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VOLUNTARY SAMPLING DESIGN

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Abstract: *This article proposes a novel non-probability sampling design named "voluntary sampling" design. The final survey sample is selected from volunteered and qualified potential respondents in the target population. The intent to conduct a survey is published prior to the implementation of the sampling design. This accords prospective respondents ample time to decide on whether or not to volunteer for selection to participate in the survey. A pilot sampling is conducted to determine the alacrity of the prospective respondents to participate in the survey. The proposed sampling design divides the target population into volunteers and non-volunteers strata. The implementation of the sampling design achieved a hundred percentage response rate and gathered quality and dependable research data in a brief HIV/AIDS survey.*

Keywords: *Voluntary sampling, sampling technique, non-probability sampling, probability sampling*

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INTRODUCTION

A number of sampling methods have been developed for selecting potential respondents in economic, social and market surveys. Due to advanced changes in most current research areas, most of these sampling methods fall short when applied to select participants in highly sensitive and complex surveys as evidenced by poor quality data and intolerable response rates that eclipse the data collection and analysis stage of most researches. Most of the questionnaires that are returned by respondents will be incomplete. The data gathered will be inaccurate, inadequate and unreliable for making meaningful decisions and recommendations. Some of the espoused sampling methods are categorized into two groups that are shown in Figure 1; RNM = Random Number Method and RW = Random Walk.

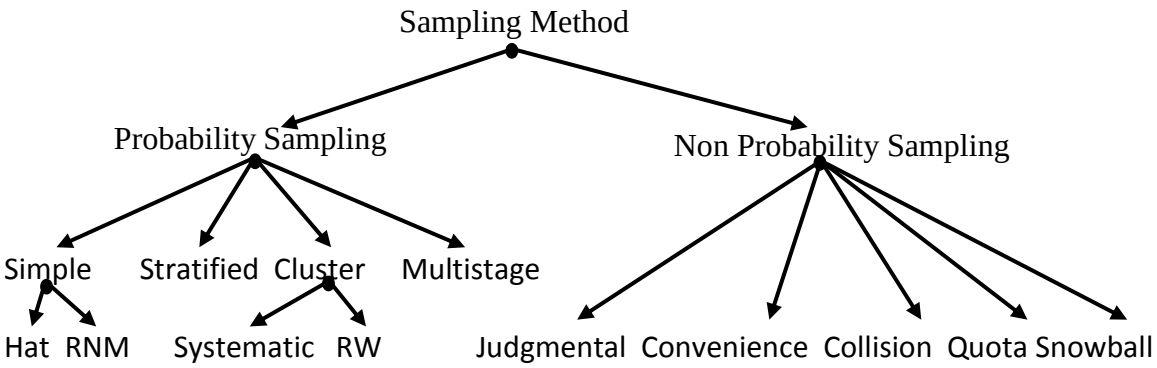

Figure 1: Classification of sampling methods

A survey conducted by this article during the implementation of the voluntary sampling design found that the Harare Executive Master of Business Administration (EMBA) students in Zimbabwe regarded Human Immuno-deficiency Virus/Acquired Immuno-deficiency Syndrome (HIV/AIDS) as a sensitive research area requiring voluntary participants in order for the researcher to gather accurate and dependable data and reduce the non-response rate. Therefore, this article develops a reliable non-probability sampling design that is capable of gathering accurate and reliable data from sensitive and complex surveys.

VOLUNTARY SAMPLE DESIGN

This is a new non-probability sampling design. As the name suggests, the final sample is selected from the potential respondents who are willing and qualifying to participate in the survey. The intent to conduct a sensitive survey is published in preparation for the

implementation of the sampling design. This accords prospective respondents ample time to make a decision on whether or not to volunteer for selection to participate in the survey. There is also an opportunity for the individuals in the target population to investigate on the responses to give during the survey when selected in the final sample. A pilot sampling is conducted to determine the alacrity of the prospective respondents to participate in the survey. So, the success or failure of the sampling design depends on two aspects and these are the advocacy and pilot sampling. The former aspect deals with the publication of the intent to conduct the survey. The intent heralds the impending survey and consists of the topic, problem, objectives and scope of the research. The latter aspect stratifies the target population, estimates the response rate and tests the quality of the responses. The initial stages for implementing the voluntary sampling design are presented in Figure 2.

