

Knowledge and Attitudes toward HIV and People Living with HIV (PLWH) Among
Public Health Midwives in the Galle District, Sri Lanka

by

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Larry Park

Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
in the Graduate School of Duke University

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ABSTRACT

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Abstract

Background: Even though a recent increase in HIV prevalence has been noticed in Sri Lanka, not many studies have been done there relating to HIV/AIDS. In particular, little is known about HIV-related stigma among healthcare workers, which has been identified as an obstacle to addressing the HIV epidemic. To examine this issue, this study first aimed to assess knowledge and attitudes of PHMs, the frontline community health workers in Sri Lanka. Second, the study examined the factors associated with their knowledge and attitudes. Lastly, the study examined the association of demographic information, knowledge, and attitudes with extra precautionary behaviors.

Methods: Two-hundred and ninety-one PHMs were recruited for this cross-sectional study. The study team visited each of the 20 Medical Officers of Health areas (MOH: administrative division) in the Galle District and surveyed PHMs during their monthly meetings. The study utilized two questionnaires to assess knowledge (16 items), attitudes and stigma (37 items). After assessing the PHMs knowledge and attitudes, the study explored the association of demographic information with knowledge and attitudes, and then examined how such individual factors, knowledge and attitudes were associated with extra precautionary behaviors. Results: PHMs' knowledge level was good (79.9% of answers were correct) but could be improved. Those more knowledgeable about HIV and with higher education demonstrated a more positive

attitude towards PLWH. A more negative attitude was associated with having a stronger intention to engage in extra precautionary behaviors. Conclusions: As PHMs are community health workers whose attitude can potentially influence to the general public's point of view, they need further HIV training to improve their knowledge so as to better educate the community. By reducing the PHMs misperceptions about HIV, they may develop a more positive attitude and thus help reduce stigma towards PLWH.

Keywords: HIV, PLWH, Stigma, attitude, community health workers, midwives, Asia, Sri Lanka

Dedication

I dedicate this thesis to my family.

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1. Introduction

1.1 Overview

Stigma towards HIV and people living with HIV (PLWH) has been prevalent since the HIV epidemic started in 1980s. The experiences of discrimination and stigmatization weaken people's willingness to engage in HIV testing, disclose HIV status, request care and comply with the treatment[1]. Especially stigma toward PLWH by healthcare workers has been one of the major obstacles in the HIV epidemic because of its negative impact on access to care [2] and treatment outcomes[3].

There have been many efforts to identify factors associated with such stigma among healthcare workers, however, it has not been studied much in South Asian countries [4]. In addition, little is known about HIV-related attitudes of community health workers who interact closely with the community. As PHMs are at the frontline of the Sri Lankan health system, and their interaction with community members is not limited to midwifery, it is important to examine how knowledgeable midwives are and how they perceive HIV and PLWH.

1.2 HIV-related stigma

1.2.1 HIV-related stigma

Stigma is generally conceptualized in two ways: negative attitude and discrimination [5]. People living with HIV experience stigma through negative attitude toward them that include negative emotional reactions (e.g. People living with HIV

should feel ashamed of themselves) and stereotyping, an overgeneralized or inaccurate belief (e.g. Most people living with HIV do not care if they infect other people) [6]. Discrimination is another form of stigma, which is a negative behavior or decisions that is often considered as a consequence of such a negative attitude [7]. When treating PLWH, healthcare workers' engaging with extra precautionary behaviors, such as wearing double gloves or using special measures that are not normally used for other patients, would be an example of discrimination.

This study defines stigma as a negative attitude that includes unjustifiable negative emotional reactions and stereotyping. Knowledge is not often included in the theoretical conceptualization of stigma; however, ignorance could be one of the reasons for negative attitude and discrimination. Therefore, the study also includes knowledge level as a predictor, and extra precautionary behaviors as a consequence of such a negative attitude.

1.2.2 HIV-related stigma by healthcare workers

The impact of HIV-related stigma in healthcare settings is important because of its negative impact on patient-provider relationships, patients' seeking of treatment and treatment adherence. HIV patients often have experienced discrimination in the clinical setting[8] and having such experiences resulted in a loss of trust towards healthcare workers and therefore obstructed access to healthcare[3]. Healthcare workers' stigma toward PLWH is also associated with lower perceived quality of care by the patients,

lower access to care, decreased appointment attendance, and lower treatment adherence [9].

1.2.3 Factors associated with HIV-related attitudes among healthcare workers

Even though early literature review revealed that certain factors such as age, gender, education, knowledge, religion do not show consistent associations with healthcare workers' negative attitude toward PLWH [10], some studies shown associations between such factors and negative attitude.

Among Malaysian medical and dental students, females and those less advanced in training showed more negative attitudes toward PLWH [11]. Training was also one of the significant predictors in another study done with medical students in Vietnam. In that study, less training, number of family members and less knowledge were positively associated with negative attitude [12]. Knowledge was also one of the significant predictor of negative attitude in another study. Older age, less knowledgeable and having more fear of infection were associated with negative attitude among Indonesian doctors, nurses and medical interns [13]. Older participants, again, showed more negative attitude than their younger counterparts among doctors, nurses and staff in Bangladesh [14]. Fear of infection was again one of the significant predictors of negative attitude among doctors, nurses and staffs in India [15]. Along with the fear of infection, less frequent contact with PLWH was another predictor of negative attitude in this group [15].

In general, previous studies indicate that healthcare workers who are older, less trained, less knowledgeable, have more fear of infection and less contact with PLWH demonstrate more negative attitudes.

1.2.4 Lack of literature in Asian countries and Community Health Workers(CHWs)

Although HIV-related stigma has been studied with some Asian populations, still the number is less than that of North America and Europe [4,16]. Mahajan, et al (2008) revealed that only 39 of 239 articles that assessed HIV-related stigma were based in Asia and the Pacific Islands. Until now, 4 papers were published on this topic within the context of Sri Lanka and only one focused on healthcare workers. That paper surveyed dental students and the other three focused on construction workers and general populations of two districts in Sri Lanka [17–20].

In addition, community health workers(CHWs) are not often studied in this context. CHWs are important contributors to control infectious disease, such as HIV, in low, middle or even high income countries [21]. What makes them different from other healthcare workers is that they do not stay in a fixed place, such as a clinic or a hospital, but travel to homes of people in the community. They are expected to have a close relationship and often live in the same community [22]. Most studies done with CHWs were focused on the efficiency or effectiveness of utilizing CHW for interventions to promote HIV treatment, increase HIV awareness, HIV testing rate or reduce stigma [23,24]. To utilize CHWs as potential frontline workers in the fight against the HIV

epidemic, it is essential to understand their HIV-related knowledge and attitudes towards PLWH.

1.3 HIV in Sri Lanka (Low prevalence but increasing potential risk)

1.3.1 HIV in Sri Lanka

Sri Lanka has low HIV prevalence; however, HIV incidence is increasing. Reasons for this rise include low condom use and lack of HIV-related knowledge among at-risk populations, increasing migrant workers, low level of HIV testing, and high level of stigma in all populations including healthcare workers [2,25,26]. There are 4,200 estimated and 1,900 diagnosed PLWH with a male to female ratio of 1.7:1 as of 2015 [27]. Only about 50% of diagnosed PLWH are on antiretroviral treatment(ART) as of 2015 [27].

Sri Lanka consists of 25 districts in 9 provinces. Galle District is the capital of the Southern Province and has the 6th largest population nationwide (Figure 1). IBBS¹, a survey conducted in 4 districts (Colombo, Galle, Kandy and Anuradhapura) with key populations at higher risk for HIV, showed that Galle District has more PLWH than expected. It identified HIV prevalence among female sex workers (FSW) and men who have sex with men (MSM) as 1% and 0.4% in the district, respectively [26]. However, HIV testing rate of both populations remained lower than the average. Less than 25% of

¹ Integrated biological and behavioral surveillance(IBBS) survey among key populations at higher risk of HIV in Sri Lanka.

FSW and about 5% MSM were tested for HIV. Furthermore, the rate of condom usage among FSW (87.7%) and MSM (37.2%) was the lowest among the 4 districts surveyed. Because of the below-average rate of HIV testing and condom usage, it is predicted that the HIV prevalence in the at-risk population in the Galle District is higher than the statistics presented.



Figure 1: Location of Sri Lanka in the World map and the district map of Sri Lanka

1.3.2 HIV stigma in Sri Lanka

Stigma toward PLWH has improved from the past; however, PLWH are still experiencing stigma from family, neighborhoods and within the healthcare settings in Sri Lanka [26]. What they are mostly experiencing is verbal harassment and physical

abuse from others. The HIV Stigma Index of Sri Lanka disclosed that PLWH are experiencing verbal harassments (12%) and physical abuse (5%) due to their health condition. Particularly, those stigma attitudes are from neighbors (8%), family members (12%) and health staff (13%) [28].

Within healthcare settings, stigma is expressed as several forms of discriminations towards PLWH. Refusal of treatment and delay of treatment are the major discrimination that PLWH are facing in Sri Lanka. Nearly 10% of HIV-positive women experienced denial of healthcare due to their HIV status. Again, almost 10% of caregivers experienced denial of healthcare because they take care of an HIV-positive child. Another study revealed a more serious situation in Sri Lanka. Almost half (43%) of PLWH reported that they experienced discrimination from health care workers by refusal (15%) or delay (16%) of treatment.

