level, the fact that the actual practice of preventive behaviors is consistently lower than their perceived effectiveness highlights the limitations of existing public health prevention programs that are failing to motivate people to practice healthy behaviors. The reason is apparent on the official website (<http://nvbdcp.gov.in/UMS.html>) of the Indian government's Urban Malaria Scheme (launched in 1971) that lists controlling parasites, vectors and biological elements as its main priorities with no mention of a health education component targeted at enhancing awareness and preventive behaviors.

As a consequence, the efficacy of Malaria and Dengue prevention efforts in India, unlike that of HIV/AIDS²⁸ have been weakened by the lack of a concrete communication strategy based on empirical evidence. While culturally based strategies such as folk theater have been implemented and tested in rural areas (ibid), evaluation of Malaria campaigns in urban India is scant. In addition, existing Malaria campaigns that are designed by health authorities almost arbitrarily are rarely informed by public health information seeking preferences.

Our study partially addresses this gap by suggesting that television is the most preferred medium for obtaining health information followed by newspapers (Table 2). This finding affirms the historic role of Indian television in disseminating prosocial messages, a trend that started with Hum Log²⁹, a serial famous for family planning messages and widely covered by health communication scholars. In terms of print media, India is one of the few markets with growing newspaper readership figures and newspaper reading continues to be historically enmeshed in lifestyle norms in both urban and rural areas³⁰. Our findings highlight mobile phones as a future opportunity for health authorities especially given the unprecedented penetration of mobile phones in India. The need for evidence-based decisions becomes increasingly important given that a senior health municipal official in Mumbai had recently announced that the civic body is planning health messaging through email²⁵—our study shows that the Internet is the least preferred choice of medium for obtaining health information. The penetration of Internet-enabled smartphones is increasing and is poised to find momentum as costs decrease in the future.

Findings from the multivariate regression analysis (Tables 4, 5; and Figure 2) demonstrate how media preferences significantly influence the actual performance of scientific methods of prevention whereas health attitudes strongly shape the practices surrounding indigenous preventive methods. From these results, it appears that health authorities are more likely to highlight scientific methods of prevention through the use of media. In contrast, practices surrounding indigenous (or unscientific) means of prevention appear to be influenced by attitudes shaped through years of indigenous knowledge and cultural notions trickling through generations among the local populace. From a health prevention standpoint, these results imply that health authorities may employ a combination

of television, print and digital media strategies to enhance health awareness and practices surrounding malaria preventive behaviors. Were they to promote indigenous methods of prevention however, the diffusion of messages through alternative medical practitioners such as ayurvedics and homeopathic doctors might be preferred. In addition, the specific media strategies employed by health authorities might assume greater importance in the dissemination of messages surrounding scientific prevention methods. In contrast, communication of indigenous preventive methods might focus specifically on the message contents, and whether and how themes address specific attitudinal constructs such as severity, susceptibility and response efficacy. The authors would have ideally liked to capture self-efficacy in an effort to test the Protection Motivation Theory (PMT) in totality but the scale of the survey (more than 150 questions across various themes) compelled us to compromise on some items. Another limitation of this study is the sample size relative to the Indian urban population (approximately 310 million); we attempted to address this limitation through a robust stratified sampling strategy that enhances the generalizability of the results to the urban population.

In summary, our findings suggest the chronic need for robust communication strategies based on a combination of traditional and new media to increase vector-borne disease awareness and preventive behaviors in rural India. Consistent with the principles of behavior change communication, communication campaigns need to be supplemented by a supportive environment, which provide access to scientific preventive devices. At a broader level, the call is for cross-sectorial collaboration among various stakeholders including civic bodies, public health authorities, private health practitioners (dispensaries/general practitioners) and community organizations to engage in arriving at

holistic solutions to address the gap between positive attitudes and low practices of preventive behaviors.

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Table 1: Demographic profile of survey respondents in 5 major Indian cities

<i>Description</i>	<i>Frequency (%)</i>
<u>Gender</u>	
Male	458 (45.80%)
Female	542 (54.20%)
<u>Age</u>	
	M = 38.37; SD = 13.82
18-30	359 (35.90%)
31-50	442 (44.20%)
51 and above	199 (19.90%)
<u>Marital Status</u>	
Single	162 (16.20%)
Married	791 (79.10%)
Separated / Divorced / Widowed	46 (4.60%)
<u>Highest Education Level</u>	
Primary school and below	83 (8.30%)
Secondary school and pre-university	583 (58.30%)
University and above	328 (32.80%)
<u>Monthly Income</u>	
	M = 24 254.25; SD = 20 243.39
10 000 and below	132 (13.20%)
10 001 - 20 000	400 (40.00%)
20 001 - 30 000	231 (23.10%)
30 001 - 40 000	100 (10.00%)
40 001 and above	79 (7.90%)
Don't know	58 (5.80%)
<u>First Home Housing Type</u>	
1 BHK	366 (36.60%)
2 BHK	401 (40.10%)

