Personal protection behaviors against Malaria in India : urban attitudes and health info seeking preferences

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Urban attitudes & health info seeking preferences

BACKGROUND

"Baseball and Malaria keep coming back", Gene Mauch[1] famously noted. His words might find resonance with health authorities and policymakers across the tropical world grappling with Malaria outbreaks year after year. Despite noticeable improvements in Malaria control in countries like Vietnam and India (Barat, 2006), vast numbers of urban and rural populations in these countries continue to be threatened by this and other related vector-borne infectious diseases like dengue and chikungunya (Bhargava & Chatterjee, 2007). According to latest estimates, India alone records about 9.75 million malaria cases every year with more than 40,000 lives lost annually (Sinha, 2012).

While malaria is widely perceived to be a rural disease and has thus been widely studied (Dambhare, Nimgade, & Dudhe, 2012; Mazumdar, 2011; Narayanasamy et al., 2012), the issue of urban malaria has received scant attention from health communication scientists. This is surprising given that urban areas contribute to approximately 15% of the malaria burden in India (Dash, Valecha, & Kumar, 2008). The gradual surge of malaria in cities like Mumbai, New Delhi and Chennai has been partly attributed to migration from rural to urban areas that has led to haphazard and unplanned expansions of cities and towns (Agarwal, 2009). As a result, congestion of crowds and relentless construction activities create fertile breeding grounds for mosquitoes and consequently, malaria transmission.

[1] Gene William Mauch was an American professional baseball player and manager (http://en.wikipedia.org/wiki/Gene_Mauch).

Communicating Malaria

Over the past 50 years, communication efforts to increase the awareness of malaria among the general public by informing them about risks and preventive methods have refused to evolve. Indian health authorities have depended on a combination of traditional mass media (like posters) (The Asian Age, 2012) and interpersonal communication strategies like health workshops to create malaria awareness among the population. Initiatives like these are usually launched before or during outbreak season and sometimes conducted in collaboration with civic or business organizations such as the builder's guild. Conceptually, the approach towards communication campaigns related to malaria and other vector-borne diseases has remained constrained to the dated "information, education and communication" (IEC) paradigm (Prasad, 2009) that has advanced in the past two decades to "behavior change communication" (BCC) (Vijaykumar, 2008). The essential difference between the two is that IEC focuses only on the educational element, whereas BCC comprises IEC plus the creation of a supportive environment that act as enablers for individuals and communities to start practicing healthier behaviors.

More importantly, these programs are neither informed by an understanding of knowledge, attitudes and practices related to preventive strategies, nor of health information seeking behaviors among targeted audiences. Furthermore, efforts to evaluate the effectiveness of these campaigns are rare. Spiraling malaria figures even in urban residential zones with high media concentration like Mumbai (Praja, 2012)demonstrate the limited impact of existing health communication efforts and suggest the inadequate power of traditional media alone. In this scenario, the unprecedented penetration of mobile phones across India might offer cost-effective and sustainable solutions. India is amongst the fastest growing mobile phone markets with a 210-fold increase in subscriptions from 2000 to 2010 and a 62% penetration rate (Economics, 2011).

Despite this fact, initiatives that use the power of mobile phones 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) (Zurovac et al., 2011). In this study, the authors' conducted a 3-year randomized control trial testing automated delivery of SMSes to health workers for malaria case management and found significantly positive changes on case management and counseling practices. Another study examined the effects of a mobile phone based disease and treatment monitoring of malaria (DTMM) in Thailand (Meankaew et al., 2010) and found that follow-up rates among Thai health workers improved considerably.

Both these studies, and other mobile-phone based initiatives, have of course approached interventions from a health systems standpoint. However, the unparalleled penetration of mobile phones across India and the widening base of social innovations using mobile-based interventions on other health issues, for enhancing knowledge, attitudes and practices among individuals offer us many avenues for opportunity. In terms of research, it is of concern that we were unable that examined attitudes towards malaria among India's urban population and evaluated their health information seeking preferences in relation to the same. Therefore, one of the objectives of our study is to be able to address this gap and provide a platform for future inquiries into this issue. The motivation is to identify not one, but at least the top three media preferences that can potentially inform integrated communication campaigns of state health departments in the country and aid them in enhancing personal protection behaviors related to malaria.