1.3.3 Public Health Midwives(PHMs) in the Sri Lankan healthcare system

Sri Lanka's healthcare system is operated by several health units that consist of a medical officer, nurses, sanitary inspectors and public health midwives (PHMs) [29]. Each health unit is divided into PHM areas where one PHM usually looks after 3000-5000 population. PHMs are trained community health workers who have been recruited from the community they would serve since 1930s [30]. PHMs plays an important role in maternal and child health such as providing antenatal, postnatal and newborn care [31]. They periodically visit every community household to provide health advice and

maintain basic health records for household members. Since the PHMs are recruited from the community and registered as healthcare worker by the government, their interaction with community members is not limited to midwifery. According to a study, PHMs are used as a resource for handling domestic violence issues [32]. In the study, one PHM stated that PHMs get to know all the history of women in the community [32]. In addition, as most of the deliveries occur in hospitals in recent days, their role has progressed to provide health education for preventive health, such as nutrition and tobacco use. Therefore, it is important to know whether the PHMs are knowledgeable, trained and prepared for PLWH because their interaction with people is broader than assumed.

1.4 Rationale and study aims

1.4.1 Rationale

Although the number of new HIV infections and PLWH has been increasing in Sri Lanka since 1990, not many studies have been done in the country of this topic. In addition, even though many studies have examined the association of factors with healthcare workers' HIV stigma and its direction and magnitude, community health workers' attitude has not been much studied yet. Since PHMs' interaction with people living in the community is more than midwifery, it is important to know whether PHMs are knowledgeable and trained to reach out to PLWH. Additionally, this topic needs to

be explored in the Galle District as it has a high cumulative rate of reported HIV cases per 100,000 populations from 1987 to 2015 (6th out of 25 districts) [27].

1.4.2 Study aims

To address the gap in the current literature, first, the study aimed to assess PHMs' knowledge and attitudes towards PLWH in the Galle District in Sri Lanka. Secondly, the study sought to examine factors associated with such knowledge, attitudes and stigma. Third, the study aimed to inspect the association of knowledge, attitude, stigma with engaging precautionary behaviors and conducting HIV awareness program.

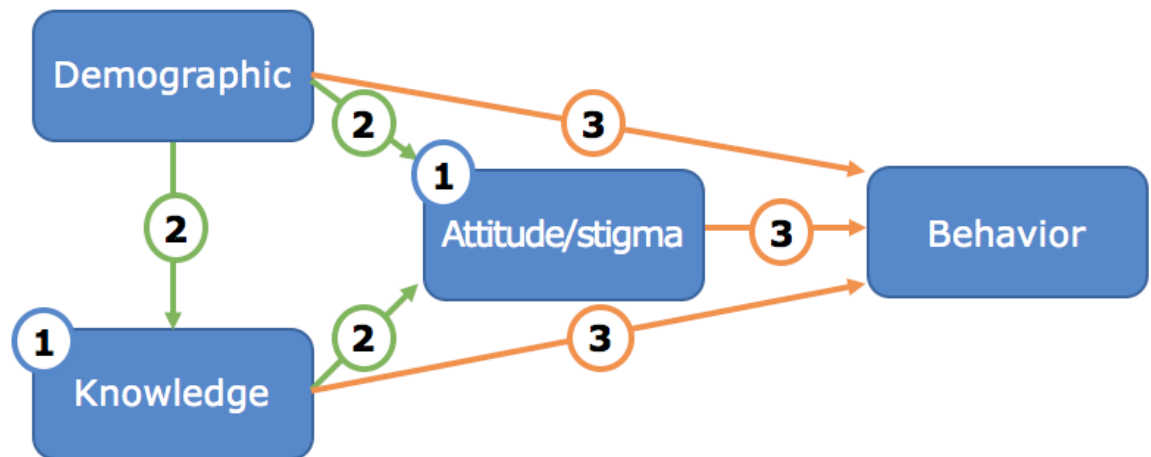


Figure 2: Conceptual analytic model and the 3 study aims.

2. Methods

2.1 Setting

A cross-sectional study was conducted in the Galle District, Sri Lanka from June 2015 to August 2015. The study team surveyed public health midwives (PHM) to assess their HIV-related knowledge and attitudes. PHMs usually work in the community in peoples' homes but meet monthly as a group with the local Medical Officer of Health (MOH). The MOH conducts these meetings to educate nurses, PHMs and sanitization inspectors about important health issues and new policies. The study team visited each of the 20 MOH offices on the meeting day and conducted the survey before or after their meeting. Before visiting each MOH division, the study team contacted the MOH by phone to set up a suitable time to conduct the survey during the meeting day.

In this meeting, PHMs provide updated data about mothers and children for whom they care since their main duty is keeping the record of children's development and vaccination. Another major role of them is providing health education to community mothers to prevent communicable and non-communicable disease. Therefore, the topics they cover range from malaria prevention to healthy eating and smoking habits.

2.2 Participants

Participants consisted of 291 PHMs who worked in the Galle District. There were no exclusion criteria for the PHMs. All PHMs who work in this area were recruited at the MOH office. This sample size of 291 covers almost all midwives of the Galle District except those who were not present at the meeting due to sickness, maternal leave or personal reasons.

2.3 Procedures

The MOH introduced the study team and explained the purpose of our visit to PHMs who were either in a conference room or in an open space as a group. Then a medical doctor acting as a research assistant introduced himself and the primary researcher. He explained the purpose of the questionnaire and the contents of the consent form. After that, the study team distributed the paper-based consent form and questionnaire to every PHM and encouraged them to read through the consent form. PHMs freely asked questions about the research and the consent form during this time. After PHMs had reviewed the consent form and signed it, they were asked to start filling out the survey.

The study team discouraged them from talking to each other or sharing any thoughts on the questions or discussing the correct answers. After they finished the questionnaire, the study team checked if there were any unanswered questions to minimize missing data. If unanswered questions were found, the research assistant

kindly asked if this was unanswered on purpose or accidentally skipped. If it was an accident, the participant was given the opportunity to complete the question.

After all participants had completed the questionnaire, all responses were checked by the research team. Each PHM was compensated 500 Sri Lankan Rupees, which is equivalent to approximately \$3.50 US dollars. Procedures were approved by the Ethical review boards at Duke University and University of Ruhuna.

2.4 Measures

Two different questionnaires were adapted for this study. First, to assess attitudes toward people living with HIV, the study adapted a standardized brief questionnaire measuring stigma and discrimination among health facility staff [33]. The low-prevalence version of this questionnaire was utilized. This scale was chosen because it is a standardized scale, which has a reduced number of questions based on a longer questionnaire used in 6 countries: China, Dominica, Egypt, Kenya, Puerto Rico and St. Christopher & Nevis [33]. Also, as most literature acknowledged, it is difficult to compare HIV-related attitudes across countries because they use different scales. Many stigma scales exist; this questionnaire was chosen because this is not only particularly assessing health care workers' attitudes but also it is comparable across the countries.

Second, to measure the knowledge level of PHMs, the HIV Knowledge Questionnaire with 18 items (HIV-KQ-18) was utilized [34]. The questions focus on sexual transmission of HIV that are suitable for low income, low literacy, heterosexual

subjects [34]. This tool is a shorter version of HIV knowledge questionnaire with 45 items (HIV-K-Q) while maintaining almost same psychometric features [34]. After the study team developed the final questionnaire and a consent form in English, they were translated into Sinhalese by our research assistant who is a native Sinhalese speaker.

Before translating this English version of questionnaire into Sinhalese, few changes were made to fit the Sri Lankan setting. First in the demographic section, profession category was replaced with PHM and supervising PHM (SPHM) instead of what the questionnaire originally provided. PHM is a public health midwife and SPHM is a senior PHM who supervises other PHMs. Questions were added to ask if they conducted HIV awareness program and what were the difficulties if they carried out the program.

Two items were deleted that ask how often they had observed other PHMs discriminate against HIV-positive pregnant women during delivery because almost all pregnant women deliver in a hospital and most PHMs do not participate in the delivery. However, one question about delivery was kept asking how worried PHMs were when assisting a pregnant woman who has HIV. It is asked them to answer this question hypothetically. Another item was deleted that asked how often they observed other PHMs not respecting pregnant women living with HIV within their HIV treatment procedure. This item was deleted because pregnant women with HIV are treated in a

specialized Sexually Transmitted Diseases (STD) center attached to the tertiary care maternity hospital.

2.4.1 Characteristics of respondents

The study obtained the PHMs' age, education level, marital status, and religion. PHMs' years of experience in healthcare, HIV clinic and HIV training experience were also asked.

2.4.2 Potential drivers and consequences of HIV-related stigma

Facility and working environment. (7 items) Participants were asked if there are HIV-related policies to protect patients from discrimination and instruments to protect PHMs from infection. Opinions about colleagues were asked including whether other PHMs are willing to care for PLWH and if they will get in trouble if they discriminate against HIV patients.

Secondary stigma. (3 items) Stigma towards the PHMs by others (friends, family, colleagues) due to their care for PLWH were asked.

Observed stigma. (4 items) PHMs were asked how often they observed other PHMs discriminate or neglect PLWH by showing lack of willingness to care, providing poor quality of care, talking badly about them or performing HIV test without informed consent.

Extra infection precaution. (4 items) Participants were asked if they use extra precautions (e.g., double gloves, special infection-control supplies) that they do not use when they treat patients who do not have HIV.

Fear. (5 items) Five items described situations that PHMs might fear to interact with HIV patients. Items included: touching clothing or bedding of HIV patients, dressing wounds, drawing blood, taking temperature, and assisting labor of HIV positive women. Even though most PHMs do not participate in deliveries, it was asked them to answer based on the assumption that they are assisting with HIV positive women's labor. Participants indicated their fear on a scale from Not worried (0) to Very worried (3).