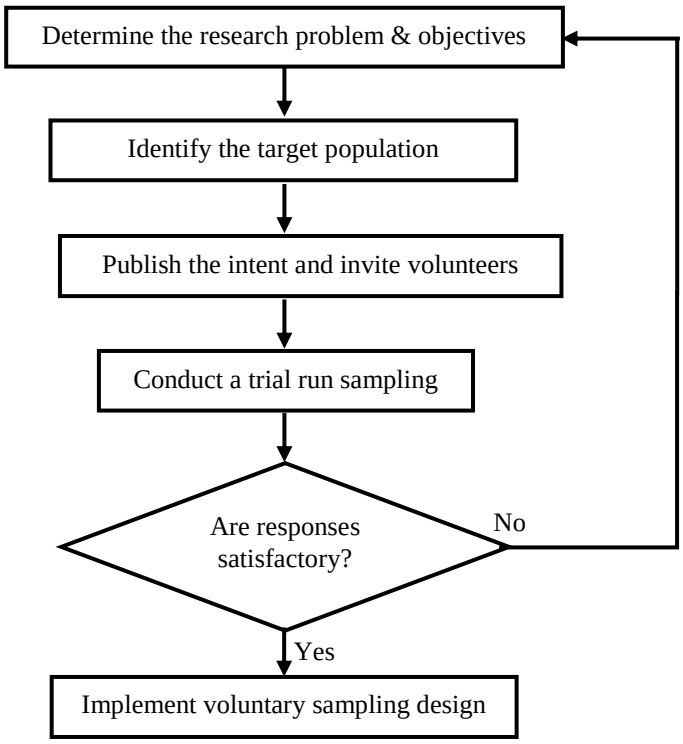

Figure 2: Voluntary sampling design preparation stages

The initial stages for implementing the sampling design that are presented in Figure 2 are discussed henceforth.

Step 1: The researcher selects a valuable research area and problem and determines the objectives. An interesting research area lures more than enough volunteers for selection to participate in the survey.

Step 2: The researcher identifies the target population. This step investigates the availability of the targeted attributes and determines the distribution of the potential respondents in the target population. The target population is divided into two strata, namely, volunteers and non-volunteers.

Step 3: The researcher publishes the intent to conduct a sensitive survey and invites potential respondents to volunteer for selection to participate in the survey. The researcher focuses mainly on potential respondents with the targeted attributes.

Step 4: The researcher conducts a trial run sampling to determine the enthusiasm of the prospective respondents to participate in the published survey. The researcher decides on whether or not the survey is capable of attracting enough volunteers with the required attributes. If the survey is capable of attracting enough potential respondents, the researcher will implement **Step 5**; otherwise the researcher will return to **Step 1** to commence the process.

Step 5: The researcher implements the voluntary sampling process that is presented in Figure 4 to select the survey participants.

The voluntary sampling design stratifies the target population into two main strata: the volunteers and non-volunteers. The former stratum comprises of potential respondents who are willing to participate in the survey. The potential respondents may have or may not have the attributes required by the researcher. The sampling design further stratifies the volunteers' stratum to separate those willing to participate in the survey with the required attributes from those without the required targeted attributes. The potential respondents from the former group are selected in the final sample through first volunteer first select (FVFS) concept. The FVFS concept allows volunteers with the required attributes one at a time to join the final sample by the order the potential respondents undertake to participate in the survey. So, the potential respondents are selected in the following voluntary order: 1^{st}, 2^{nd}, 3^{rd}... n^{th} volunteer, where n is the final sample size. The n^{th} volunteer with the required attributes is the last potential respondent to be allowed to join the final sample. The voluntary ties are broken arbitrarily by the researcher.