Malaria Prevention Strategies

Strategies to control malaria can be broadly divided into those implemented by public health authorities and those practiced by individuals (the general public). Action by health systems personnel is primarily focused on vector control (NVBDCP, n.d.)which comprises a) elimination of breeding sites through various engineering methods and b) treatment through anti-larval efforts and anti-adult mosquito efforts (such as fogging).

Individuals carry out a wide range of malaria preventive methods which we categorize into, scientific and unscientific (heretofore referred to as indigenous) personal protection methods (Lwin et al., 1997). According to the UNICEF (2000), the main PPSs include the use of insecticide-treated mosquito nets (also commonly referred to as bednets), use of mosquito coils and body repellents (sprays and lotions), and indoor insecticide spraying. In addition, the WHO (2008) recommends eliminating places where mosquitoes can breed by removing discarded containers that might collect water, repairing leaks and improving drainage. Wearing long-sleeve shirts and full-length trousers are also often recommended.

Unscientific or indigenous personal protection methods emerge from socio-cultural norms, notions and mores that remain prevalent in vast swathes of the country. For instance, traditional medical practitioners recommend growing a plant called Tulsi (Ocimum Sanctum Linn) (Prakash & Gupta, 2005)whose stem and leaves 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) (Tandon & Sirohi, 2010) 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 effectiveness (Eversole & Bammek, 1998) Incense sticks are often used by travelers to east Africa and used extensively in various parts of India apart from the

relatively recent electric mosquito racquets or bats. Across the various scientific and indigenous personal protection strategies, 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 behaviors (Delacollette et al., 2009). While some studies in specific pockets of semi-urban and rural India have examined personal protection strategies against Malaria (Snehalatha, Ramaiah, Vijay Kumar, & Das, 2003; Tyagi, Roy, & Malhotra, 2005), investigations of such practices in urban regions are scant and often overlooked.

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 kinds of medium do urban Indians prefer in seeking health information?

RQ2: 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?

RQ3: Do attitudes related to Malaria and health information seeking preferences affect the performance of personal protective strategies against contacting the disease?

METHODOLOGY

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. We conducted a cross-sectional survey in five large Indian cities chosen in terms of urban agglomeration: New Delhi, Mumbai, Chennai, Kolkata and Hyderabad.

Sampling: 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.

Respondent Selection: 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.

Survey Administration: They 60-minute survey was administered across five weeks in the middle of 2012 by trained interviewers. Informed consent was sought from respondents after describing the aims and background of the study. The interviews were conducted in one of six languages – Bengali, English, Hindi, Marathi, Tamil and Telugu – based on the respondents' preference.

Survey Questionnaire: 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. Attitudes related to Malaria were scored on 5-point Likert (strongly agree to strongly disagree) scales. Specifically, perceived severity was captured through a 2-item scale (e.g. You feel that Malaria is a serious disease) and perceived severity was captured through a 3-item scale (e.g. Your living conditions put you at risk for Malaria) adapted from existing scales. 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). 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.

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 were 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 the various preventive 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.

None of the demographic variables that we controlled for proved to be significant predictors of any of the preventive behaviors. Among scientific methods of prevention, we see response efficacy significantly contributes to a model explaining 6% of the variance in sleeping under mosquito nets. Including health-related media use significantly improves 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%. In

contrast to the above two behaviors, health-related attitudes alone explain 18% of the variance in spraying insecticides on walls with health-related media using adding a further 10% to its explanatory power. Similarly, health-related attitudes explain a substantial 24% of variance in sealing cracks and holes in ceilings, and media use variables contribute significantly to the model and adds a substantial 15%.