Attitude to PLWH. (5 items) Participants addressed their opinions about 5 items that negatively describe PLWH (e.g., People living with HIV should feel ashamed of themselves, HIV is punishment for bad behavior) on a scale from 0 (Strongly disagree) to 3 (Strongly agree).

Attitude to pregnant women with HIV. (5 items) Participants presented their opinion to 4 items that negatively describe pregnant women with HIV (e.g., Pregnant women who refuse HIV testing are irresponsible, Women living with HIV should not get pregnant if they already have children) on the scale from 0 (Strongly disagree) to 3 (Strongly agree).

Attitude to at-risk population. (4 items) The at-risk population includes people who inject illegal drugs, men who have sex with men and female/male sex workers. Items assessed their willingness to treat the at-risk population. If they agreed or strongly agreed on not providing treatment to the at-risk population, they were additionally asked the reason for that answer.

2.4.3 HIV/AIDS knowledge

The HIV Knowledge Questionnaire (HIV-KQ-18) measures the participant's knowledge about sexual transmissions mostly, and a few questions about other transmissions, risk factors and prevention of HIV. This is designed to assess knowledge among the general population especially in the low-income settings. In this study, 2 questions from HIV-KQ-18 were deleted and kept 16 items: one question with culturally sensitive content to the Sri Lanka setting (*Pulling out the penis before a man climaxes/cums keeps a woman from getting HIV during sex.*), and the other question (*A natural skin condom works better against HIV than does a latex condom*) that is not relevant to the situation of Sri Lanka since they do not have natural skin condoms. A phrase (*putting their tongue in their partner's mouth*) of one question to be culturally sensitive were also deleted.

2.5 Analysis

Responses to the paper-based questionnaire were translated into English and entered into REDCAP for storage. The data was then transferred to STATA software for analysis. Summary statistics were used to present demographic and professional

information such as age, religion, marital status, education level and professional category, healthcare working experience, HIV clinic experience, and received trainings. Participants' age, healthcare working experience were divided by 3-4 categories based on the relatively even numbers in each category.

First, knowledge level was simply calculated by summing correct answers. Exploratory factor analysis (EFA) was done to identify underlying attitude and stigma factors. Even though the authors who developed the questionnaire predefined the groups of questions, EFA was conducted to find the best fitted grouping for the data. Items having the same answer format (Strongly agree, agree, disagree, strongly disagree) were kept and used for the EFA. Six items asking about facility policy and other healthcare workers were excluded because the study team was interested in knowing PHMs attitudes to PLWH. Four items measuring "fear" were excluded due to a too large number of missing values. The study did not include four items of "extra infection precaution" in the EFA because the study team was interested in using these items as consequences of attitude and stigma.

Six factors were obtained from EFA of 17 items but those 6 factors could not be grouped meaningfully. A Scree plot was graphed to select the right number of factors (Figure 3). In the plot, rapid slope change was inspected between 4 and 5. After having limited the number of factors to 4, meaningful factors were obtained: attitude to at-risk

population, attitude to PLWH, secondary stigma, and attitude to reproduction of pregnant women in HIV.

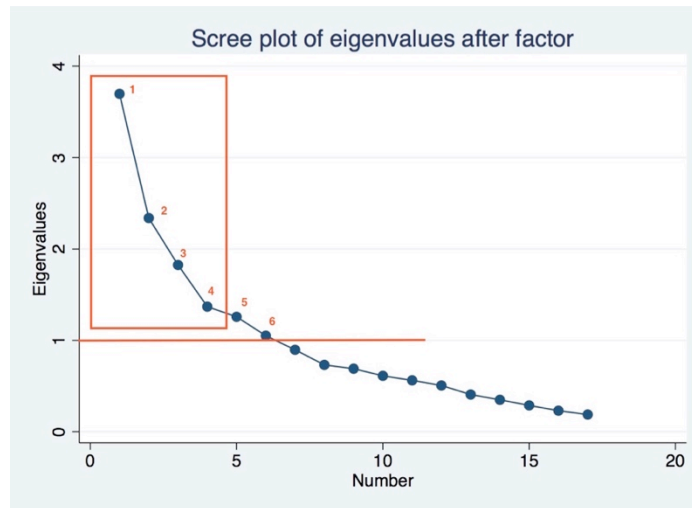


Figure 3: Scree Plot of eigenvalues after factor analysis

After obtaining 4 attitudes/stigma factors, it was examined that the association between demographic information and knowledge level and how such demographic information and knowledge level are associated with attitudes/stigma factors. A multiple linear regression model was used to predict each of the 4 factor scores by age, professional category, marital status, education level, HIV clinic experience, training and knowledge level.

Lastly, the study team wanted to know how such attitudes/stigma factors are related to extra precautionary behaviors. Logistic regression analysis was used to predict the probability of conducting HIV awareness program and 4 precautionary behaviors: avoiding physical contact, using double glove when treating PLWH, using gloves all the time and using special measures when treat PLWH.

3. Results

3.1 Participants

Table 1 summarizes the characteristics of participants. 291 PHMs who work in the 20 MOHs in the Galle District were recruited to this study. PHMs were similar in terms of attributes in religion, marital status, education and experience in taking care of HIV patients. Most PHMs were Buddhist (99.3%), married (94.8%), high school graduates (83.8%), had no experience in a HIV-clinic (96.9%) and had not seen any PLWH in the past 12 months (99.6%). Especially, only 1 PHM answered that she had observed 1 HIV patient in the past year.

Table 1: Characteristics of participants

Variable	N	Frequency
Age (n=290)		
under 40	112	(0.39)
40-49	71	(0.24)
50+	107	(0.37)
Professional category (n=291)		
SPHM	15	(0.05)
PHM	276	(0.95)
Religion (n=290)		
Buddhist	288	(0.99)
Hindu	0	(0.00)
Muslim	1	(0.00)
Christian	1	(0.00)
Marital status (n=291)		
Single	15	(0.05)
Married	276	(0.95)
Education (n=291)		
Middle school	12	(0.04)
High school	244	(0.84)
College	23	(0.08)
Graduate	12	(0.04)

Healthcare work experience (n=291)		
less than 10 years	92	(0.32)
10-19	71	(0.24)
20-29	112	(0.38)
30+	16	(0.05)
HIV clinic experience (n=288)		
yes	9	(0.03)
no	279	(0.97)
Number of HIV patients seen in the past year (n=267)		
0	266	(1.00)
1	1	(0.00)
Received training in the last 12 months		
HIV stigma and discrimination	50	(0.17)
Infection control and universal precautions	96	(0.33)
Patient's informed consent, privacy, and confidentiality	67	(0.23)
Key population stigma and discrimination	29	(0.10)
At least one training	132	(0.45)
None of these	159	(0.55)

PHMs were mostly older with a quite long working experience. Mean age was 44.2 ± 9.7 years (min: 27, max: 62) and average years of working as PHM was 16.9 ± 8.6 years (min: 1.5, max: 34). Only 17% received training about HIV stigma and more than half (54.6%) had never received any training about the following subjects: HIV stigma, infection control, patient's confidentiality and stigma toward at-risk population.

3.2 HIV-related Knowledge

Table 2 presents the 16 questions that were asked of PHMs and their answers to each, as well as whether the answer was correct. The mean number of correct answers was 12.8 ± 1.9 (min: 4, max: 16) out of 16 ($\alpha=0.46$). As inferred from the average score (12.8/16), PHMs were generally knowledgeable of HIV transmissions, but there was some confusion on a few items. Approximately one in five PHMs incorrectly answered that "Coughing and sneezing could spread HIV" (22.3%), "All pregnant women with

HIV will have a baby born with HIV" (23%) and "Using Vaseline or baby oil with condoms could lower the chance of getting HIV" (23.7%). Almost 30% incorrectly answered that a person cannot get HIV from oral sex.

There were some items where a fair number of PHMs did not know if the statement was true or false. Approximately one in four of respondents answered that they "don't know" to the statement that "Taking a test for HIV one week after sex will tell a person if she/he has HIV" (24.1%) which is a false statement. Nearly one third of PHMs did not know if there is an HIV vaccine or not.