The latter group is of the voluntary potential individuals who are willing to participate in the survey but without the required attributes. The non-volunteers stratum is made up of individuals from the target population who are not willing to participate in the survey. The

individuals may have the attributes required or not, thus, constituting two sub-strata, namely, the non-volunteers with and without the targeted attributes. The former sub-stratum, depending on the required sample size, may require the researcher to develop strategies that lure them into volunteering to participate in the survey. Therefore, the researcher should develop persuasive strategies at the beginning of the survey that are aimed at reducing the size of this sub-stratum. The researcher may consider adopting some or all of the following strategies:

- Providing incentives to survey participants. The researcher may provide free transport to ferry individuals to the survey centres and refreshments during the survey.
- Publishing the intent statement: the purpose, problem, scope and objectives of the survey. This may encourage potential individuals to change their minds and volunteer to take part in the survey. This may also allow the potential respondents in the target population to decide on whether the research is of value to them or not, a decision that determines whether or not to participate in the survey.
- Selecting valuable and constructive research area. If the research area is of value to the target population, the initial sample will be over-subscribed by potential respondents who will be willing to participate in the survey.
- Scheduling talk shows for the published survey intent statement. This assists the researcher to determine whether the voluntary sampling design is the appropriate sampling method to use to select the survey participants.
- Assuring protection and confidentiality to the participants and data that will be gathered from the survey. Since the research will be sensitive or political, it is advisable to categorically state the security procedures and laws governing the confidentiality of the responses and participants. The participants normally give accurate and reliable data when an unquestionable degree of confidentiality and security for both the participants and responses is guaranteed. This strategy, therefore, determines the quality of responses that will be gathered.
- Establishing adequate survey centres. The closeness of the survey centres reduces the walking distances for the potential respondents who are willing to participate in the survey. In such a scenario, more potential respondents will visit the survey

centres for more information. The long walking distances would discourage potential respondents and this may result in the initial sample being under-subscribed.

- Awarding participation certificates. The researcher may award certificates to the survey participants. This acts as an incentive and recognition for taking part in the survey. However, this depends on the type of the survey, in case where participants' identity is strictly confidential; the strategy may fail to achieve the desired results.

These strategies are useful when the final sample is undersubscribed and there will be more non-volunteers who will be qualifying to participate in the survey. Assuming that the number of prospective respondents in each stratum (as well as in each sub-stratum) is the same, the hypothetical distribution of the target population is depicted in Figure 3.

