

# Crowdsourcing Based Social Awareness for Taboo Diseases like HIV/AIDS

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## ABSTRACT

Creating social awareness for sexually transmitted diseases, such as HIV/AIDS is critical. The 2015 UNAIDS statistics shows that newly infected cases of HIV/AIDS has fallen down by 35% since 2000, worldwide. However, the statistics of Fiji tells a different story. The newly infected HIV/AIDS cases in Fiji has been increasing every year since 2000. Different HIV/AIDS awareness programs have been launched previously such as, workshops and seminars. Despite these efforts, there has been no reduction in the newly infected HIV/AIDS cases. Fiji's health sector is still using traditional approaches for building public awareness. Therefore, the primary purpose of this study is to explore the benefits of crowdsourcing in developing the social awareness on taboo diseases among Fijians. Data for this study were collected through questionnaire and experimental methods from the people living with HIV as well as from the young Fijians, such as secondary and tertiary students. The result clearly showed that crowdsourcing can be an effective means of assisting Fiji's public health by reaching out to the remote areas, reducing the program costs, and assisting thousands of people simultaneously.

## CCS CONCEPTS

• **Applied computing** → **Life and medical sciences**; Health care information systems;

## KEYWORDS

Crowdsourcing, Taboo Disease, Social Awareness, HIV/AIDS, Public Health

## ACM Reference Format:

Pinky P. Kumar and Mahmood A. Rashid. 2018. Crowdsourcing Based Social Awareness for Taboo Diseases like HIV/AIDS. In *ACSW 2018: Australasian Computer Science Week 2018, January 29-February 2, 2018, Brisbane, QLD, Australia*. ACM, New York, NY, USA, 9 pages. <https://doi.org/10.1145/3167918.3167965>

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*ACSW 2018, January 29-February 2, 2018, Brisbane, QLD, Australia*

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ACM ISBN 978-1-4503-5436-3/18/01...\$15.00

<https://doi.org/10.1145/3167918.3167965>

## 1 INTRODUCTION

The *Silent Killer*, the another name of HIV/AIDS [1] is fatal disease caused by the Human Immunodeficiency Virus (HIV). This virus affects individuals immune system and destroys or impairs its functionality. The advanced stage of HIV is known as Acquired Immune deficiency Syndrome (AIDS). HIV is mainly spread from infected people through sex, sharing of injections, and blood transfusions. The new born babies may also get infected by HIV through their infected mothers at pregnancy, in childbirth, and during breastfeeding. According to WHO and UNAIDS, at the end of 2013 there were 35 million people living with HIV, globally; among those 2.1 million people became newly infected, and 1.5 million people died of AIDS related causes [2].

Global Statistics show that the highest number of newly infected cases of HIV are teenagers and young adults. Similar trend is also seen in Fiji with 36 young adults being infected out of the 64 newly infected cases last year. This is a major concern for Fiji as the future generation is being affected. Since HIV/AIDS still does not have a cure, prevention is the only way to survive. Many traditional HIV/AIDS awareness programs have been launched by the authorities in Fiji but has been proven ineffective in reducing newly infected cases. In this study, technologies primarily, crowdsourcing is used to improve HIV/AIDS awareness in Fiji which has been proven effective.

Crowdsourcing is the use of internet technology to outsource a task from the general public, *the crowd*. This task could be accomplished with no or very minimum cost because the organisation does not require hiring a professional. In 2006, Jeff Howe introduced the concept of Crowdsourcing. There are four types of crowdsourcing [3]—Crowd Creation, Crowd Wisdom ([www.innocentive.com](http://www.innocentive.com)), Crowd Voting [4], and Crowd Funding [5].

Health industry has also started using this new technique to help the health professionals to cope with the rapid changes in the industry. Mpofu and Salawu mentioned that there is a rise in the use of internet and its applications for health information purposes. They also mentioned that there have been studies showing that the internet is one of the most widely used resources for health information [6]. McNab supported these claims by mentioning that the public health information can be brought to many more people, more quickly and directly than at any time in history through the increased access to the internet and mobile communication which combined with strategic uses of social media [7]. Bottles also supported other authors by stating that crowdsourcing has helped to improve public health interventions and in developing models to improve health behaviours [8].

In [9], the crowdsourcing model has been used for diagnosis and treatment, helping scientists collaborate on large-scale health projects, such as pandemics and also helping the specialist to solve complicated problems. Foldit [10] is a very well-known online game for science to solve the protein structure prediction problem with the help of crowds. The pharmaceutical companies also use this model to gather the trends about their products through social media channels, such as Twitter and public conversation threads [11]. With all the above mentioned benefit, it clearly shows that crowdsourcing has created its place in health care sector around the globe, which is benefiting all of its stakeholders.

The rest of the paper is organised as follows: Section 2 reviews related work on crowdsourcing and HIV/AIDS; Section 3 describes our approaches; Section 4 presents the experimental results and analyses; and finally, Section 5 draws the conclusion of our research.