(insert Table 4 around here)

Among indigenous methods of prevention, we found that health-related attitudes alone predict 27% of the variance in behaviors involving burning trash around the house and fumigation using *dhoop.* Adding media use variables increases the explanatory of these models significantly to 43% and 38% respectively. All health-related attitude variables contribute significantly to models that explain 30% of the variance in growing plants such as tulsi, and 31% in burning coconut husks. Here too, adding media use variables enhances 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 demise (Daily Bhaskar, 2012). 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 city (CNN-IBN, 2012). 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 Mumbai (Kowli & Attar, 2010). Possibly because the survey was conducted in urban areas, indigenous methods were found to be less frequently used. 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 sociodemographic factors (Snehalatha, et al., 2003; Srinivas, Edwin Amalraj, & Dhanraj, 2005) – 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/AIDS (Ghosh, Patil, Tiwari, & Dash, 2006) have been weakened by the lack of a concrete communication strategy based on empirical evidence. Senior officials from Mumbai's municipal corporation and the Government of India's Environmental Monitoring Unit (EMU) in meetings with the paper's authors seconded this concern. Specifically, these officials reaffirmed their confidence in existing Malaria/Dengue surveillance efforts through a combination of manual and automated methods but opined that effective strategies to educate citizens about Malaria transmission and personal protection strategies were found wanting. 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 Log (Singhal, Rogers, & Brown, 1993), 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 areas (Reyes-Hockings, 1966). 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 email (CNN-IBN, 2012)– 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; 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. If they were to promote indigenous methods of prevention however, attempting to diffuse 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 highlight 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, there is also need to supplement communication campaigns by providing a supportive environment, in terms of increasing access to scientific preventive devices and decreasing costs. At a broader level, the call is for cross-sectoral 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.

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

Description	*Frequency (%)*
Gender	
Male	458 (45.80%)
Female	542 (54.20%)
Age	M = 38.37; SD = 13.82
18-30	359 (35.90%)
31-50	442 (44.20%)
51 and above	199 (19.90%)
Marital Status	
Single	162 (16.20%)
Married	791 (79.10%)
Separated / Divorced / Widowed	46 (4.60%)
Highest Education Level	
Primary school and below	83 (8.30%)
Secondary school and pre-university	583 (58.30%)
University and above	328 (32.80%)
Monthly Income	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%)
First Home Housing Type	
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%)

N = 1 000

Table 2: Media preferences related to health information seeking

Gaps	*Mean*	*SD*
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

Preventive Methods	*Perceived Effectiveness*		*Actual Practice*		*Gaps*		*t*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	
Sleep under mosquito nets	4.36	.71	3.12	1.54	1.24	1.55	25.24***
Drain stagnant water	4.16	.90	3.46	1.51	.71	1.75	12.47***
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***
Use mosquito repellents	4.25	.76	4.00	1.10	.25	1.13	7.06***
Use mosquito repellent ointments	3.62	1.00	2.99	1.42	.63	1.73	11.49***
Wear long-sleeves clothes	3.21	1.35	2.22	1.35	1.00	1.31	24.05***
Burn trash around the house	3.28	1.33	2.38	1.51	.90	1.43	19.79***
Grow plants	2.72	1.37	2.49	1.58	.23	1.48	4.88***
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***
Burn anti-mosquito incense	3.52	1.30	2.56	1.57	.96	1.68	18.01***
Use insect killer bat / racquet	3.94	.97	2.69	1.39	1.25	1.49	26.54***