Table 2: Knowledge (n=291)

Item	Correct	Wrong	Don't know	missing
Having sex with more than one partner can increase a person's chance of being infected with HIV (T)	96.2%	2.4%	1.4%	0.0%
Showering, or washing one's genitals/private parts, after sex keeps a person from getting HIV (F)	95.5%	1.7%	2.4%	0.3%
A person can get HIV by sitting in a hot tub or a swimming pool with a person who has HIV (F)	94.2%	2.1%	3.4%	0.3%
People are likely to get HIV by kissing, if their partner has HIV (F)	93.1%	5.2%	1.4%	0.3%
A person can get HIV by sharing a glass of water with someone who has HIV (F)	89.3%	7.9%	2.4%	0.3%
A person will NOT get HIV if she or he is taking antibiotics (F)	89.0%	1.7%	8.9%	0.3%
People who have been infected with HIV quickly show serious signs of being	88.3%	6.5%	4.8%	0.3%
A woman cannot get HIV if she has sex during her period (F)	87.6%	5.5%	6.5%	0.3%
A woman can get HIV if she has anal sex with a man (T)	82.1%	8.6%	8.9%	0.3%
There is a female condom that can help decrease a woman's chance of getting	81.4%	7.9%	10.7%	0.0%
Coughing and sneezing DO NOT spread HIV (T)	74.6%	22.3%	2.7%	0.3%
Taking a test for HIV one week after having sex will tell a person if she or he has	70.1%	5.8%	24.1%	0.0%
There is a vaccine that can stop adults from getting HIV (F)	62.9%	4.5%	32.3%	0.3%
A person can get HIV from oral sex (T)	61.2%	28.9%	10.0%	0.0%
All pregnant women infected with HIV will have babies born with HIV (F)	60.8%	23.0%	15.8%	0.3%
Using Vaseline or baby oil with condoms lowers the chance of getting HIV (F)	52.2%	23.7%	24.1%	0.0%
Total score	79.9%	9.9%	10.0%	0.2%

3.3 Factor analysis of HIV-related attitudes and stigma scale

An exploratory factor analysis (EFA) was conducted to identify the underlying factors among questions asking about attitudes and stigma. We entered 17 items (187 observations) into the analysis and obtained 6 factors which were not grouped meaningfully. After having reduced the number of factors into four, we identified: Attitude to at-risk population (Factor 1), Attitude to people living with HIV (Factor 2), Secondary stigma (Factor 3), and Attitude to reproduction among pregnant women with HIV (Factor 4). To gain interpretable results from these groups, orthogonal rotation (varimax) was used. We used it because we believed that there is no inter-correlation between the factors that we obtained. After rotation, we gained each participant's standardized factor score (mean=0, SD=1) which represents extent of PHM's attitudes and stigma. In the study, higher factor score indicates more negative attitudes and higher stigma.

Table 3: Loadings of factors for attitudes and stigma items after varimax rotation(n=187)

Denomination of factors	Items	Factor			
		1	2	3	4
Attitude to at-risk population	If I had a choice, I would prefer not to provide services to	0.8482			
	People who inject illegal drugs	0.8698			
	Men who have sex with men	0.8544			
	Female sex workers	0.8459			
Attitude to PLWHA	Male sex workers				
	Most people living with HIV do not care if they infect other people		0.4527		
	People living with HIV should feel ashamed of themselves		0.5308		
	Most people living with HIV have had many sexual partners		0.7204		
	People get infected with HIV because they engage in irresponsible behaviors		0.6356		
	HIV is punishment for bad behavior		0.6793		
Secondary stigma	If a pregnant woman is HIV positive, her family has a right to know.		0.5308		
	Pregnant women who refuse HIV testing are irresponsible		0.3508		
Attitude to reproduction	People talking badly about you because you care for patients living with HIV			0.6478	
	Friends and family avoiding you because you care for patients living with HIV			0.8360	
	Colleagues avoiding you because of your work caring for patients living with			0.8397	
Attitude to reproduction	Women living with HIV should not get pregnant if they already have children				0.7444
	It can be appropriate to sterilize a woman living with HIV, even if this is not her				0.7176
	Women living with HIV should be allowed to have babies if they wish				0.6130
Variance explained by factors (%)		18.51	14.12	11.49	10.15
Number of observations		187			

As presented in the Table 3, attitude to at-risk population (Factor 1) included participants' willingness to interact with 4 categories of at-risk people: people who inject illegal drugs, men who have sex with men, and female and male sex workers. The more they were reluctant to interact with these people, the higher their scores were for this factor. Attitude to PLWH (Factor 2) included stereotypes and negative emotional reactions (e.g. blame, shame) on PLWH including pregnant women. The more negative attitudes and stronger negative belief about PLWH they reported, the higher scores were allocated. Secondary stigma (Factor 3) is an experienced stigma from the public, friends, family and colleagues due to caring for PLWH. High score for this factor indicates PHMs worry and care a lot of other people's reaction to themselves. The last factor, attitude to reproduction, indicates attitude to pregnancy in women living with HIV. Similarly, higher score means PHMs had higher stigma relating to reproduction in HIV positive women.

3.4 Predictors and consequences of attitudes, stigma and knowledge related to HIV/AIDS (Bivariate analyses)

After obtained factor scores, the study looked at the bivariate relationships of predictors with knowledge, attitudes, stigma. Parametric test (Two-sample t-test or a one way Anova test) was used to test if there were any differences between/among groups in terms of their knowledge, attitudes and stigma.

As presented in the Table 4, significant differences in knowledge were found between the group that had received at least 1 training with the group that had received

no training ($\mu=13.02$ vs. 12.60 , $p<0.05$). Among age groups, significant differences were found for 2 factors: attitude to PLWH ($p<0.001$), secondary stigma ($p<0.05$). Education level was also one of the significant predictors. Attitude to at-risk population ($p<0.05$) and reproduction in pregnant women with HIV ($p<0.01$) were significantly different by education level. Interestingly, PHMs educated above college level showed positive attitude towards reproduction, while PHMs with less than high school showed negative attitude toward it. Years of working experience was divided into 4 groups and showed significant difference of attitude to PLWH ($p<0.001$) among the groups. Participants who worked more than 20 years showed more negative attitude than those who worked less than 19 years.

Table 4: Predictors of attitudes, stigma and knowledge related to HIV/AIDS (Bivariate)

	Knowledge			Attitude to at-risk population			Attitude to PLWH		Secondary stigma		Attitude to reproduction	
	N	mean	(s.d)	N	mean	(s.d)	mean	(s.d)	mean	(s.d)	mean	(s.d)
Age												
under 40	112	12.87	(1.88)	70	0.01	(0.92)	-0.26	(0.96)	0.24	(1.27)	-0.10	(0.96)
40-49	71	13.10	(2.03)	47	-0.24	(0.77)	-0.28	(0.86)	0.00	(0.94)	-0.18	(1.02)
50+	107	12.49	(1.76)	69	0.16	(1.18)	0.43	(0.97) ***	-0.24	(0.63) *	0.20	(0.99)
Professional category												
SPHM	15	12.33	(1.50)	9	-0.03	(0.52)	0.51	(0.70)	0.14	(1.10)	-0.06	(1.08)
PHM	276	12.81	(1.90)	178	0.00	(1.02)	-0.03	(1.01)	-0.01	(1.00)	0.00	(1.00)
Marital status												
Single	15	13.27	(1.39)	11	0.23	(1.43)	0.15	(1.11)	-0.39	(0.22)	0.01	(0.74)
Married	276	12.76	(1.90)	176	-0.01	(0.97)	-0.01	(1.00)	0.02	(1.02)	0.00	(1.02)
Education												
ordinary	12	12.58	(2.27)	7	0.35	(1.41)	0.49	(0.82)	-0.37	(0.15)	0.97	(0.59)
advanced	244	12.74	(1.89)	160	-0.07	(0.94)	0.01	(1.01)	-0.02	(0.94)	0.02	(0.98)
diploma	23	13.22	(1.65)	14	0.28	(1.18)	-0.33	(1.04)	0.30	(1.33)	-0.63	(0.88)
graduate	12	13.08	(1.68)	6	0.93	(1.14) *	-0.02	(0.62)	0.41	(1.99)	-0.12	(1.33) **
Health care work												
less than 10	92	12.82	(2.01)	55	0.07	(0.97)	-0.33	(1.02)	0.16	(1.24)	-0.12	(1.02)
10-19	71	13.11	(1.73)	50	-0.16	(0.93)	-0.22	(0.79)	0.12	(1.11)	-0.05	(0.91)
20-29	112	12.59	(1.88)	73	0.05	(1.06)	0.36	(1.02)	-0.19	(0.68)	0.08	(1.05)
30+	16	12.56	(1.71)	9	0.07	(1.05)	0.36	(0.74) ***	-0.12	(0.78)	0.38	(0.88)
HIV clinic experience												
Yes	9	13.67	(1.12)	6	0.06	(1.04)	-0.49	(1.14)	0.79	(1.65)	-0.47	(0.60)
No	279	12.76	(1.90)	180	0.00	(1.00)	0.02	(1.00)	-0.03	(0.97) *	0.02	(1.01)
Training												
At least 1 training	132	13.02	(1.74)	95	0.04	(1.09)	0.05	(0.97)	0.07	(1.12)	0.08	(1.00)
None	159	12.60	(1.97) *	92	-0.04	(0.90)	-0.05	(1.03)	-0.08	(0.86)	-0.08	(1.00)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Consequences of attitudes, stigma and knowledge related with HIV/AIDS (Bivariate)

	Knowledge			Attitude to at-risk population			Attitude to PLWH		Secondary stigma		Attitude to reproduction	
	N	mean	(s.d)	N	mean	(s.d)	mean	(s.d)	mean	(s.d)	mean	(s.d)
Avoid physical contact												
Yes	34	12.00	(2.56)	19	0.82	(1.39)	0.39	(1.25)	0.30	(1.24)	0.07	(0.95)
No	235	12.94	(1.70) **	157	-0.10	(0.87) ***	-0.09	(0.93) *	-0.02	(0.98)	-0.04	(0.99)
Wear double glove												
Yes	213	12.78	(1.86)	136	-0.01	(1.01)	0.02	(1.04)	-0.05	(0.98)	0.04	(1.00)
No	60	13.05	(1.74)	40	-0.05	(0.92)	-0.08	(0.93)	0.17	(1.05)	-0.18	(0.97)
Wear glove all the aspect of care												
Yes	89	12.60	(1.83)	55	0.20	(1.17)	0.32	(0.99)	-0.01	(1.01)	0.18	(1.03)
No	167	12.96	(1.69)	118	-0.08	(0.87) **	-0.19	(0.99) ***	0.02	(1.02)	-0.09	(0.97) *
Use special measure												
Yes	197	12.87	(1.80)	127	0.01	(1.04)	0.01	(0.98)	0.03	(1.03)	0.03	(1.05)
No	63	13.16	(1.45)	46	-0.06	(0.87)	-0.04	(1.13)	-0.12	(0.91)	-0.19	(0.83)
HIV awareness												
Yes	85	13.33	(1.63)	58	-0.07	(1.04)	0.06	(0.95)	0.00	(0.99)	-0.13	(0.98)
No	203	12.57	(1.92) **	127	0.04	(0.94)	-0.04	(1.03)	0.00	(1.01)	0.06	(1.02)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In the Table 5, the results were presented if there is difference in PHMs' knowledge, attitudes and stigma between a group that will engage with precautionary behaviors or not when they provide care to PLWH. Significant differences were noted for 4 behaviors: avoid physical contact, wear gloves for all the aspects of care, use special measures and conduct HIV awareness program. Negative attitudes to at-risk population and PLWH were significantly associated with avoiding physical contact and wearing gloves during all the aspects of care. Having a negative attitude to reproduction also was associated with wearing gloves during all the aspects of care. Knowledge level was significantly higher in the group that will not avoid physical contact and PHMs who conducted HIV awareness program.