## 2 RELATED WORK

Public health is concerned with the health of the whole population [12]. It is the science and the art of preventing diseases, prolonging life, promoting health and efficiencies through organized community efforts [13]. Since HIV/AIDS is a public health issue, schools, government organizations, non-government organizations, towns and village communities around the world, work hand in hand to prevent the spread of HIV. It has been noticed that only the traditional efforts of informing people such as workshops, seminars, brochure and advertisement is not that effective [14]. In this technological era, creative and communicating power is required to gather the interest of the public. Therefore, the public health organizers have started to utilize information technology in their awareness programs.

Health informatics [15] assists public health in preventing outbreaks, analysing population health trends and educating and promoting healthy choices for the public [16]. Crowdsourcing is used as an E-health technique where the health services and information are delivered through the Internet and related technologies [17]. Crowdsourcing is not only asking for feedback and ideas via social media but also can be as complex as crowdsourcing a range of different online and mobile media sources to accumulate real-time data [18]. A lot of public health awareness programs have started using internet for their campaigns to reach out to the remote and isolated areas [19]. Carleen Hawn [20] has mentioned that internet has reshaped healthcare as it has empowered the patients so they can gather, learn and support each other to improve health outcomes.

Mpofu and Salawu [21] stated that discussions held on HIV/AIDS on social sites, have contributed towards an increased understanding of the various aspects of HIV/AIDS. Crowdsourcing was also supported by Nasution [22] and Curioso *et al.* [19] where they mentioned that it allowed remote and isolated communities to communicate in 'real time'. With the University of North Carolina project [23], China is using crowdsourcing to promote HIV testing. Africa also used crowdsourcing as a mobile social community called Young Africa Live which was developed in 2011 [24]. Within a year this platform had generated more than 950,000 comments showing its success. UNAIDS with the youths also launched a first crowd sourced strategy of UN on October 2011 called CrowdOutAIDS [25].

In January 2000, AIDSWEB [26], a pilot project was designed to promote the use of information and communications technology to enhance HIV/AIDS education in secondary schools and communities in several African countries such as, Botswana, Ghana, Kenya, Nigeria, South Africa, Uganda, Zambia and Zimbabwe along with the United States. "The World Starts with Me" is another web-based initiative for HIV/AIDS prevention and reproductive health education which was implemented in Uganda in 2011 [26]. It is used by secondary schools in Indonesia, Thailand, Kenya and Uganda. The content of World Starts with Me was developed for self-study for youth in the age bracket of 12-19 year [27].

HIV/AIDS is at a rise in Fiji with 610 reported cases since the first case in 1989 [28]. Statistics has shown that the ages between 20-29 has the highest number of HIV/AIDS patients [29], and most of the cases that have been detected in Fiji are through the screening of pregnant women, screening for employment or migration purposes, and in people with advanced symptoms of the disease [30]. This clearly shows that these people may not be aware of the symptoms or maybe too shy to share their symptoms and experiences. The major reason for this could be that HIV/AIDS is a taboo and a sensitive topic in Fiji [31]. A recent review stated that Fiji has insufficient health information and communication technology infrastructure [32]. Therefore, this research aims to identify the benefits of using crowdsourcing for awareness of HIV/AIDS. The major reason for using this E-health technique is because, Fiji is well equipped with the internet and mobile technology i.e., almost 95% of the population have mobile and internet coverage [33].

## 3 METHODOLOGY

Two methods were used for conducting this research. First, a questionnaire method was used to gather information from the school students and from the people living with HIV. Second, an experimental method was applied on two separate groups—one group was the control group having awareness through the traditional approaches and the other group having awareness through the crowdsourcing method.

### 3.1 Questionnaire Approach

Firstly, the questionnaires were used so that the participants could express their views and ideas freely. These questionnaires were distributed to two groups of participants: (i) HIV/AIDS patients and doctors and (ii) Secondary and Tertiary students. The questionnaire designed (see Appendix A) had very simple and easy to understand questions since it was distributed to secondary and tertiary students plus the people living with HIV who may not be highly educated. The following two procedures were applied to two different groups:

- (1) **For HIV Patients:** 80 questionnaires were given to the HIV patients through the three major hubs of Reproductive Health Clinic (Suva, Lautoka, and Labasa) as they are responsible for the HIV/AIDS awareness programs. The hubs then distributed the questionnaire to FJN+ group members—Fiji Network for people living with HIV. Note that to hide the identity of the HIV patients, they were communicated through the Reproductive Health Clinic hubs. After the questionnaires were filled out by the participants, those were returned to the respective hubs.

- (2) **For Secondary and Tertiary Students:** The remainder 220 questionnaires was distributed randomly to the students of secondary schools and tertiary institutes. The questionnaires were distributed to the students from University of the South Pacific, Fiji National University and randomly selected student from different secondary schools around the central division of the country.