N = 1 000

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

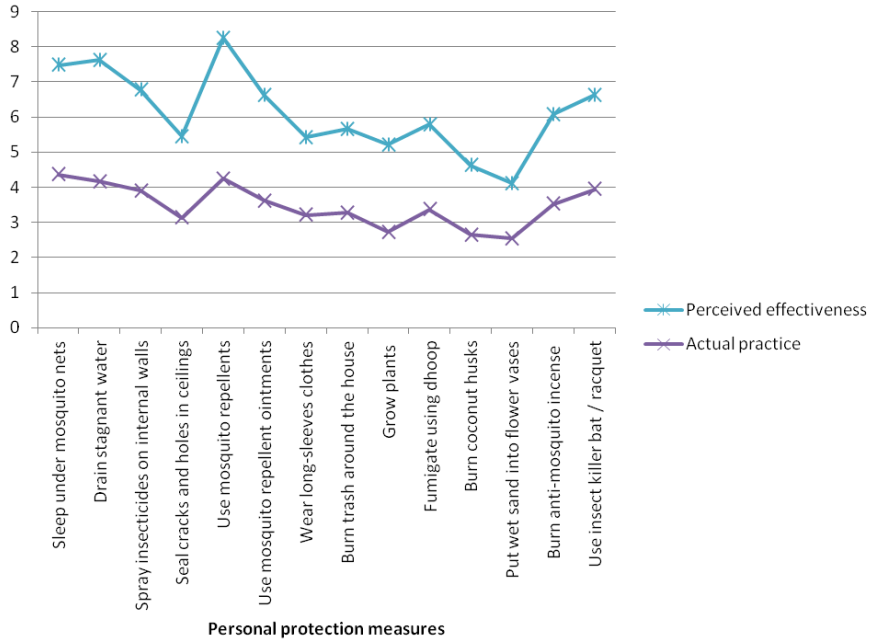

Figure 1: Graphical depiction of gaps between perceived effectiveness and actual practice

Table 4: Scientific methods of personal protection against malaria

	Model 1				*Model 2*			
	B	*SE*	*Beta*	*t*	*B*	*SE*	*Beta*	*t*
Sleeping under mosquito nets								
(Constant)	10.31	5.85		1.76	5.21	5.21		1.00
Gender	-.09	.10	-.03	-.93	.05	.09	.02	.52
Age	.00	.00	.01	.43	.01**	.00	.07	2.51
Highest educational level	-.04	.03	-.05	-1.57	-.04	.03	-.05	-1.62
Monthly household income	.00	.00	-.00	-.06	.00	.00	.01	.21
Perceived severity	-.11	.08	-.04	-1.27	-.13	.07	-.05	-1.83
Perceived susceptibility	.13*	.05	.08	2.46	.03	.05	.02	.64
Perceived response efficacy	.48***	.07	.22	6.97	.63***	.06	.30	10.42
Broadcast					.46***	.07	.23	6.74
Print					.29***	.06	.18	4.78
Digital					.25***	.06	.19	4.58
F	8.77				38.37			
R^2	.06				.29			
Draining stagnant water								
(Constant)	1.47	5.84		.25	3.90	5.20		.75
Gender	-.09	.10	-.03	-.91	.08	.09	.03	.94
Age	-.00	.00	-.01	-.32	.01*	.00	.07	2.26
Highest educational level	.01	.03	.01	.32	-.03	.03	-.03	-1.00
Monthly household income	.00	.00	.04	1.07	.00	.00	.02	.79
Perceived severity	.02	.08	.01	.25	.02	.07	.01	.24
Perceived susceptibility	.14**	.05	.09	2.76	.06	.05	.04	1.38
Perceived response efficacy	-.04	.06	-.03	-.74	.22***	.05	.14	4.32
Broadcast					.17*	.07	.09	2.49
Print					.25***	.06	.16	4.15
Digital					.48***	.06	.36	8.61
F	1.64				31.51			
R^2	.01				.25			
Spraying insecticides on internal walls								
(Constant)	-7.24	5.19		-1.39	-5.40	4.99		-1.08
Gender	-.02	.10	-.01	-.18	.09	.09	.03	1.09
Age	.01	.00	.06	1.88	.01***	.00	.13	4.26
Highest educational level	.03	.03	.04	1.33	.02	.02	.02	.65
Monthly household income	.00	.00	.01	.41	.00	.00	.00	.06
Perceived severity	.11	.07	.04	1.43	.09	.07	.04	1.33
Perceived susceptibility	.22***	.05	.15	4.88	.14**	.04	.10	3.30
Perceived response efficacy	.52***	.04	.38	12.60	.55***	.04	.40	13.66
Broadcast					.07	.07	.04	1.03
Print					-.05	.06	-.03	-.83
Digital					.43***	.05	.33	8.04
F	28.65				35.01			
R^2	.18				.28			