3.5 Predictors of attitudes, stigma and knowledge related to HIV/AIDS

Multiple linear regression was used to identify significant predictors of knowledge, attitudes and stigma when other conditions remained the same. As presented in the Table 6, predictors which were significant in bivariate analysis and all the other predictors were included in the analysis. Training ($\beta=0.468, p<0.05$) was the only significant and positive predictor of knowledge. Better knowledge was positively associated with better attitude to at-risk population ($\beta=-0.125, p<0.05$) and lower secondary stigma ($\beta=-0.105, p<0.05$). With all other conditions remaining the same, married ($\beta=0.444, p<0.01$) PHMs showed higher secondary stigma compared to

unmarried PHMs. In contrast, people who were older than 50 ($\beta=-0.877, p<0.05$) showed lower secondary stigma compare to age under 30.

Table 6: Predictors of attitudes, stigma and knowledge related to HIV/AIDS (multiple linear regression)

Predictors	Knowledge		Attitude to at-risk population		Attitude to PLWH		Secondary stigma		Attitude to reproduction	
	Coef.	(S.E.)	Coef.	(S.E.*)	Coef.	(S.E.)	Coef.	(S.E.*)	Coef.	(S.E.)
Age (ref. under 30)										
40-49	0.170	(0.505)	0.154	(0.260)	-0.378	(0.303)	-0.431	(0.387)	-0.272	(0.310)
50+	-0.377	(0.620)	0.534	(0.392)	0.098	(0.372)	-0.877	(0.426)	*	0.155 (0.381)
PHM	0.209	(0.544)	0.199	(0.247)	-0.071	(0.349)	-0.381	(0.339)		0.256 (0.358)
Married	-0.433	(0.515)	-0.142	(0.393)	-0.189	(0.307)	0.444	(0.162)	**	-0.090 (0.315)
Education(ref. middle)										
Advanced level(high)	0.038	(0.592)	-0.194	(0.430)	-0.173	(0.403)	0.241	(0.152)		-0.819 (0.413) *
Diploma(college)	0.420	(0.740)	0.253	(0.554)	-0.250	(0.496)	0.406	(0.415)		-1.525 (0.508) **
Graduate	0.259	(0.825)	0.788	(0.566)	0.003	(0.566)	0.604	(0.705)		-0.970 (0.580)
HIV clinic experience	0.683	(0.643)	0.151	(0.453)	-0.334	(0.401)	0.827	(0.638)		-0.394 (0.411)
Working experience(yr)										
less than 10	0.374	(0.467)	-0.262	(0.224)	0.350	(0.281)	0.305	(0.383)		0.132 (0.289)
10-19	0.147	(0.624)	-0.361	(0.354)	0.641	(0.379)	0.383	(0.444)		-0.033 (0.388)
30+	0.319	(0.812)	-0.392	(0.482)	0.507	(0.521)	0.722	(0.516)		-0.009 (0.535)
At least 1 training	0.468	(0.226)	*	0.069 (0.157)	0.063	(0.145)	0.250	(0.150)		0.160 (0.149)
Knowledge				-0.125 (0.049) *	-0.049	(0.042)	-0.105	(0.047)	*	0.004 (0.043)
R square	0.049		0.119		0.149		0.133		0.101	
Numer of observations	287						185			

* Robust regression was used in two models (attitude to at-risk population, secondary stigma) to manage heteroscedasticity in their results.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Unexpectedly, training ($\beta=-0.250, p<0.1$) was positively associated with secondary stigma, which means training increases secondary stigma. Better attitude to reproduction of HIV positive women was observed for those with higher education including high school ($\beta=-0.819, p<0.05$) and college ($\beta=-1.525, p<0.01$), compared to middle school graduated PHMs.

3.6 Consequences of attitudes, stigma, knowledge and other factors

The relationships of predictors (attitudes, stigma, knowledge, demographic information) with the precautionary behaviors and conduct of HIV awareness program are summarized in the Table 7 and Table 8. Unadjusted logistic regression results that calculated each predictor's odds ratio of 4 behaviors and HIV program conduction are presented in Table 7. Having more negative attitudes to at-risk population (OR=2.24; 95% CI 1.44-3.49) and PLWH (OR=1.65; 95% CI 1.01-2.68), PHMs were more likely to avoid physical contact with PLWH. In contrast, the more knowledgeable they are, the less likely were they to avoid physical contact with PLWH (OR=0.79; 95% CI 0.66-0.94).

Similarly, having more negative attitudes to PLWH (OR=1.67; 95% CI 1.19-2.34), the more likely were they to wear glove during all the aspect of care.

Table 7: The relationship of attitudes, stigma, knowledge, demographic predictors with the precautionary behaviors and conduct of awareness program (unadjusted logistic regression)

Predictors	Avoid physical contact				Wear double glove			Wear glove all the time			Use special measure			Conduct HIV awareness program					
	OR	95% CI			OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI				
Attitude to at-risk pop.	2.24	1.44	3.49	***	1.04	0.72	1.49	1.33	0.96	1.83	1.07	0.76	1.51	0.90	0.66	1.24			
Attitude to PLWH	1.65	1.01	2.68	*	1.11	0.78	1.57	1.67	1.19	2.34	**	1.05	0.75	1.46	1.11	0.81	1.51		
Secondary stigma	1.29	0.87	1.91		0.81	0.59	1.13	0.97	0.70	1.34	1.18	0.81	1.72	1.00	0.73	1.36			
Attitude to reproduction	1.12	0.69	1.81		1.26	0.88	1.81	1.33	0.96	1.85	1.26	0.89	1.78	0.82	0.60	1.13			
Knowledge	0.79	0.66	0.94	**	0.92	0.78	1.08	0.89	0.77	1.03	0.90	0.76	1.07	1.29	1.10	1.51	**		
Age																			
under 30	1.00				1.00			1.00			1.00			1.00					
40-49	1.81	0.66	4.95		1.60	0.78	3.30	1.61	0.77	3.37	1.13	0.55	2.32	1.96	0.99	3.87			
50+	2.52	1.03	6.15	*	2.19	1.09	4.38	*	5.61	2.93	10.75	***	1.46	0.75	2.85	2.45	1.33	4.53	**
Education																			
Ordniary level	1.00				1.00			1.00			1.00			1.00					
Advanced level(high)	0.49	0.10	2.48		1.16	0.23	5.78	0.68	0.20	2.30	1.32	0.33	5.27	2.26	0.48	10.56			
Diploma(college)	0.37	0.04	3.14		0.35	0.06	2.12	0.28	0.06	1.41	0.93	0.18	4.90	1.05	0.16	6.78			
Graduate	0.78	0.09	6.98		0.76	0.10	5.96	0.45	0.08	2.67				2.50	0.36	17.32			
Married	0.51	0.13	1.92		1.31	0.40	4.28				2.20	0.75	6.44	1.72	0.47	6.25			
At least 1 training	1.54	0.75	3.18		0.54	0.30	0.96	*	0.60	0.35	1.01	1.51	0.85	2.70	1.67	1.00	2.78	*	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Here again, age was a significant predictor. PHMs older than 50 were more likely to engage extra precautionary behaviors than PHMs with age of under 30. Training was another predictor that was significantly associated with less precautionary behaviors. If they had at least 1 training, they were less likely to wear double glove (OR=0.54; 95% CI 0.30-0.96). PHMs who conducted HIV awareness program to the public were likely to have better knowledge (OR=1.29; 95% CI 1.10-1.51), be older than 50 (OR=2.45; 95% CI 1.33-4.53) and have received at least 1 training (OR=1.67; 95% CI 1.00-2.78).

Table 8 and Table 9 summarize the adjusted logistic regression results from 3 models examining the association of attitudes, stigma, knowledge and demographic predictors with the precautionary behavioral intentions and the conduct of awareness program. For the “avoid physical contact”, Model 1 was interpreted because adding knowledge and demographic factors did not change much of the effect of attitude factors. Therefore, having more negative attitude to at-risk population (OR=2.27; 95% CI 1.44-3.58) and PLWH (OR=1.66; 95% CI 1.02-2.73) was significantly associated with higher odds to avoid physical contact. The odds of “wearing glove for all the aspect of care” was significantly associated attitude to PLWH (OR=1.62; 95% CI 1.06-2.45). Interestingly, age had a huge odd ratio of “wearing glove all the aspect of care” (OR=4.62; 95% CI 1.77-12.02). Those over age 50 had 4.62 times greater odds compared to those under 30. In contrast, the behavior showed negative association with having at least one training (OR=0.41; 95% CI 0.19-0.92).