### 3.2 Experimental Approach

In this method, 120 students from Semester 1, 2 and 3 of Diploma of Networking from College of National Training and Productivity Centre of Fiji National University were surveyed. This method was used to identify the difference between the traditional methods (flyer, lecturers, and workshops) of HIV/AIDS awareness and on-line HIV/AIDS awareness. Firstly, the students were divided into two groups—the controlled group and the test group—both of the groups were consisted of 60 students. Each group had a combination of students from different genders, race and religion so that the experiment remain unbiased. The following two procedures were applied to two different groups:

*On Controlled Group.* A two hour HIV/AIDS awareness workshop was conducted where 21 females and 39 males of age ranging from 17 to 22 were participated. The awareness programs were conducted by using PowerPoint presentations and videos. The participants were also provided with HIV/AIDS pamphlets. Before the workshop, a test consisting of 10 questions was taken to gather their current knowledge on HIV/AIDS (see Appendix B). The topics covered in the workshop are provided in Appendix C. All the responses and participation of the student were recorded for analysis purpose. Two days later, the same students were called for a post workshop evaluation through the questionnaire with 10 multiple choice questions from the topics covered in the workshop (see Appendix B) to measure their level of understanding.

*On Test group.* Here on ProBoards<sup>1</sup>, a discussion forum was created to have a simple prototype for a crowdsourcing on HIV/AIDS awareness. In this forum, the students were allowed to have open discussion about HIV/AIDS. Firstly, the 60 student, 23 girls and 37 boys were given a pre-test. The pre-test was a questionnaire with 10 questions to gather their current knowledge on HIV/AIDS. Then they were asked to access the forum page. They were given two hours to read through the same slides and watch the same videos which were shown to the control group participants. The HIV awareness trainer was also online and the students were allowed to ask question, comment and create discussions online as anonymous. All the discussions and questions were recorded for the analysis purpose. After two hours the students were dispatched from the labs but the online forum was open for any further queries or discussions. Two days later the 60 participants were called again for the post evaluation. This was the same evaluation that as used for the control group.

<sup>1</sup>ProBoards: www.freeforums.net

**Table 1: The expected values of participants attending awareness**

|                    |              | PLHIV     |      | Students   |      |            |
|--------------------|--------------|-----------|------|------------|------|------------|
|                    |              | Exp.      | Obs. | Exp.       | Obs. | Total      |
| Attended           |              |           |      |            |      |            |
| HIV/AIDS awareness | Yes          | 46.24     | 70   | 129.4      | 105  | 175        |
|                    | No           | 23.76     | 0    | 66.6       | 90   | 90         |
|                    | <b>Total</b> | <b>70</b> |      | <b>195</b> |      | <b>265</b> |

### 3.3 Analysis Design

**3.3.1 Chi-Squared Test.** The Chi-Squared ( $\chi^2$ ) test was applied for analysis of the questionnaire which had unrelated and categorical data and the two tailed test was used for the analysis of experimental data as there were two samples—a controlled and a test group. This tests were appropriate because the sampling method used was simple random sampling, the samples were independent, the sample size was much smaller than the population size, and the samples were drawn from a normal population. A larger significance level (0.1) is used to be more certain that one will not miss detecting a difference that might exist [34]. Then the expected values of participants attending the awareness program was calculated using Equation (1) as shown in Table 1 and the ( $\chi^2$ ) value was calculated using Equation (2).

$$ExpectedValue = \frac{ColumnTotal \times RowTotal}{GrandTotal} \quad (1)$$

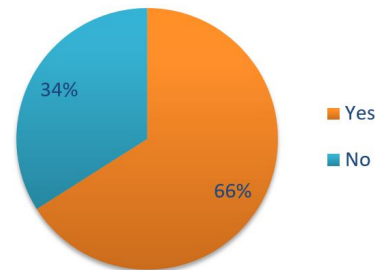
$$\chi^2 = \sum \frac{(O - E)^2}{E} \quad (2)$$

where,  $O$  is observed value and  $E$  is expected value.

**3.3.2 t-Test.** t-Test, as shown in Equation (3), is used to compare the mean of the two groups of samples. It evaluates whether the means of the two sets of data are statistically significantly different from each other or not.

$$t = \frac{\bar{X}_A - \bar{X}_B}{\sqrt{S_p \left( \frac{1}{n_A} + \frac{1}{n_B} \right)}} \quad (3)$$

where,  $A$  and  $B$  represent two groups to compare;  $\bar{X}_A$  and  $\bar{X}_B$  represent the means of Groups  $A$  and  $B$ , respectively;  $n_A$  and  $n_B$  represent the size of the groups; and  $S_p$  is an estimator of the variance of the two samples.



**Figure 1: Percentage of participants who attended HIV/AIDS awareness program.**

## 4 RESULT AND ANALYSES

### 4.1 Questionnaire Data Analysis

Based on the responses of question 2 as shown in Figure 1, 66%(N = 175/265) of the population surveyed had attended some kind of HIV/AIDS awareness program. 100%(N = 70/70) of the people living with HIV and 54%(N = 105/195) of the secondary and tertiary students indicated attending some kind of awareness program. The chi square test was used to prove if there was any association between the different participants and the awareness program. From the test, it has been found that there was a significant association between the different participants and the awareness program which means, more people living with HIV/AIDS attended the awareness programs compared to the students who were not infected by HIV. From the above analysis 66% of the participants indicated that they have attended the awareness programs.

Figure 2 shows the type of awareness programs the participants were attended. Here the participants had selected one or more awareness programs they attended before. By the use of Chi-Squared Test it has also been found that there was a significant relationship with the type of HIV/AIDS awareness and the participants. Facebook, workshops, and seminars were popular among the people living with HIV which were the common method of building awareness for the PLHIV. Whereas, community and school talks topped the list with the students showing their common mode of building awareness by the respective authorities.