N = 1 000

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

	Model 1				*Model 2*			
	B	*SE*	*Beta*	*t*	*B*	*SE*	*Beta*	*t*
Sealing cracks and holes in ceilings								
(Constant)	1.22	5.41		.23	-.75	4.93		-.15
Gender	.14	.09	.05	1.53	.27**	.08	.09	3.27
Age	.00	.00	.03	1.11	.01***	.00	.10	3.78
Highest educational level	-.01	.03	-.02	-.49	-.02	.02	-.02	-.73
Monthly household income	.00	.00	-.05	-1.60	.00	.00	-.05	-1.66
Perceived severity	.27***	.08	.10	3.54	.25***	.07	.10	3.69
Perceived susceptibility	.25***	.05	.16	5.39	.16***	.04	.10	3.70
Perceived response efficacy	.51***	.04	.42	14.24	.53***	.03	.44	16.45
Broadcast					.31***	.07	.15	4.78
Print					.08	.06	.05	1.43
Digital					.38***	.05	.27	7.27
F	40.87				59.41			
R^2	.24				.39			
Using mosquito repellents such as Tortoise Coil, All Out, Flit, Baygon, and etc.								
(Constant)	-14.78***	3.96		-3.73	-12.77**	4.05		-3.15
Gender	.13	.07	.06	1.92	.15*	.07	.07	2.19
Age	.00	.00	.01	.21	.00	.00	.02	.68
Highest educational level	.08***	.02	.14	4.39	.07	.02	.13	3.80
Monthly household income	.00**	.00	.08	2.66	.00***	.00	.07	2.35
Perceived severity	.00	.06	.00	.04	.01	.01	.00	.09
Perceived susceptibility	-.22***	.04	-.19	-6.33	-.23***	.06	-.20	-6.53
Perceived response efficacy	.45***	.04	.31	10.45	.45***	.04	.31	10.40
Broadcast					-.10	.05	-.07	-1.81
Print					.00	.05	.00	-.08
Digital					.10*	.04	.10	2.29
F	27.97				20.42			
R^2	.17				.18			
Using mosquito repellent ointments such as Odomos, Autan, and etc.								
(Constant)	18.66**	5.43		3.44	17.29***	4.88		3.54
Gender	.17	.09	.06	1.82	.30***	.08	.11	3.68
Age	-.01*	.00	-.08	-2.47	.00	.00	.01	.18
Highest educational level	-.08**	.03	-.11	-3.25	-.09***	.02	-.12	-4.04
Monthly household income	.00	.00	-.04	-1.12	.00	.00	-.04	-1.24
Perceived severity	.32***	.08	.13	4.12	.31***	.07	.13	4.56
Perceived susceptibility	.19***	.05	.13	3.99	.08	.04	.06	1.94
Perceived response efficacy	-.01	.05	-.01	-.20	.06	.04	.04	1.44
Broadcast					.32***	.06	.17	5.01
Print					.11	.06	.07	1.89
Digital					.41***	.05	.32	7.86
F	10.49				37.54			
R^2	.07				.29			

N = 1 000

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

Scientific preventive methods III

	Model 1				Model 2			
	B	*SE*	*Beta*		*B*	*SE*	*Beta*	
Wear long-sleeves clothes								
(Constant)	-10.60*	4.49		-2.36	-10.37*	4.56		-2.27
Gender	-.14	.08	-.05	-1.83	-.12	.08	-.04	-1.56
Age	.00	.00	.00	-.09	.00	.00	.02	.51
Highest educational level	.05*	.02	.08	2.52	.05*	.02	.07	2.40
Monthly household income	.00	.00	.01	.40	.00	.00	.01	.24
Perceived severity	-.04	.06	-.02	-.57	-.04	.06	-.02	-.63
Perceived susceptibility	.13**	.04	.09	3.19	.11**	.04	.08	2.81
Perceived response efficacy	.53***	.03	.53	18.46	.52***	.03	.52	17.00
Broadcast					.04	.06	.02	.67
Print					-.09	.06	-.06	-1.58
Digital					.10*	.05	.09	2.13
F	57.44				41.00			
R^2	.30				.31			