Table 8: The relationship of attitudes, stigma, knowledge, demographic predictors with the precautionary behaviors (adjusted logistic regression)

Predictors	Avoid Physical contact											
	Model 1				Model 2			Model 3				
	OR	95% CI			OR	95% CI		OR	95% CI			
Attitude to at-risk	2.27	1.44	3.58	***	2.25	1.41	3.58	**	2.18	1.28	3.69	**
Attitude to PLWH	1.66	1.02	2.73	*	1.66	0.99	2.78		1.61	0.88	2.95	
Secondary stigma	1.28	0.86	1.92		1.24	0.82	1.89		1.48	0.90	2.45	
Attitude to Knowledge	1.02	0.61	1.68		1.00	0.60	1.68		0.93	0.53	1.66	
Age					0.98	0.70	1.38		1.05	0.74	1.49	
under 30												
40-49									4.11	0.69	24.68	
50+									2.83	0.45	17.65	
Education												
ordinary level												
Advanced									0.28	0.02	3.52	
Diploma(college)									0.22	0.00	10.28	
Graduate									0.98	0.04	26.77	
Married									0.30	0.05	1.94	
At least 1 training					2.01	0.67	6.05		1.88	0.59	6.03	
Predictors	Wear glove all the time											
	OR	95% CI			OR	95% CI		OR	95% CI			
Attitude to at-risk	1.34	0.95	1.89		1.37	0.96	1.94		1.45	0.95	2.21	
Attitude to PLWH	1.69	1.20	2.38	**	1.71	1.21	2.44	**	1.62	1.06	2.45	*
Secondary stigma	0.97	0.69	1.34		0.98	0.70	1.38		1.08	0.74	1.57	
Attitude to Knowledge	1.34	0.95	1.89		1.39	0.98	1.96		1.42	0.95	2.10	
Age					0.99	0.80	1.24		1.08	0.84	1.39	
under 30												
40-49									0.88	0.30	2.61	
50+									4.62	1.77	12.02	**
Education												
ordinary level												
Advanced									2.31	0.28	18.70	
Diploma(college)									2.56	0.16	41.86	
Graduate									2.11	0.11	39.44	
Married									1.00			
At least 1 training					0.50	0.25	1.00	*	0.41	0.19	0.92	*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Finally, knowledge and age were significantly associated with conducting HIV awareness programs (Table 9). PHMs with greater knowledge (OR=1.46; 95% CI 1.14-1.86) and those older than 50 (OR=3.18; 95% CI 1.24-8.20) were more likely to have conducted such programs compared to those under 30 years old.

Table 9: The relationship of attitudes, stigma, knowledge, demographic predictors with the conduct of awareness program (adjusted logistic regression)

Predictors	Conduct HIV awareness program											
	OR	95% CI			OR	95% CI			OR	95% CI		
Attitude to at-risk	0.90	0.65	1.24		0.99	0.71	1.38		0.98	0.69	1.38	
Attitude to PLWH	1.11	0.81	1.52		1.19	0.86	1.64		1.00	0.69	1.44	
Secondary stigma	1.00	0.72	1.37		1.07	0.77	1.49		1.21	0.85	1.72	
Attitude to	0.82	0.60	1.13		0.82	0.60	1.14		0.75	0.53	1.06	
Knowledge					1.38	1.10	1.73		1.46	1.14	1.86	
Age												
under 30												
40-49									1.93	0.76	4.87	
50+									3.18	1.24	8.20	
Education												
ordinary level												
Advanced									3.12	0.32	30.43	
Diploma(college)									1.25	0.07	21.61	
Graduate									9.81	0.54	178.53	
Married									1.01	0.23	4.53	
At least 1 training					1.39	0.72	2.67		1.49	0.75	2.96	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4. Discussion

4.1 Key findings

The study aimed at assessing PHMs' HIV-related knowledge, attitudes and stigma toward people living with HIV. Then the study examined how such knowledge, attitudes, and stigma were associated with extra precautionary behaviors.

4.1.1 Knowledge level

Participants' knowledge level was relatively high, but there was also room for improvement. Even though participants had worked as PHMs for more than 16 years on average, they rarely had any experience with people living with HIV. Considering this fact, their knowledge level was generally good. They showed 79.9% correctness on 16 items. This result lies within the range of other studies' results from Indonesia (69.4%), Bangladesh (78%), Fiji (80%), south Korea (85.9%) that utilized same questionnaire (HIV-KQ-18) on similar populations such as nurses or nursing students [14,35–37].

Because they are healthcare workers who provide health advice to the community, their knowledge level could be improved. Given the fact that the study found that the training was positively associated with their knowledge level, comprehensive education on mother-to-child transmission, appropriate condom use and sexual transmission are suggested.

4.1.2 Factors associated with attitudes and stigma

Knowledge. Participants with higher knowledge showed a more positive attitude and lower stigma towards PLWH. This result is consistent with associations of knowledge and attitude found in previous studies [12,13].

Age and education. Older participants tended to demonstrate more negative attitude toward PLWH and at-risk populations but also showed less secondary stigma than younger participants. This result is comparable with previous studies that demonstrated older participants have more negative attitude towards PLWH than their younger counterpart [13,14]. However, in some studies, there have been inconsistent associations between age and attitudes. In a systematic review, studies revealed that experienced senior healthcare workers showed better attitude to PLWH while in other studies, the younger showed more positive attitude toward at-risk populations [10]. Therefore, it may not be age per se but other factors associated with age that are associated with results.

The results of this study make it possible to speculate that *education level* is more influential than age per se. Lower education level was higher in older participants than those who are younger. In fact, education level was related to knowledge level. Knowledge level was higher among the more educated group (college, graduate) than the less educated group (high/middle school). As more knowledge was associated with

better attitudes, because of low knowledge level, older public health midwives' attitude could have been negative to PLWH.

Interestingly, although the older participants had more negative attitudes towards PLWH, they exhibited less secondary stigma. This may be in part because they have more work experience and may be more familiar with the community members. They might not feel as though their community members would judge them as harshly since they are rooted in the community.

Education. Highly educated PHMs demonstrated more positive attitudes toward pregnant women with HIV choosing to reproduce. It is not clear why more educated participants showed better attitude to reproduction among women with HIV.

Marital status. Married PHMs demonstrated higher secondary stigma than those who were single. This result is comparable with previous studies [12,13]. Married healthcare workers in Indonesia showed more negative attitude than the single workers [13] and medical students in Vietnam having more numbers of family members showed more negative attitude [12]. It may be that having more family members might change the person's attitude more cautiously on how other people perceive and recognize them and their family members.

4.1.3 Associations of knowledge, attitudes and stigma with precautionary behaviors

Participants with more negative attitudes, those who were older and less trained indicated that they would take more precautionary behaviors. The literature identifies

these behaviors as delayed treatment, avoiding touch, breaking confidentiality, differential treatment and refusing treatment [9]. In this study, we focused on 4 precautionary behaviors: avoiding physical contact, using double gloves, using gloves during all the aspects of care and using different measures that are not used with other patients. Since most participants had not experienced working directly with PLWH, the information we collected is not necessarily based on what they have done in the past. It was collected based on assumption which means they would engage with the behaviors if they were in the situation.

Avoid physical contact. More negative attitudes to at-risk populations was associated with more avoidance of physical contact. The more they were not willing to provide treatment to this group of people, the more they were likely to avoid physical contact with PLWH. On the other hand, knowledge or education level displayed no strong relation with such behaviors in this study. Through these results, we can infer that attitudes plays an important role for their behavior.

Wear gloves during all aspects of care. In this case, more negative attitude to PLWH was associated with more intention towards the behavior. Age and training were also significant predictors. Older participants demonstrated more intention to this behavior and more trained participants demonstrated lower intention.

4.2 Implications for policy, education, practice

Even though PHMs currently do not work with PLWH, their knowledge and attitudes should be improved for a few reasons. First, they are frontline workers who educate the public on a variety of health issues. PHMs are the community health workers who are the faces of the public health system to community members. Especially since many PHMs have worked in the same region for decades, they get to know the patients personally. Their attitudes toward PLWH may impact the general public's view towards PLWH. Previous literatures have shown that CHWs are trusted and respected by community members and even play leadership role in some contexts [22]. Therefore, if they have negative attitudes towards HIV and insufficient knowledge about HIV, they could shape the public's attitude and knowledge as well.

Second, PHMs should be ready to be able to work with PLWH if HIV continues to spread as expected. Although most PHMs do not currently work directly with PLWH, it is important for them to be prepared as HIV spreads. Currently, the majority of PLWH are those considered most at-risk (i.e. sex workers); however, as the general population interacts with those with HIV, the disease may spread more among the general population [38]. For this reason, PHMs' interaction with PLWH might therefore be increased in the future.

Third, PHMs could be a resource that the MOH utilizes to spread awareness about HIV and to stop the spread of the disease. Literatures have demonstrated

effectiveness of utilizing CHWs to spread HIV awareness and reach out PLWH in many regions [23,24]. Currently Galle District has 2 STD clinics that take care of PLWH. If PHMs of 20 MOHs are prepared to interact with PLWH, it will be more effective to prevent an HIV epidemic in the region. They should be prepared to explain the disease and how it is transmitted so that they can prevent the spread as much as possible. PHMs can play an important role in limiting the spread of the disease in the general population and be a trusted resource for people seeking care.