From the analysis of the 34% participants (Secondary and Tertiary students) who indicated that they had not attended any awareness program. "I don't have HIV/AIDS" and "I am not comfortable with discussions about HIV/AIDS in Public" were the two major reasons indicated for not attending the awareness programs which is represented in Figure 3. The relationship of these two reasons with the participant is obviously significant, at  $\chi^2$  value of 5.991 using the Chi-Squared Test (refer to Equation (2)).

From the response of question 3, the Figure 4 shows that the 68%(N = 181/265) of the population surveyed, indicated that HIV/AIDS is still a taboo topic. The 76%(N = 148/195) of the students (Secondary and Tertiary) agreed that HIV/AIDS topic is still taboo topics in their homes while only 47%(N = 33/70) of people living with HIV accepted that it is still considered a taboo topic in their home. With the calculated  $\chi^2$  value 42.6 (refer to Equation (2)), which is greater than the value from the  $\chi^2$  distribution table, indicates that there is a significant relationship between the different types of people and HIV topic still being a taboo in homes.

The 92% (N = 243/265; 70 - PLHIV, 173 - student) of the population surveyed, stated that they have internet access as shown in Figure 5. As per the responses of question 4 from the 243 participants who have internet access, only 35%(N = 95/265) have seen or used internet for HIV/ AIDS awareness. 50 PLHIV participants had mentioned that they are using FIJI Network for PLHIV on Facebook and their doctor's personal page on Facebook for basic awareness and consultation. Whereas, only 45 students stated that they have seen HIV / AIDS awareness over the internet.

Moreover, based on the responses of questions 5, 6 and 7, the 81%(N = 215/265) of the population prefer to have HIV/AIDS awareness over internet. From 81%, the 158 participants (82%) were from PLHIV and 157 (80%) were from the students who favoured for

crowdsourcing. Table 2 shows the percentage of participants and reasons that were provided by the participants as the benefits of using crowdsourcing for HIV/AIDS awareness. With the calculated  $\chi^2$  value of 30.87 which is far greater than the  $\chi^2$  value from the Chi-Squared Test (refer to Equation (2)), it can be said that there is a significant association between the type of participant and benefit identified by them.

Furthermore, 80% of the participants responded to question 8 suggesting the ways in which HIV/AIDS awareness could be implemented over the internet. Figure 6 shows the proportions of the choice made by the two groups of participants. The height of the bars are the proportion of people living with HIV compared to students who have suggested the ways of implementation of online HIV/AIDS awareness. Both the PLHIV and the students presented a strong indication to have a closed group discussions on Facebook as a choice of implementing online HIV/AIDS awareness. The rest of the participants 20%, did not answer this question.

### 4.2 Experimental Data Analysis

4.2.1 *Pre Evaluation Test Analysis.* Pre-evaluation test was taken for both the groups before the awareness program was conducted. Table 3 presents the test results. These results were then analysed by the two tailed test, where the null hypothesis was that the mean of both the test is equal; i.e., there is no difference in the understanding of the students on HIV/AIDS. The significance level used was 0.1.

$$t = \frac{3.52 - 3.57}{\sqrt{2.51 \left( \frac{1}{60} + \frac{1}{60} \right)}} = -0.17$$

The *t-value* calculated as above using Equation (3), was -0.17 whereas the *t-value* from the t distribution chart was 1.67. This clearly showed that the calculated *t-value* was in the accepted region. Therefore the Null hypothesis was accepted. That is there was no difference in the means of the test. Thus it can be said that there is no difference in the understanding of the students on HIV/AIDS.

Observations was conducted on the class participation of both the controlled group and the test group and the results are presented in Table 4.

On an average, there was 7 students participating in a discussion during a 2 hour HIV/AIDS awareness workshop whereas there was 23 students participating in a discussion during the online

**Table 2: Benefits of crowdsourcing mentioned by the participants**

| Benefits of crowdsourcing on HIV/AIDS awareness   | PLHIV      | TYA        |
|---|------------|------------|
|   | Yes        | Yes        |
| Reduces time and cost   | 15%        | 8%         |
| Privacy—don't have to reveal identity   | 15%        | 16%        |
| Reach out to remote people  | 29%        | 10%        |
| Increase self-confidence as one will be able to communicate with people from the same group | 8%         | 5%         |
| Better understanding about HIV/AIDS   | 10%        | 13%        |
| Easier, information available anytime and anywhere  | 5%         | 28%        |
| <b>Total percentage</b>   | <b>82%</b> | <b>80%</b> |