N = 1 000

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

Table 5: Indigenous methods of personal protection against Malaria

	Model 1				Model 2			
	B	*SE*	*Beta*	*t*	*B*	*SE*	*Beta*	*t*
Burning trash around the house								
(Constant)	8.52	5.13		1.66	5.97	4.66		1.28
Gender	.01	.09	.00	.10	.14	.08	.05	1.78
Age	.00	.00	.01	33	.01**	.00	.08	3.15
Highest educational level	-.04	.03	-.05	-1.62	-.04	.02	-.05	-1.79
Monthly household income	.00	.00	.00	.10	.00	.00	.00	-.04
Perceived severity	.01	.07	.01	.18	-.02	.07	-.01	-.36
Perceived susceptibility	.04	.05	.02	.80	-.05	.04	-.04	-1.33
Perceived response efficacy	.58***		.51	18.02	.49***	.03	.44	16.07
Broadcast		.03			.45***	.07	.23	6.93
Print					-.06	.06	-.04	-1.04
Digital					.38***	.05	.28	7.63
F	49.29				68.62			
R^2	.27				.43			
Growing plants such as tulsi, lemongrass, serai or lavender								
(Constant)	12.48*	5.24		2.38	6.19	4.78		1.30
Gender	.13	.09	.04	1.43	.21*	.08	.07	2.62
Age	.00	.00	-.04	-1.30	.00	.00	.01	.21
Highest educational level	-.07**	.03	-.08	-2.70	-.05*	.02	-.06	-2.20
Monthly household income	.00	.00	-.02	-.57	.00	.00	.00	.06
Perceived severity	.53***	.08	.20	7.05	.48***	.07	.18	7.18
Perceived susceptibility	.05	.05	.03	1.06	-.03	.04	-.02	-.72
Perceived response efficacy	.58***	.03	.50	17.87	.48***	.03	.41	15.78
Broadcast					.69***	.07	.33	10.34
Print					.01	.06	.01	.22
Digital					.14**	.05	.10	2.81
F	56.80				72.94			
R^2	.30				.44			

N = 1 000

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

	Model 1				*Model 2*			
	B	*SE*	*Beta*		*B*	*SE*	*Beta*	
Fumigation using dhoop (incense sticks)								
(Constant)	4.00	4.88		.82	.65	4.88		.14
Gender	-.03	.08	-.01	-.37	.03	.08	.01	.41
Age	-.01*	.00	-.06	-1.99	.00	.00	-.01	-.51
Highest educational level	-.02	.02	-.02	-.67	-.01	.02	-.01	-.41
Monthly household income	.00	.00	.04	1.34	.00	.00	.05	1.73
Perceived severity	.03	.07	.01	.38	.01	.07	.01	.22
Perceived susceptibility	-.08	.04	-.05	-1.82	-.14**	.04	-.09	-3.15
Perceived response efficacy	.59***	.03	.52	18.14	.42***	.04	.37	12.77
Broadcast					.61***	.06	.33	9.55
Print					-.09	.06	-.06	-1.62
Digital					.16**	.05	.13	3.37
F	49.50				57.34			
R^2	.27				.38			
Burning coconut husks								
(Constant)	3.11	4.68		.67	1.95	4.08		.48
Gender	-.02	.08	-.01	-.25	.11	.07	.04	1.57
Age	.00	.00	.01	.39	.01**	.00	.07	2.89
Highest educational level	-.02	.02	-.03	-.99	-.03	.02	-.04	-1.51
Monthly household income	.00	.00	-.04	-1.25	.00	.00	-.04	-1.46
Perceived severity	.34***	.07	.14	5.20	.29***	.06	.12	5.06
Perceived susceptibility	.26***	.04	.18	6.41	.18***	.04	.12	5.07
Perceived response efficacy	.50***	.03	.49	17.35	.35***	.03	.34	12.73
Broadcast					.54***	.06	.29	9.37
Print					.08	.05	.06	1.71
Digital					.25***	.04	.20	5.69
F	60.48				90.42			
R^2	.31				.49			
Putting wet sand into flower vases								
(Constant)	-7.77*	3.59		-2.16	-6.43	3.54		-1.82
Gender	.04	.06	.02	.60	.09	.06	.04	1.48
Age	.00	.00	-.05	-1.54	.00	.00	-.01	-.42
Highest educational level	.04*	.02	.07	2.13	.03	.02	.05	1.53
Monthly household income	.00	.00	.02	.51	.00	.00	.01	.24
Perceived severity	.11*	.05	.07	2.28	.11*	.05	.06	2.17
Perceived susceptibility	.22***	.03	.20	6.94	.19***	.03	.18	6.20
Perceived response efficacy	.32***	.02	.44	14.51	.27***	.03	.36	10.75
Broadcast					.12*	.05	.09	2.32
Print					.01	.04	.01	.31
Digital					.14***	.04	.15	3.73
F	45.59				38.75			
R^2	.26				.30			