3 BHK	161 (16.10%)
4 BHK	48 (4.80%)
5 and above BHK	21 (2.10%)
Bungalow with land	3 (0.30%)
<hr/>	
$N = 1\ 000$	

Table 2: Media preferences related to health information seeking

<i>Gaps</i>	<i>Mean</i>	<i>SD</i>
Broadcast	3.65	.76
Radio	2.84	1.32
Television	4.46	.58
Print	3.44	.99
Newspapers	3.91	1.02
Magazines	3.30	1.24
Posters / pamphlets	3.12	1.29
Digital	3.27	1.15
Internet via computers	2.94	1.38
Mobile phones	3.59	1.26

N = 1 000

Table 3: Comparison of perceived effectiveness and actual practice of personal preventive methods

<i>Preventive Methods</i>	<i>Perceived Effectiveness</i>		<i>Actual Practice</i>		<i>Gaps</i>		<i>t</i>
	<i>(A)</i>		<i>(B)</i>		<i>(A - B)</i>		
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Scientific methods							
Use mosquito repellents	4.25	.76	4.00	1.10	.25	1.13	7.06***
Drain stagnant water	4.16	.90	3.46	1.51	.71	1.75	12.47***
Sleep under mosquito nets	4.36	.71	3.12	1.54	1.24	1.55	25.24***
Use mosquito repellent ointments	3.62	1.00	2.99	1.42	.63	1.73	11.49***
Spray insecticides on internal walls	3.91	1.04	2.86	1.45	1.04	1.42	23.17***
Seal cracks and holes in ceilings	3.13	1.27	2.31	1.54	.81	1.52	16.94***
Wear long-sleeves clothes	3.21	1.35	2.22	1.35	1.00	1.31	24.05***
Indigenous methods							
Use insect killer bat / racquet	3.94	.97	2.69	1.39	1.25	1.49	26.54***
Burn anti-mosquito incense	3.52	1.30	2.56	1.57	.96	1.68	18.01***
Grow plants	2.72	1.37	2.49	1.58	.23	1.48	4.88***
Burn trash around the house	3.28	1.33	2.38	1.51	.90	1.43	19.79***
Fumigate using dhoop	3.37	1.26	2.41	1.42	.97	1.34	22.85***
Burn coconut husks	2.65	1.36	1.97	1.39	.68	1.40	15.27***
Put wet sand into flower vases	2.54	1.38	1.58	1.01	.96	1.31	23.07***

$N = 1\ 000$

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4: Scientific methods of personal protection against malaria

	<i>Model 1</i>				<i>Model 2</i>			
	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>t</i>	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>t</i>
Using mosquito repellents such as Tortoise Coil, All Out, Flit, Baygon, and etc.								
<i>(Constant)</i>	-14.78***	3.96		-3.73	-12.77**	4.05		-3.15
<i>Gender</i>	.13	.07	.06	1.92	.15*	.07	.07	2.19
<i>Age</i>	.00	.00	.01	.21	.00	.00	.02	.68
<i>Highest educational level</i>	.08***	.02	.14	4.39	.07	.02	.13	3.80
<i>Monthly household income</i>	.00**	.00	.08	2.66	.00***	.00	.07	2.35
<i>Perceived severity</i>	.00	.06	.00	.04	.01	.01	.00	.09
<i>Perceived susceptibility</i>	-.22***	.04	-.19	-6.33	-.23***	.06	-.20	-6.53
<i>Perceived response efficacy</i>	.45***	.04	.31	10.45	.45***	.04	.31	10.40
<i>Broadcast</i>					-.10	.05	-.07	-1.81
<i>Print</i>					.00	.05	.00	-.08
<i>Digital</i>					.10*	.04	.10	2.29
<i>F</i>	27.97				20.42			
<i>R²</i>	.17				.18			
Draining stagnant water								
<i>(Constant)</i>	1.47	5.84		.25	3.90	5.20		.75
<i>Gender</i>	-.09	.10	-.03	-.91	.08	.09	.03	.94
<i>Age</i>	-.00	.00	-.01	-.32	.01*	.00	.07	2.26
<i>Highest educational level</i>	.01	.03	.01	.32	-.03	.03	-.03	-1.00
<i>Monthly household income</i>	.00	.00	.04	1.07	.00	.00	.02	.79
<i>Perceived severity</i>	.02	.08	.01	.25	.02	.07	.01	.24
<i>Perceived susceptibility</i>	.14**	.05	.09	2.76	.06	.05	.04	1.38
<i>Perceived response efficacy</i>	-.04	.06	-.03	-.74	.22***	.05	.14	4.32
<i>Broadcast</i>					.17*	.07	.09	2.49