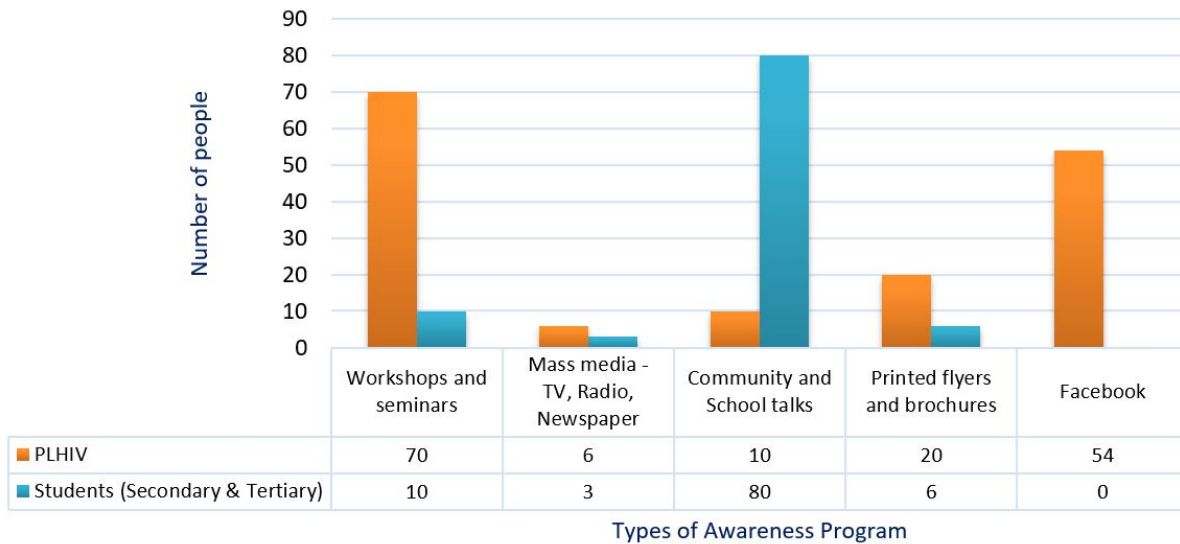


Figure 2: The number of PLHIV and students who attend different types of HIV/AIDS awareness programs.

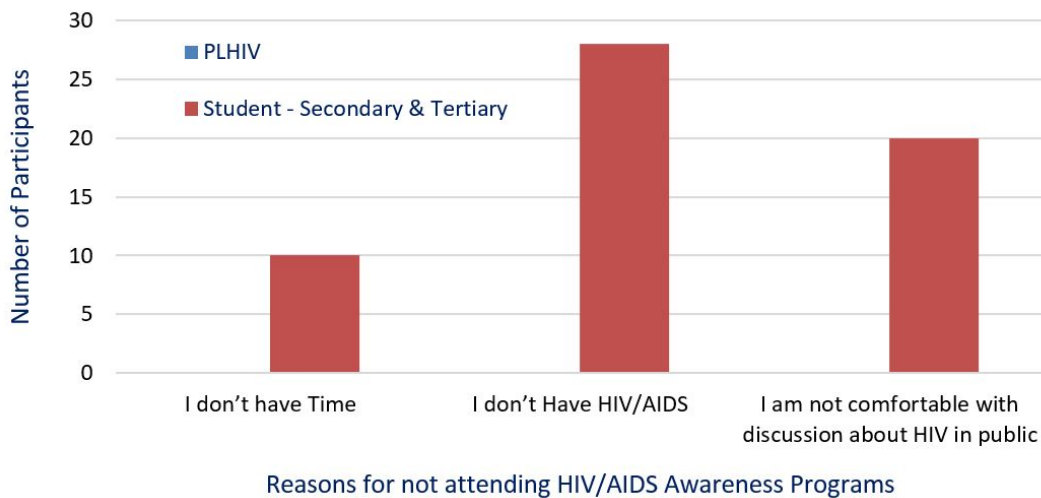


Figure 3: Number of participant and their reasons for not attending HIV/AIDS awareness programs.

HIV/AIDS awareness program. These result were then analysed by the two tailed test, where the null hypothesis was that the mean of both the awareness program’s participation is equal that is there is no difference in the participation of the students due to the difference in the mode of awareness. The significance level used was 0.1. Refer to Equation (3) for the formula.

$$t = \frac{6.7 - 23.3}{\sqrt{22.3 \left( \frac{1}{3} + \frac{1}{3} \right)}} = -4.3$$

The *t-value* calculated as above using Equation (3), was  $-4.3$  whereas the *t-value* from the *t* distribution chart was 2.13. This clearly showed that the calculate *t-value* was in the rejected region. Therefore, the Null hypothesis was rejected. That is, there is

difference in the means of the participation of students from the two different mode of awareness. Thus it can be said that there is difference in the number of participation of the students due to the different modes of awareness. Hence online HIV/AIDS awareness had more student participating in the discussions.

4.2.2 *Post-Evaluation Test Analysis.* For both the groups, a post-evaluation test was conducted after two days of the awareness program. Table 5 presents the test results.

These results were then analysed by the two tailed test, where the null hypothesis was that the mean of both the test is equal that is there is no difference in the understanding of the students due to the difference in the mode of awareness. The significance level used was 0.1. Refer to Equation (3) for the formula.

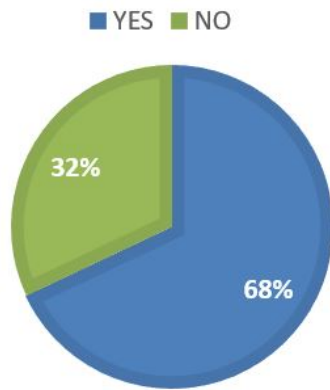


Figure 4: Percentage of participants accepting that HIV/AIDS is still a taboo topic in Fiji.