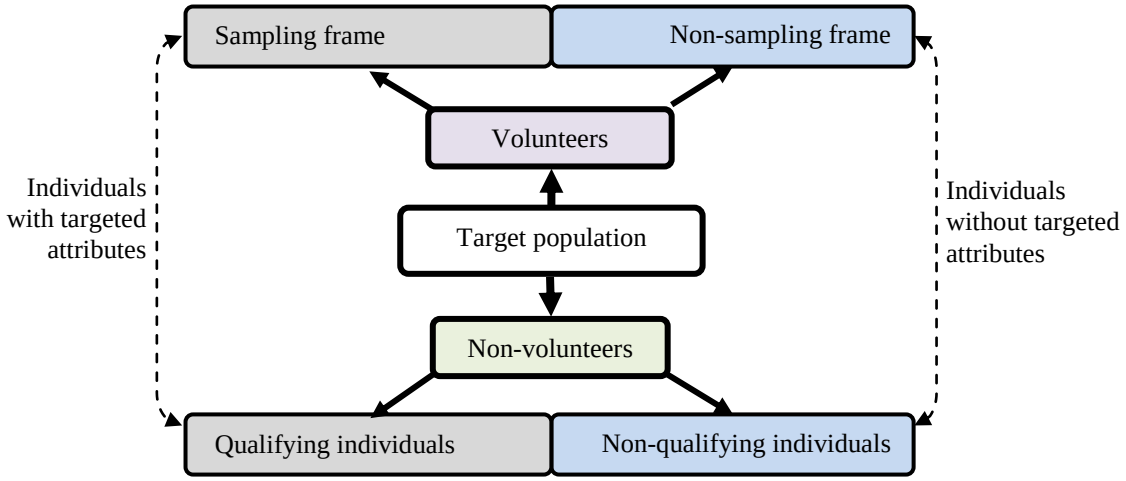

Figure 3: Hypothetical strata of the target population

Figure 3 shows that there are volunteers and non-volunteers without the targeted attributes. On the other hand, there are volunteers and non-volunteers with the targeted attributes. The proportion of the non-volunteers with the required attributes should be small; otherwise the researcher will be required to implement some or all of the possible strategies discussed earlier in order to attract the potential respondents in the stratum to re-consider their decisions of not participating in the survey. The partitioning of the target population is done during the selection of the sampling frame. However, in real life, the sizes of the strata (and that of sub-strata) of the target population are different. The size of each stratum (or sub-stratum) of the target population depends on the number of potential respondents falling in each stratum (or sub-stratum). Therefore, the researcher must be able to demarcate the strata of the target population. After determining the strata of the

target population, the researcher implements the voluntary sampling process that is presented in Figure 3.

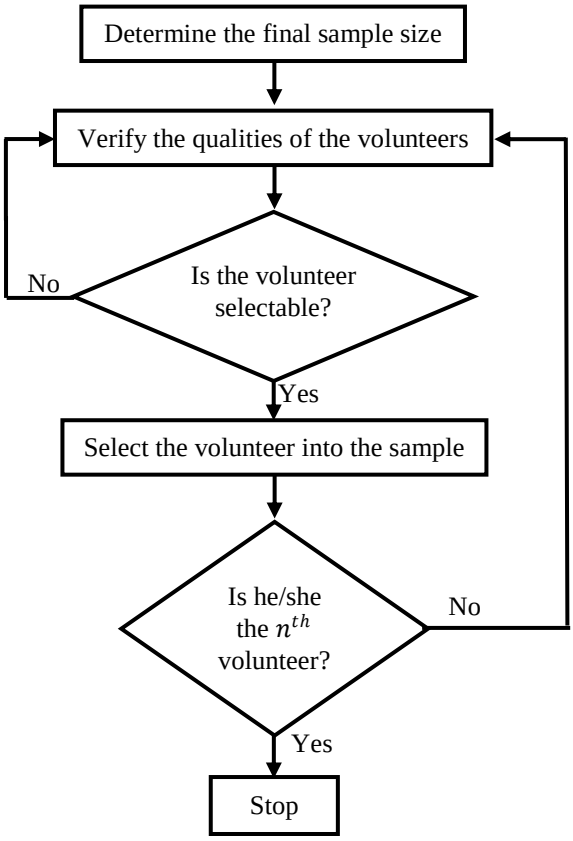

Figure 4: Voluntary sampling process

Figure 4 shows the three steps of the sampling process that are discussed thereafter.

Step 1: The researcher determines the final sample size (*n*) that can provide adequate data for the research.

Step 2: The researcher verifies the qualities of each prospective respondent who volunteers to participate in the survey.

Step 3: The researcher selects or rejects the potential respondent who volunteers to participate in the survey. The researcher selects or rejects the volunteer after assessing the qualities of the attributes of the prospective respondent. The researcher selects the volunteers who qualify to participate in the survey. The verification and selection or rejection process ends when the researcher had selected *n* volunteers. Therefore, the selection of the n^{th} volunteer terminates the voluntary sampling process.

The sampling design can be applied to select the initial sample or the final sample. In the former application, the voluntary sampling design is used in a hybrid sampling design to

select the sampling frame for either probability or non-probability sampling method to select the final sample. For instance, the voluntary sampling design can be applied ahead of the Simple Random sampling method (Hat method or Random Number method) to select the final sample. In the latter application, the voluntary sampling design is applied in a non-hybrid environment to select the participants in the final sample. This means that the full voluntary sampling design process outlined earlier is implemented to select the participants in a survey.