Therefore, it is recommended to train PHMs about HIV, transmission of the disease and where patients can receive care if needed. As the study found, training will enhance their knowledge and may bring more positive attitudes toward PLWH. This could in turn, impact the general population's attitudes.

In addition, it is recommended that there be written policies and measures around treating PLWH to protect both patients' confidentiality and right to quality care and PHMs from the disease. It has been found that institutional support will improve participants attitude toward PLWH [39].

4.3 Implications for further study

Further study could examine underlying reasons for negative attitudes using a qualitative approach. The study identified several factors that are associated with negative attitudes and precautionary behaviors. The underlying reasons for why more educated people have more positive attitudes to reproduction could be explored

through qualitative approaches. For example, asking why do they think PLWH should be ashamed of their status will make it possible to understand their attitudes and behaviors.

In addition, it is recommended to assess PHMs care with maintaining patient confidentiality. We found that only 23% participants received training on this topic. One of the major reasons why PLWH in Sri Lanka seek care from non-government organizations (NGOs) or other HIV-specific clinics, instead of local clinics, was lack of confidentiality in local clinics[26,40]. How healthcare workers protect patients' confidentiality and what factors are associated with such confidentiality will be meaningful to weaken spread of HIV.

Further studies can also assess attitude toward other diseases in this population and compare the results with the current study. Because attitude towards one disease might spill over to other diseases, this might enhance the understanding of their attitudes toward people living with both HIV and other diseases.

4.4 Strengths and limitations of the study

The population of PHMs in the Galle District in Sri Lanka has not been studied previously relating to this topic. More than 90% of the PHMs registered in the region participated in this study. However, the results and implications of this study should be carefully interpreted due to several limitations.

First, this was a cross-sectional study therefore the bivariate results should be cautiously interpreted. Strictly, what the study found is association not causality.

Second, the study did not have one strong hypothesis but rather explored factors associated with negative attitudes and precautionary behaviors. Therefore, the study result could have a multiple testing issue that the result might incorrectly reject the null hypothesis.

Third, the study did not observe or assess actual precautionary behavior. What the study assessed is self-reported intention or decision to behave precautionary not the actual behavior. Participants in this study had rarely experiences with PLWH and because of this limited contact, their reported reaction may be different from how they would behave when they interact with PLWH.

Related to the third issue, there could be social expectation bias because this was survey was based on self-report. The study team confirmed that there is no written policy to protect HIV patients from discrimination in the MOH, however, 15.3% of participants still answered that there is a written policy. We can speculate that participants might have answered more positively to other questions as well.

Lastly, it is difficult to generalize the result to all PHMs in Sri Lanka since the study only worked within one district; however, this method may be used and expanded upon to further study of PHMs' attitudes and behaviors when working with

PLWH. In fact, a parallel study is currently being conducted in the Northern, Tamil-speaking areas of Sri Lanka.

5. Conclusion

The study provides one of the first analyses of HIV-related knowledge and attitudes of PHMs in Sri Lanka. It appears that more HIV-related training for PHMs may be needed to improve their knowledge to better educate the community and prevent further spread of HIV. Moreover, training could lead to better attitudes in a long-term perspective, since more knowledge was generally related to more positive attitudes among PHMs. By decreasing community health workers' misperception about HIV, stigma towards PLWH from the community could be reduced. Ultimately, eliminating stigmatized experience in the healthcare settings will increase HIV testing among PLWH and encourage PLWH to adhere to the treatment.

Appendix A

Facilities and working environment	Strongly Agree	Agree	Disagree	Strongly disagree	
In my health center it is not acceptable to test a patient for HIV	31.6%	46.0%	18.9%	2.1%	
There are adequate supplies in my health facility that reduce my risk of becoming infected with HIV	12.0%	55.7%	28.5%	2.7%	
There are standardized procedure/protocols in my health facility that reduce my risk of becoming infected with HIV	16.8%	60.5%	17.5%	2.1%	
	Yes	No	Don't know		
In the past 12 months have you seen a person living with HIV in My health facility has written guidelines to protect patients living with HIV from discrimination	0.7%	77.7%	21.6%		
I will get in trouble at work if I discriminate against patients living	15.1%	47.1%	36.4%		
	53.3%	23.7%	23.0%		
	Not hesitant	A little hesitant	Somewhat hesitant	Very hesitant	
How hesitant are healthcare workers in this area to work alongside a co-worker living with HIV, regardless of their duties	88.0%	5.8%	5.5%	0.7%	
Secondary stigma	Not worried	A little worried	Worried	Very worried	n/a
People talking badly about you because you care for patients	83.8%	5.5%	0.3%	0.3%	9.6%
Friends and family avoiding you because you care for patients	73.5%	11.7%	4.1%	0.7%	9.6%
Colleagues avoiding you because of your work caring for patients	78.4%	6.9%	3.4%	0.3%	10.3%
Observed stigma	Never	Once or twice	Several times	Most of the time	
In the past 12 months, how often have you observed other healthcare providers performing an HIV test on a pregnant	84.9%	3.1%	2.4%	8.9%	
Extra infection precaution	Yes	No	n/a		
Avoid physical contact	11.7%	80.8%	7.6%		
Wear double gloves	73.2%	20.6%	5.8%		
Wear gloves during all aspects of the patient's care	30.6%	57.4%	11.3%		
Use any special infection-control measures with patients living with HIV that you do not use with other patients	67.7%	21.6%	9.3%		

Fear	Not worried	A little worried	Worried	Very worried	n/a
Touched the clothing or bedding of a patient living with HIV	75.6%	5.5%	3.8%	1.4%	13.1%
Dressed the wounds of a patient living with HIV	37.5%	11.3%	11.0%	5.5%	34.0%
Drew blood from a patient living with HIV	20.3%	4.1%	2.4%	1.7%	71.1%
Took the temperature of a patient living with HIV	85.2%	1.4%	1.0%	0.3%	12.0%
How worried are you about assisting in labor and delivery if the	56.0%	17.9%	9.3%	5.2%	10.7%
Attitude to PLWHA	Strongly Agree	Agree	Disagree	Strongly disagree	
Most people living with HIV do not care if they infect other people	20.6%	57.0%	17.2%	3.8%	
People living with HIV should feel ashamed of themselves	8.6%	15.1%	65.6%	10.0%	
Most people living with HIV have had many sexual partners	17.5%	41.9%	32.3%	7.2%	
People get infected with HIV because they engage in	24.1%	40.2%	29.9%	5.5%	
HIV is punishment for bad behavior	14.1%	29.6%	45.4%	10.7%	
Attitude to Pregnant women with HIV	Strongly Agree	Agree	Disagree	Strongly disagree	
If a pregnant woman is HIV positive, her family has a right to	29.6%	45.0%	19.6%	5.5%	
Pregnant women who refuse HIV testing are irresponsible	29.9%	39.5%	25.8%	3.8%	
Women living with HIV should not get pregnant if they already	32.6%	37.1%	26.5%	3.8%	
It can be appropriate to sterilize a woman living with HIV, even if	5.8%	10.0%	62.2%	21.3%	
Women living with HIV should be allowed to have babies if they	5.2%	51.9%	33.7%	7.9%	
If I had a choice, I would prefer not to provide services to	Strongly Agree	Agree	Disagree	Strongly disagree	
People who inject illegal drugs	6.5%	18.9%	54.6%	6.2%	
<i>They put me at higher risk for disease</i>	Yes	No			
<i>This group engages in immoral behavior</i>	37.0%	63.0%			
<i>I have not received training to work with this group</i>	67.8%	34.3%			
	90.4%	9.6%			
Men who have sex with men	7.9%	16.8%	54.6%	3.4%	
<i>They put me at higher risk for disease</i>	19.4%	80.6%			
<i>This group engages in immoral behavior</i>	61.1%	38.9%			
<i>I have not received training to work with this group</i>	81.9%	18.1%			
Female sex workers	3.4%	12.4%	61.9%	5.8%	
<i>They put me at higher risk for disease</i>	20.0%	80.0%			
<i>This group engages in immoral behavior</i>	71.1%	28.9%			
<i>I have not received training to work with this group</i>	75.6%	24.4%			
Male sex workers	6.2%	17.5%	50.9%	5.2%	
<i>They put me at higher risk for disease</i>	23.5%	76.5%			
<i>This group engages in immoral behavior</i>	69.1%	30.9%			
<i>I have not received training to work with this group</i>	77.9%	22.1%			

Appendix B

Questionnaire

Date.....

Study ID

No.....

SECTION A: BACKGROUND INFORMATION

First, we will ask about your background.

A1. How old were you at your last birthday?In Years

A2. What is your current job?

Hospital PHM PHM SPHM

A3. What is your religion?

Buddhist Hindu Muslim Christian Other → PLEASE SPECIFY _____

A4. Marital status:

Single
 Married
 Divorced

A5. What is the highest level of education you have completed?

Less than primary school
 Primary School
 Ordinary level
 Advanced level
 Intermediate or Post High School diploma

A6. How many years have you been working in healthcare? years

A7. Have you ever worked in a clinic/hospital/department that specialized in HIV care and treatment?

Yes No

A8. In the past 12 months, approximately how many HIV-positive patients did you provide with care or services? _____

A9. Did you ever receive training in the following subjects? (Check all that apply.)