<i>Print</i>					.25***	.06	.16	4.15
<i>Digital</i>					.48***	.06	.36	8.61
<i>F</i>	1.64				31.51			
<i>R²</i>	.01				.25			
Sleeping under mosquito nets								
(Constant)	10.31	5.85		1.76	5.21	5.21		1.00
<i>Gender</i>	-.09	.10	-.03	-.93	.05	.09	.02	.52
<i>Age</i>	.00	.00	.01	.43	.01**	.00	.07	2.51
<i>Highest educational level</i>	-.04	.03	-.05	-1.57	-.04	.03	-.05	-1.62
<i>Monthly household income</i>	.00	.00	-.00	-.06	.00	.00	.01	.21
<i>Perceived severity</i>	-.11	.08	-.04	-1.27	-.13	.07	-.05	-1.83
<i>Perceived susceptibility</i>	.13*	.05	.08	2.46	.03	.05	.02	.64
<i>Perceived response efficacy</i>	.48***	.07	.22	6.97	.63***	.06	.30	10.42
Broadcast					.46***	.07	.23	6.74
<i>Print</i>					.29***	.06	.18	4.78
<i>Digital</i>					.25***	.06	.19	4.58
<i>F</i>	8.77				38.37			
<i>R²</i>	.06				.29			
<i>N</i> = 1 000 * <i>p</i> < .05, ** <i>p</i> < .01, *** <i>p</i> < .001								

Table 5: Indigenous methods of personal protection against Malaria

	<i>Model 1</i>				<i>Model 2</i>			
	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>t</i>	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>t</i>
Using insect killer bat / racquet								
<i>(Constant)</i>	-7.77	5.27		-1.47	-8.55	5.30		-1.61
<i>Gender</i>	-.06	.09	-.02	-.70	-.01	.09	.00	-.09
<i>Age</i>	.00	.00	-.03	-1.07	.00	.00	.01	.22
<i>Highest educational level</i>	.04	.03	.06	1.68	.04	.03	.06	1.67
<i>Monthly household income</i>	.00	.00	.02	.67	.00	.00	.02	.51
<i>Perceived severity</i>	.16*	.08	.07	2.05	.15	.08	.06	1.93
<i>Perceived susceptibility</i>	-.07	.05	-.05	-1.38	-.11*	.05	-.08	-2.28
<i>Perceived response efficacy</i>	.37***	.05	.25	7.68	.35***	.05	.25	7.32
<i>Broadcast</i>					.17*	.07	.09	2.42
<i>Print</i>					-.16*	.06	-.11	-2.60
<i>Digital</i>					.23***	.06	.19	4.16
<i>F</i>	11.00				11.44			
<i>R²</i>	.08				.11			
Anti-mosquito incense such as Jumbo, Baygon, Vape, and etc.								
<i>(Constant)</i>	8.58	5.69		1.51	1.33	4.76		.28
<i>Gender</i>	-.02	.10	-.01	-.21	.12	.08	.04	1.50
<i>Age</i>	.00	.00	.00	-.14	.01*	.00	.06	2.32
<i>Highest educational level</i>	-.04	.03	-.05	-1.54	-.03	.02	-.03	-1.26
<i>Monthly household income</i>	.00**	.00	-.08	-2.67	.00*	.00	-.06	-2.19
<i>Perceived severity</i>	.20*	.08	.07	2.40	.15*	.07	.06	2.28
<i>Perceived susceptibility</i>	.22***	.05	.14	4.40	.10*	.04	.06	2.41
<i>Perceived response efficacy</i>	.40***	.04	.33	10.80	.50***	.03	.41	15.22
<i>Broadcast</i>					.67***	.06	.32	10.49

Model 1					Model 2			
<i>Print</i>					.23***	.06	.14	3.95
<i>Digital</i>					.27***	.05	.19	5.29
<i>F</i>	26.07				73.75			
<i>R</i> ²	.16				.44			
Growing plants such as tulsi, lemongrass, serai or lavender								
<i>(Constant)</i>	12.48*	5.24		2.38	6.19	4.78		1.30
<i>Gender</i>	.13	.09	.04	1.43	.21*	.08	.07	2.62
<i>Age</i>	.00	.00	-.04	-1.30	.00	.00	.01	.21
<i>Highest educational level</i>	-.07**	.03	-.08	-2.70	-.05*	.02	-.06	-2.20
<i>Monthly household income</i>	.00	.00	-.02	-.57	.00	.00	.00	.06
<i>Perceived severity</i>	.53***	.08	.20	7.05	.48***	.07	.18	7.18
<i>Perceived susceptibility</i>	.05	.05	.03	1.06	-.03	.04	-.02	-.72
<i>Perceived response efficacy</i>	.58***	.03	.50	17.87	.48***	.03	.41	15.78
<i>Broadcast</i>					.69***	.07	.33	10.34
<i>Print</i>					.01	.06	.01	.22
<i>Digital</i>					.14**	.05	.10	2.81
<i>F</i>	56.80				72.94			
<i>R</i> ²	.30				.44			

N = 1 000
 * *p* < .05, ** *p* < .01, *** *p* < .001

Figure 1: Graphical depiction of gaps between perceived effectiveness and actual practice

Figure 2: Relative influence of models with only attitudes vs. attitudes + media preferences