The sampling design can be applied in any research area to select the participants in the survey. Some of the research areas where the voluntary sampling design can be applied to select the final sample are:

- An investigation of the effects of a new drug to HIV/AIDS patients.
- A research on household expenditure.
- A research on the marital problems being faced by married couples.
- An investigation on corruption

The voluntary sampling design allows selected voluntary participants to provide data for the research. The valuable research areas may be over-subscribed by voluntary respondents. The data gathered will be accurate, complete, appropriate and reliable. The use of the voluntary sampling design guarantees high response rate and acceptable research findings. This is the only sampling design that verifies the prospective respondents before selecting (or rejecting) them. The final sample will be made up of qualified respondents who will be willing to participate in the survey and, as a result, this improves the quality of the data gathered. However, the voluntary sampling design may fail to attract potential respondents who are willing to participate in the survey if the subject under investigation will not be of value to the target population. The voluntary sampling design is still under investigation and, therefore, on trial run and its success is being tested in various sensitive research areas.

IMPLEMENTATION OF THE VOLUNTARY SAMPLING DESIGN

The new development was implemented to gather data from an HIV/AIDS survey. The researcher developed a questionnaire and distributed sixty copies to Harare EMBA students who had volunteered to participate in the HIV/AIDS survey.

VARIABLES OF INTEREST

The researcher collected data on marital status, HIV/AIDS status, number of times the respondent was tested of HIV/AIDS, research areas that are considered sensitive, HIV/AIDS

death in the family, reasons for seeking respondent's willingness to participate, number of times cheated and opinion on whether it was necessary to seek respondent's willingness to participate in a sensitive survey.

POPULATION AND SAMPLE

The target population (*N*) was Africa University, Faculty of Management and Administration Harare Executive Master of Business Administration (EMBA) students of 2013. The Harare EMBA students attend lectures on selected weekends. The Harare EMBA programme had 113 students at various stages of the programme. The size of the initial sample was composed of volunteer Harare EMBA students. The formula in Yamane (1967) for computing the sample size was used to determine the final sample size for the HIV/AIDS survey. The formula is

$$n = \frac{N}{1 + N(E^2)}, \quad (1)$$

where *N* is the target population size and *E* is the level of precision which in this case was 8.84%. $n = \frac{N}{1+N(E^2)} = \frac{113}{1+113(0.0884^2)} = 60$. Therefore, the final sample (*n*) was composed of the first sixty volunteer Harare EMBA students. This implies that the research's sampling fraction (*f*) computed with

$$S_f = \frac{n}{N}, \ldots \quad (2)$$

where *n* is the sample size and *N* is the population size, is $S_f = \frac{n}{N} = \frac{60}{113} = 0.5310$. The study sampled 53.10% of the target population. The elevation factor computed with

$$E_f = \frac{N}{n}, \ldots\ldots \quad (3)$$

where *n* is the sample size and *N* is the population size, is $E_f = \frac{N}{n} = \frac{113}{60} = 1.88$ or equivalently, each EMBA student who participated in the survey represented two colleagues.

INTENT TO CONDUCT A SURVEY

The researcher published the intent to conduct a survey through email to all Harare EMBA students more than two weeks before the data was gathered. The following is the extract from the intent statement emailed to all Harare EMBA students on 3 June 2013:

"I am *Stanley Murairwa (PhD) preparing to conduct a scholarly HIV/AIDS survey. The objective of the survey is to test the effectiveness of the proposed sampling design. You have been approached as a potential respondent to the survey. If you are willing to participate, please, come to the Main Great Hall during lunchtime on 22 June 2013 to complete the questionnaire developed to gather the data for the research. However, your inclusion in the final sample solely depends on your willingness to participate in the survey*."