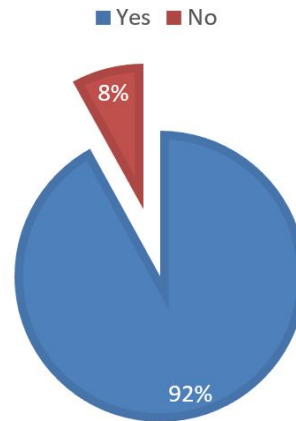


Figure 5: Percentage of participants who have Internet Access.

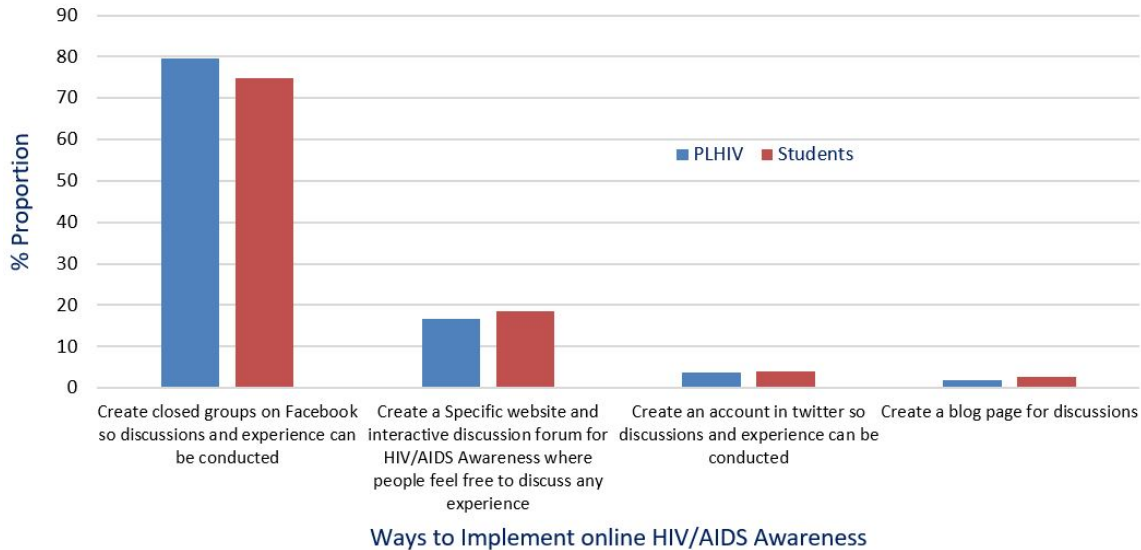


Figure 6: Percentage of participants and their suggestions on the implementation of online HIV/AIDS awareness programs.

$$t = \frac{7.7 - 5.96}{\sqrt{4 \left( \frac{1}{60} + \frac{1}{60} \right)}} = 4.765$$

The *t-value* calculated as above using Equation (3), was 4.765 whereas the *t-value* from the t distribution chart was 1.67. This clearly showed that the calculated *t-value* was in the rejected region. Therefore the Null hypothesis was rejected. That is there is difference in the means of the test from the two different mode of awareness. Thus it can be said that there is difference in the understanding of the students due to the different modes of awareness.

The findings from this study clearly indicate that there is hardly any type of crowdsourcing used in the HIV/AIDS awareness programs by Fiji’s public health sector. Majority of the awareness

programs conducted by authorizes are through seminars, workshops, community/school talks and printed flyers. However, the findings also indicated that there are few small groups providing awareness over the internet such as PLHIV (People Living with HIV) group and FijiSTAHS (Fiji Students Stand against HIV and AIDS). These groups use Facebook to provide support and awareness to the public.

The study also revealed few benefits of crowdsourcing that can improve the HIV/AIDS awareness programs in Fiji. The first benefit pointed out was the willingness of participants to participate and share their ideas and experiences in the awareness programs conducted by crowdsourcing. Research also suggest that patients are more empowered to learn and support each other through online awareness programs [20]. This will be beneficial to the public health

**Table 3: The frequency of the marks of the pre-evaluation**

| Test Scores  | Control Group |             | Test Group |             |
|--------------|---------------|-------------|------------|-------------|
|              | Freq.         | Total       | Freq.      | Total       |
| 1            | 15            | 15          | 11         | 11          |
| 2            | 6             | 12          | 8          | 16          |
| 3            | 11            | 33          | 13         | 39          |
| 4            | 3             | 12          | 8          | 32          |
| 5            | 16            | 80          | 9          | 45          |
| 6            | 4             | 24          | 7          | 42          |
| 7            | 5             | 35          | 3          | 21          |
| 8            | 0             | 0           | 1          | 8           |
| 9            | 0             | 0           | 0          | 0           |
| 10           | 0             | 0           | 0          | 0           |
| <b>Total</b> | <b>60</b>     | <b>211</b>  | <b>60</b>  | <b>214</b>  |
| <b>Mean</b>  |               | <b>3.52</b> |            | <b>3.57</b> |
| <b>SD</b>    |               | <b>1.99</b> |            | <b>1.89</b> |