- a. HIV stigma and discrimination
- b. Infection control and universal precautions (including post-exposure prophylaxis)
- c. Patients' informed consent, privacy, and confidentiality
- d. Key population stigma and discrimination

A10. Did you carry out an HIV awareness program in the past year at your area?

- Yes No

A11. What are the barriers in conducting HIV related awareness programs?

a. Being a female

- Yes No Couldn't say confidentially

b. Our culture

- Yes No Couldn't say confidentially

c. Not enough knowledge in HIV

- Yes No Couldn't say confidentially

d. Couldn't answer the questions asked by the audience

- Yes No Couldn't say confidentially

e. Not any vulnerable population in our area

- Yes No Couldn't say confidentially

f. If I speak about the HIV related topic, people in my area won't give respect

- Yes No Couldn't say confidentially

g. Rather than speak about HIV, giving awareness about diseases like dengue is more beneficial

- Yes No Couldn't say confidentially

SECTION B: INFECTION CONTROL

Now we will ask you about infection concerns in your health facility.

B1. How worried would you be about getting HIV if you did the following? *If any of the following is not one of your job responsibilities, please select "Not applicable."*

Touched the clothing or bedding of a patient living with HIV

Not worried A little worried Worried Very worried Not applicable

Dressed the wounds of a patient living with HIV

Not worried A little worried Worried Very worried Not applicable

Drew blood from a patient living with HIV

Not worried A little worried Worried Very worried Not applicable

Took the temperature of a patient living with HIV

Not worried A little worried Worried Very worried Not applicable

B2. Do you typically use any of the following measures when providing care or services for a patient living with HIV?

Avoid physical contact

Yes No Not applicable

Wear double gloves

Yes No Not applicable

Wear gloves during all aspects of the patient's care

Yes No Not applicable

Use any special infection-control measures with patients living with HIV that you do not use with other patients

Yes No Not applicable

SECTION C: HEALTH FACILITY ENVIRONMENT AND POLICIES

Now we will ask about practices in your health facility and your experiences working in a facility that provides care to people living with HIV.

C1. In the past 12 months have you seen a person living with HIV in your health facility?

Yes- Go to question C2 No- Skip to question C3 Don't know-Skip to question C3

C2. In the past 12 months, how often have you observed the following in your health facility?

Healthcare workers unwilling to care for a patient living with or thought to be living with HIV

Never Once or twice Several times Most of the time

Healthcare workers providing poorer quality of care to a patient living with or thought to be living with HIV than to other patients

Never Once or twice Several times Most of the time

Healthcare workers talking badly about people living with or thought to be living with HIV

Never Once or twice Several times Most of the time

C3. How worried are you about:

People talking badly about you because you care for patients living with HIV?

Not worried A little worried Worried Very worried

Not applicable- I do not care for patients living with HIV

Friends and family avoiding you because you care for patients living with HIV?

Not worried A little worried Worried Very worried

Not applicable- I do not care for patients living with HIV

Colleagues avoiding you because of your work caring for patients living with HIV?

Not worried A little worried Worried Very worried

Not applicable- I do not care for patients living with HIV

C4. How hesitant are healthcare workers in this area to work alongside a co-worker living with HIV, regardless of their duties?

Not hesitant A little hesitant Somewhat hesitant Very hesitant

C5. In my health center it is not acceptable to test a patient for HIV without their knowledge.

Strongly Agree Agree Disagree Strongly Disagree

C6. I will get in trouble at work if I discriminate against patients living with HIV.

Yes No Don't Know

C7. Do you strongly agree, agree, disagree, or strongly disagree with the following statements?

There are adequate supplies in my health facility that reduce my risk of becoming infected with HIV.

Strongly Agree Agree Disagree Strongly Disagree

b. There are standardized procedures/protocols in my health facility that reduce my risk of becoming infected with HIV.

Strongly Agree Agree Disagree Strongly Disagree

C8. My health facility has written guidelines to protect patients living with HIV from discrimination.

Yes No Don't Know

C9. How worried are you about assisting in labor and delivery if the woman is living with HIV?

Not worried A little worried Worried Very worried
 Not applicable

C10. In the past 12 months, how often have you observed other healthcare providers performing an HIV test on a pregnant woman without her informed consent?

Never Once or twice Several times Most of the time

C11. Do you strongly agree, agree, disagree, or strongly disagree with the following statements?

a) If a pregnant woman is HIV positive, her family has a right to know.

Strongly Agree Agree Disagree Strongly Disagree

b) Pregnant women who refuse HIV testing are irresponsible.

Strongly Agree Agree Disagree Strongly Disagree

c) Women living with HIV should not get pregnant if they already have children.

Strongly Agree Agree Disagree Strongly Disagree

d) It can be appropriate to sterilize a woman living with HIV, even if this is not her choice.

Strongly Agree Agree Disagree Strongly Disagree

SECTION D: OPINIONS ABOUT PEOPLE LIVING WITH HIV

Now we are going to ask about opinions related to people living with HIV.

D1. Do you strongly agree, agree, disagree, or strongly disagree with the following statements?

Most people living with HIV do not care if they infect other people.

Strongly Agree Agree Disagree Strongly Disagree

People living with HIV should feel ashamed of themselves.

Strongly Agree Agree Disagree Strongly Disagree

Most people living with HIV have had many sexual partners.

Strongly Agree Agree Disagree Strongly Disagree

People get infected with HIV because they engage in irresponsible behaviors.

Strongly Agree Agree Disagree Strongly Disagree

HIV is punishment for bad behavior.

Strongly Agree Agree Disagree Strongly Disagree

D2. Women living with HIV should be allowed to have babies if they wish.

Strongly Agree Agree Disagree Strongly Disagree

D3. Please tell us if you strongly agree, agree, disagree, or strongly disagree with the following statement:

a. If I had a choice, I would prefer not to provide services to people who inject illegal drugs.

- Strongly Agree → Go to question D3B
- Agree → Go to question D3B
- Disagree → skip to question D4
- Strongly Disagree → skip to question D4
- Don't know → skip to Section D4

b. I prefer not to provide services to people who inject illegal drugs because (check all reasons that apply):

- i. They put me at higher risk for disease. Agree Disagree
- ii. This group engages in immoral behavior. Agree Disagree
- iii. I have not received training to work with this group. Agree Disagree

D4. Please tell us if you strongly agree, agree, disagree, or strongly disagree with the following statement:

a. If I had a choice, I would prefer not to provide services to men who have sex with men.

- Strongly Agree → Go to question D4B
- Agree → Go to question D4B
- Disagree → skip to question D5
- Strongly Disagree → skip to question D5
- Don't know → skip to Section D5

b. I prefer not to provide services to men who have sex with men because (check all reasons that apply):

- i. They put me at higher risk for disease. Agree Disagree
- ii. This group engages in immoral behavior. Agree Disagree
- iii. I have not received training to work with this group. Agree Disagree

D5. Please tell us if you strongly agree, agree, disagree, or strongly disagree with the following statement:

If I had a choice, I would prefer not to provide services to female sex workers.

- Strongly Agree → Go to question D5B
- Agree → Go to question D5B
- Disagree → skip to Section D5C
- Strongly Disagree → skip to Section D5C
- Don't know → skip to Section D5C

I prefer not to provide services to female sex workers because (check all reasons that apply):

- i. They put me at higher risk for disease. Agree Disagree
- ii. This group engages in immoral behavior. Agree Disagree
- iii. I have not received training to work with this group. Agree Disagree

If I had a choice, I would prefer not to provide services to male sex workers.

- Strongly Agree → Go to question D5D
- Agree → Go to question D5D
- Disagree → skip to Section E
- Strongly Disagree → skip to Section E
- Don't know → skip to Section E

I prefer not to provide services to male sex workers because (check all reasons that apply):

- i. They put me at higher risk for disease. Agree Disagree
- ii. This group engages in immoral behavior. Agree Disagree
- iii. I have not received training to work with this group. Agree Disagree

SECTION E: Knowledge of HIV transmission

For each statement, please check in the box either "True" (T), "False" (F), or "I don't know" (DK). If you do not know, please do not guess; instead, please check "DK."

E1. Coughing and sneezing DO NOT spread HIV.

True False Don't know

E2. A person can get HIV by sharing a glass of water with someone who has HIV.

True False Don't know

E3. A woman can get HIV if she has anal sex with a man.

True False Don't know

E4. Showering, or washing one's genitals/private parts, after sex keeps a person from getting HIV.

True False Don't know

E5. All pregnant women infected with HIV will have babies born with HIV.

True False Don't know

E6. People who have been infected with HIV quickly show serious signs of being infected.

True False Don't know

E7. There is a vaccine that can stop adults from getting HIV.

True False Don't know

E8. People are likely to get HIV by kissing, if their partner has HIV.

True False Don't know

E9. A woman cannot get HIV if she has sex during her period.

True False Don't know

E10. There is a female condom that can help decrease a woman's chance of getting HIV.

True False Don't know

E11. A person will NOT get HIV if she or he is taking antibiotics.

True False Don't know

E12. Having sex with more than one partner can increase a person's chance of being infected with HIV.

True False Don't know

E13. Taking a test for HIV one week after having sex will tell a person if she or he has HIV.

True False Don't know

E14. A person can get HIV by sitting in a hot tub or a swimming pool with a person who has HIV.

True False Don't know

E15. A person can get HIV from oral sex.

True False Don't know

E16. Using Vaseline or baby oil with condoms lowers the chance of getting HIV.

True False Don't know

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