N = 1 000

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

	Model 1				Model 2			
	B	*SE*	*Beta*		*B*	*SE*	*Beta*	
Anti-mosquito incense such as Jumbo, Baygon, Vape, and etc.								
(Constant)	8.58	5.69		1.51	1.33	4.76		.28
Gender	-.02	.10	-.01	-.21	.12	.08	.04	1.50
Age	.00	.00	.00	-.14	.01*	.00	.06	2.32
Highest educational level	-.04	.03	-.05	-1.54	-.03	.02	-.03	-1.26
Monthly household income	.00**	.00	-.08	-2.67	.00*	.00	-.06	-2.19
Perceived severity	.20*	.08	.07	2.40	.15*	.07	.06	2.28
Perceived susceptibility	.22***	.05	.14	4.40	.10*	.04	.06	2.41
Perceived response efficacy	.40***	.04	.33	10.80	.50***	.03	.41	15.22
Broadcast					.67***	.06	.32	10.49
Print					.23***	.06	.14	3.95
Digital					.27***	.05	.19	5.29
F	26.07				73.75			
R^2	.16				.44			
Using insect killer bat / racquet								
(Constant)	-7.77	5.27		-1.47	-8.55	5.30		-1.61
Gender	-.06	.09	-.02	-.70	-.01	.09	.00	-.09
Age	.00	.00	-.03	-1.07	.00	.00	.01	.22
Highest educational level	.04	.03	.06	1.68	.04	.03	.06	1.67
Monthly household income	.00	.00	.02	.67	.00	.00	.02	.51
Perceived severity	.16*	.08	.07	2.05	.15	.08	.06	1.93
Perceived susceptibility	-.07	.05	-.05	-1.38	-.11*	.05	-.08	-2.28
Perceived response efficacy	.37***	.05	.25	7.68	.35***	.05	.25	7.32
Broadcast					.17*	.07	.09	2.42
Print					-.16*	.06	-.11	-2.60
Digital					.23***	.06	.19	4.16
F	11.00				11.44			
R^2	.08				.11			

N = 1 000

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

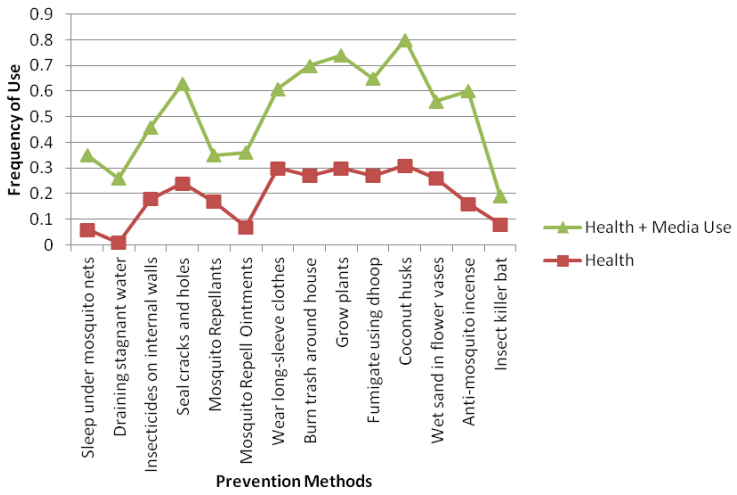

Figure 2: Relative influence of models with only attitudes vs. attitudes + media preferences

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