A return receipt was configured on recipient's opening of the email. This enabled the researcher to estimate the number of Harare EMBA students who received the intent statement. The reminder email was sent on 21 June 2013, a day before data was gathered.

DATA GATHERING INSTRUMENT AND PROCESS

The researcher developed and distributed the questionnaire to volunteered Harare EMBA students through the first volunteer first select (FVFS) concept to fill up and drop the completed questionnaire in the collection box. The sixtieth Harare EMBA student who volunteered to participate in the HIV/AIDS survey was the last respondent to be allowed to join others in the final sample.

DATA ANALYSIS TOOLS

The data gathered from the HIV/AIDS survey was analyzed using the Statistical Package for Social Sciences (SPSS). The data was tabulated to show the relationships among corresponding responses. The Cronbach's alpha (also referred to as the estimate of reliability (Cortina, 1993)) was used to determine the reliability of the data gathered by the voluntary sampling design during the HIV/AIDS survey. Cortina's (1993) Cronbach's Alpha (CA) formula is:

$$CA = \frac{N^2 \times M(COV)}{\sum\left(\frac{VAR}{COV}\right)}, \tag{4}$$

where N^2 is the square of the number of items in the scale, M(COV) is the mean inter-item covariance and $\sum\left(\frac{VAR}{COV}\right)$ equals the sum of all of the elements in $\frac{VAR}{COV}$ matrix. The Spearman's rank correlation coefficient was used to measure the respondents' consistency in answering two comparable questions that gathered ordinal data. The Spearman's formula (Anderson *et al*., 1996) is:

$$R_s = 1 - \frac{6\sum d_i^2}{n(n^2-1)}, \tag{5}$$

where *n* is the number of responses being ranked, $d_i = Q_{9i} - Q_{11i}$, Q_{9i} is the rank of the response *i* with respect to Question 9 (on whether it is necessary to seek respondent's willing to participate in a sensitive survey) and Q_{11i} is the rank of the response *i* with respect to Question 11 (on whether it is important to publish the intent to conduct a sensitive survey before gathering a research data). The value near ± 1 indicates a strong agreement in the way the respondents answered the two comparable questions.

DATA ANALYSIS

The data gathered was analyzed to determine the applicability, efficiency and consistency of the voluntary sampling design.

RESPONSE RATE

The return receipt was received from all the one hundred and thirteen emails that were sent, an indication that all the Harare EMBA students received the intent to conduct the HIV/AIDS survey. The researcher realised two types of response rates, namely, the voluntary response rate and questionnaire returning rate as shown in Figure 5 and Table 1.1.