**Table 4: Display the participation of the students during the two-hour workshop.**

|  | Control Group | Test Group  |
|--|---------------|-------------|
| Number of participants in discussion 1 created by the trainer                                  | 8             | 23          |
| Number of participants in discussion 2 created by the trainer                                  | 7             | 30          |
| Number of questions asked/discussions created by the participants during the awareness program | 5             | 17          |
| <b>Total</b>   | <b>20</b>     | <b>70</b>   |
| <b>Average</b>   | <b>6.7</b>    | <b>23.3</b> |

**Table 5: Displays the frequency of the marks of the post-evaluation**

| Test Scores  | Control Group |             | Test Group |             |
|--------------|---------------|-------------|------------|-------------|
|              | Freq.         | Total       | Freq.      | Total       |
| 1            | 2             | 2           | 0          | 0           |
| 2            | 3             | 6           | 0          | 0           |
| 3            | 0             | 0           | 0          | 0           |
| 4            | 5             | 20          | 5          | 20          |
| 5            | 12            | 60          | 6          | 30          |
| 6            | 20            | 120         | 6          | 36          |
| 7            | 4             | 28          | 7          | 49          |
| 8            | 7             | 56          | 9          | 72          |
| 9            | 4             | 36          | 14         | 126         |
| 10           | 3             | 30          | 13         | 130         |
| <b>Total</b> | <b>60</b>     | <b>358</b>  | <b>60</b>  | <b>463</b>  |
| <b>Mean</b>  |               | <b>5.96</b> |            | <b>7.7</b>  |
| <b>SD</b>    |               | <b>2.04</b> |            | <b>1.96</b> |

sector in Fiji as people in Fiji are more bounded by cultures thus uncomfortable in sharing their health problems or symptoms [35]. Through crowdsourcing people will not hesitate to discuss or share information or experience over the internet as their identity can be anonymous and this will improve the person’s self-confidences as he/she will be able to get support without anyone knowing it.

The second benefit identified by the study was that there is better understanding through awareness conducted by crowdsourcing. The findings show that there was a significant difference in the mean of the student’s marks between the test and the control group. The test group participants scored more marks when compared to the control group as they were be able to ask more question and clarify concept more clearly. Plus the content was available online all the time when compared to the workshop as the peer educator or the trainer would leave after the workshop. Research also suggest that there is increase in understanding of concepts through online discussion [21]. Fiji’s public health sector will certainly benefit from this as the general public have lots of misunderstanding about many diseases/ sickness thus availability of online contents and discussions can clear the patient’s doubts. The third benefit recognized by the study was the ability to reach out to remote and isolated area. The findings reveal that the participants would be able to access the content and ask question from their home rather than attending workshops and seminars. Nasution, Curioso and Mechael also mentioned that crowdsourcing allowed remote and isolated communities to communicate in ‘real time’ [22]. This would be beneficial to Fiji’s public health sector as Fiji has a lot of remote area where people need to be educated on disease. The use of crowdsourcing will also assist the awareness groups as they will not have to print out the material and travel to the different areas. The public will also benefit as they would not have to take out time to attend to the awareness programs as it will be available online as and when required.

In addition, the findings also suggested ways in which crowdsourcing could be implemented in the HIV/AIDS awareness programs to gain the benefits mentioned above. The first implementation suggestion was to use of social sites for crowdsourcing the awareness programs. This was the most preferred option as many people in Fiji are quite aware of social sites especially Facebook. This suggestion can be used by Fiji’s public health sector, as they can have all its divisions creating a group each on Facebook to provide awareness and support on the health issues to the general public.

The second suggestion for implementation was having a dedicated site for the HIV/AIDS group. This will be quite useful as the site will only provide information about AIDS and it can have a discussion forum for the participants to share their ideas and experience about HIV/AIDS. Ministry of Health can have its own web site where they can provide support and have discussions on all the public health issues such as Heart Attack, Stroke, HIV/AIDS, Cancer and so on. Therefore, through the findings mentioned above, it can be said that crowdsourcing can improve the HIV/AIDS awareness in Fiji, and if crowdsourcing is implemented in overall Public Health Sector it can drastically improve its awareness and services to the general public.

## 5 CONCLUSION

This study examined the effectiveness of crowdsourcing in building social awareness in the public health sector especially, for the taboo diseases like HIV/AIDS. Both questionnaires and experimental methods were applied to gather data for the study. The outcome has shown that even though crowdsourcing is not being used by



the authorities for the awareness and information sharing, if implemented, it could drastically improve the public awareness of HIV/AIDS. A dedicated website for the awareness programs can also be implemented. This site can be managed by the authorities so members can feel free to share important information, experiences and chat with other members and the health experts. The benefits identified in this research would not only improve the HIV/AIDS awareness but could improve any sector of the public health management. Therefore, implementation of crowdsourcing as a solution can benefit the entire health stakeholders in term of improving the overall health industry in Fiji.