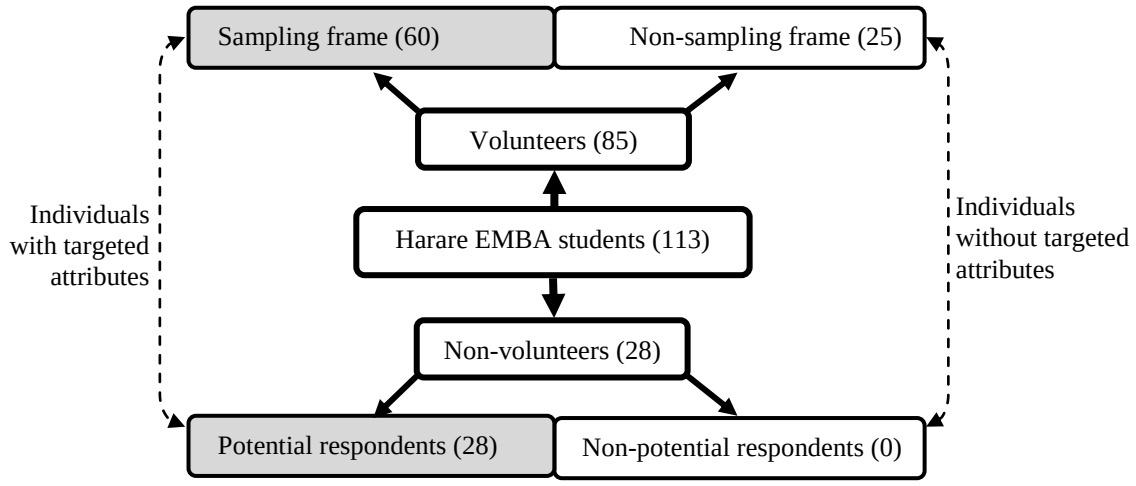

Figure 5: Strata of Harare EMBA students

Figure 5 shows the strata of the responses of all the Harare EMBA students to the intent to conduct the HIV/AIDS survey. The distribution shows that eighty-five Harare EMBA students volunteered to participate in the HIV/AIDS survey. All those who did not volunteer to participate had the targeted HIV/AIDS attributes. However, it was not necessary to implement the luring strategies since those who volunteered were more than the required final sample by forty-one percentage.

Table 1: Harare EMBA students' responses

Gender	Population	Initial sample		Final sample	
		Frequency	Percentage	Frequency	Percentage
Female	48	32	66.67	23	71.88
Male	65	53	81.54	37	69.81
Total	113	85	75.22	60	70.59

A hundred percentage questionnaire return rate was achieved implying that the sixty questionnaires distributed to Harare EMBA students were fully completed and returned. Of all the Harare EMBA students, more than seventy-five percentage volunteered to participate in the HIV/AIDS survey.

DATA QUALITY AND RELIABILITY

The data gathered was analyzed to determine the ability of the voluntary sampling design to select trustworthy respondents who were capable of giving high quality and reliable data.

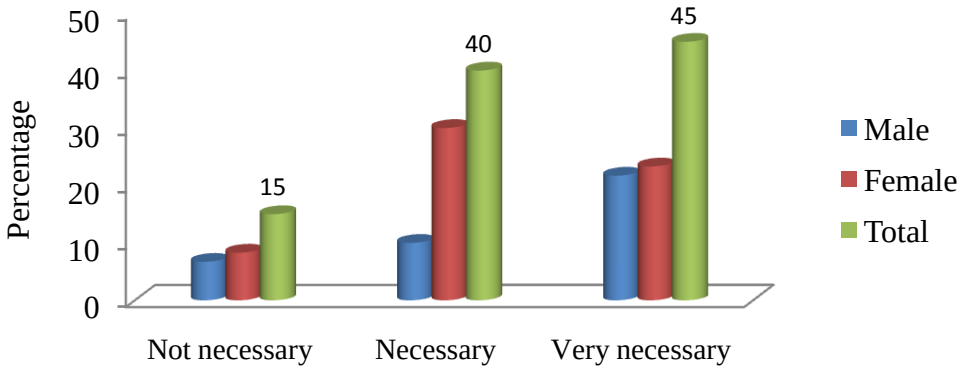

Figure 6: Sensitive surveys should engage volunteers

The results in Figure 6 show that sensitive surveys should engage only alacritous respondents. This is supported by eighty-five percentage of the Harare EMBA students who responded indicating that potential respondents must be accorded the opportunity to decide on whether or not to participate in the sensitive survey. The same proportion of respondents concurred with the idea of publishing the intent to conduct a sensitive survey prior to gathering the data.

Table 2: Percentage response on mandatory seeking participants' willingness

Should it be mandatory		Respondent approval			Total
		Unnecessary	Necessary	Very necessary	
No	Female	6.67	0.00	0.00	6.67
	Male	8.33	0.00	0.00	8.33
	Total	15.00	0.00	0.00	15.00
Yes	Female	0.00	10.00	21.67	31.67
	Male	0.00	30.00	23.33	53.33
	Total	0.00	40.00	45.00	85.00
Grand Total		15.00	40.00	45.00	100.00

Table 2 shows that fifteen percentage of the Harare EMBA students who viewed seeking for respondent's willingness to participate in a sensitive survey as unnecessary also responded that it should not be made mandatory to seek the prospective respondent's willingness to participate in a sensitive survey. The results indicate that the voluntary sampling design gathered accurate and reliable data and that the respondents were willing to participate in the survey. These remarks are supported by the results presented in Table 3.