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## A RESEARCH QUESTIONNAIRE

### Research Questionnaire

*This survey is being conducted to find out if the people of Fiji are using Crowdsourcing for the purpose of Healthcare Management, particularly in the area of HIV/AIDS awareness. It aims to reveal the benefits of using Crowdsourcing that users have identified, as well as suggestions on improving crowdsourcing for HIV/AIDS awareness in Fiji*

*(Crowdsourcing means asking for feedback and ideas as simply as asking customers via social media sites; or it can be as complex as crowdsourcing a range of different online and mobile media sources to group together real-time data)*

- Do you have internet access?  
 Yes  No
- Have you ever attended any kind of the HIV/ AIDS awareness program?  
 Yes  No  
 a) If yes, then which of the following medium was used for the awareness program  
 Workshops and seminar  community and school talks  
 Through media – talk back shows  printed flyers and brochures  
 Any other medium, please indicate  
 \_\_\_\_\_  
 \_\_\_\_\_  
 b) If No, then which of the following is the reason for not attending any awareness program  
 I don't have time to travel to the venue  too expensive to attend  
 I do not have HIV/AIDS  
 I'm not comfortable discussing in the physical presence of other people in the workshop  
 I prefer other methods of information dissemination/discussion (please specify)  
 \_\_\_\_\_  
 \_\_\_\_\_
- In some families today, HIV/AIDS is still a taboo topic. Would you be comfortable talking / discussing to person face to face about HIV/AIDS symptoms and prevention?  
 Yes  No
- Would you prefer sharing your ideas, knowledge / experiences about HIV/AIDs with a group of people over the internet?  
 Yes  No
- Would you prefer having HIV/AIDS awareness program over the internet?  
 Yes  No  
 If yes, then why  
 \_\_\_\_\_  
 \_\_\_\_\_  
 If No, then why  
 \_\_\_\_\_  
 \_\_\_\_\_
- Do you know of any kind of HIV/AIDS awareness campaign over the internet in Fiji?  
 Yes  No  
 If yes, please specify  
 \_\_\_\_\_  
 \_\_\_\_\_
- Do you think having the HIV/ AIDS awareness campaigns over the internet would benefit the Public health care? If yes what could be some of these benefits.  
 Yes  No  Not Sure  
 \_\_\_\_\_  
 \_\_\_\_\_
- What could be some ways in which authorities could use internet for awareness of HV/AIDS in Fiji?  
 \_\_\_\_\_  
 \_\_\_\_\_

Thanks for your Time and Support.

## B EVALUATION QUESTIONNAIRE

### Pre / Post Evaluation Questionnaire

- The acronym for HIV stands for?**
  - Human Immuno Virus
  - Human Immunodeficiency Virus
  - Human Infection Viral
  - All of the above
- What is the body fluid used to test the presence of HIV Antibodies?**
  - Saliva
  - Seminal fluid
  - Blood
  - Breast-milk
- What is the meaning of AIDS?**
  - Acute Insecurity Due to Sex
  - Acquired Immune Depression Syndrome
  - Acquired Immune Deficiency Syndrome
  - All the above
- One of the ways to transmit HIV is through:**
  - Unprotected sexual intercourse
  - Insect or mosquito bite
  - Donating blood
  - All of the above
- Body fluids that has highest concentration of HIV**
  - Urine, tears
  - blood, seminal fluid, breast-milk, vaginal secretions
  - Saliva, sweat
  - All of the above
- Which of the following is a correct way to prevent transmission of HIV and STIs**
  - Unprotected sexual intercourse (without condom)
  - Blood transfusion of unscreened blood
  - Sharing of syringes or needles for drug use
  - Correct and consistent use of condom during sexual intercourse
- What is the meaning of STI?**
  - Sexually Transportation Infection
  - Sexy Transmitted Interaction
  - Sexually Transmitted Infection
  - All of the above
- Which of the following is NOT sign & symptom of STI**
  - Pus coming out of the genitalia
  - Unusual itchinness of the genitalia
  - Growth/Ulceration in the genitalia
  - Body pain
- What is the meaning of Safer Sex Practice**
  - Oral and anal sex
  - Sexual intercourse that does not allow exchange of body fluids such seminal and vaginal fluids or blood.
  - Having sexual activity during menstruation
  - All of the above
- A Person Living with HIV or AIDS should be isolated and placed in a rest home centre far from the community.**
  - Yes, I agree
  - No, I disagree

## C LESSON PLAN FOR 2-HOUR WORKSHOP

### Lesson Plan for 2 hour Workshop on HIV/AIDS Awareness

| Time    | Content  | Method of delivery   | Activities   |
|---------|--|--|--|
| 20 mins | Pre test   | - Questionnaire for the student  | - Students to answer the questionnaire                   |
| 45 mins | What is HIV /AIDS?   | - Presentation and Video on facts of HIV, Personal experience of people        | - Discussion   |
|         | Why is HIV dangerous?  |  | - Question and answering session                         |
|         | Facts about HIV  |  | - Distribution of pamphlets                              |
| 5 mins  |  | break  |  |
| 25 mins | How does one get infected?<br>- High risk fluid<br>- direct transmission | - Presentation and Videos on Symptoms of HIV, Prevention and protection of HIV | - Discussion (group)<br>- Question and answering session |
| 15 mins | How do you know there is an infection                                    |  |  |
| 10 mins | How do you protect yourself  |  |  |
| 5 mins  | Why is testing important   |  |  |
| 5 mins  | What can I do to help  |  |  |