Table 3: Percentage response on HIV/AIDS status and tested

Tested	HIV/AIDS Status	Marital Status	Cheated		Total
			No	Yes	
No	Don't know	Married	1.67	1.67	3.33
Yes		Not Married	20.00	8.33	28.33
	Negative	Married	53.33	15.00	68.33
		Total	75.00	25.00	100.00

Table 3 shows that the Harare EMBA students who were not tested of HIV/AIDS also did not know their HIV/AIDS status. Those who went for HIV/AIDS counselling and testing were negative. This could be due to the use of condoms as all those who cheated responded that they used condoms. A quarter of the Harare EMBA students cheated their couples or partners. Of the Harare EMBA students who were not married, 29.41% had more than one sexual partner. The use of condoms during sex could be the reason why all the respondents are HIV/AIDS negative. Although, abstinence is the key to an HIV/AIDS free generation, the use of condoms significantly reduces the spread of HIV/AIDS and other STIs.

Reliability of the voluntary sampling design

Table 4: Consistency of the voluntary sampling design

Cronbach's Alpha	Number of questions
0.965	2

The Cronbach's alpha value, of 0.965 in Table 4, of two analogous questions is above Cortina (1993), Nunnely (1998), George and Mallery (2003) and Field's (2006) Cronbach's alpha cut off points, therefore, the voluntary sampling design performed consistently. This implies that the respondents answered the two comparable questions the same.

SPEARMAN'S RANK CORRELATION COEFFICIENT BETWEEN TWO QUESTIONS

The Spearman's rank correlation between Question 9 (on whether it is necessary to seek respondent's willing to participate in a sensitive survey) and Question 11(on whether it is important to publish the intent to conduct a sensitive survey before gathering a research data) is shown in Table 5.

Table 5: Spearman's rank correlation coefficient between Questions 9 and 11

		Question_9	Question_11
Question_9	Correlation Coefficient	1.000	0.968**
	Sig. (2-tailed)	.	0.000
	N	60	60
Question_11	Correlation Coefficient	0.968**	1.000
	Sig. (2-tailed)	0.000	.
	N	60	60

**. Correlation is significant at the 0.01 level (2-tailed)

The rank correlation coefficient (0.968) in Table 5 is positive and near 1.0 an indication of a strong association between the two responses. The correlation between Questions 9 and 11 is significant at 1% level of significance. A positive correlation coefficient indicates that the respondents answered the two comparable questions exactly the same.

GENERAL FINDINGS

Some of the findings from the data gathered by the voluntary sampling design are presented thereafter.

Table 6: Harare EMBA students' gender, marital status and sexual behaviour

		Marital Status		
		Not married	Married	Total
Not cheated	Female	13.33	21.67	35.00
	Male	6.67	33.33	40.00
	Total	20.00	55.00	75.00
Cheated	Female	1.67	1.67	3.33
	Male	6.67	15.00	21.67
	Total	8.33	16.67	25.00
Grand Total		28.33	71.67	100.00

Table 6 shows that fifteen percentage and approximately two percentage of married men and women respectively cheated their spouses. The results show that married men cheat their wives more than what married women do to their husbands. Therefore, more efforts to reduce the spread of HIV/AIDS and other Sexual Transmitted Infections (STIs) must be directed towards married men.

Table 7: Cheating and HIV/AIDS tested frequency

		Number of times cheated				Total	Percentage
		0	1 - 5	6 - 10	≥ *16*		
Number of times tested of HIV/AIDS	0	2	0	1	0	3	5.00
	1 - 3	28	6	0	1	35	58.33
	4 - 6	11	4	1	0	16	26.67
	7 - 9	2	1	0	0	3	5.00
	≥ *10*	3	0	0	0	3	5.00
	Total	46	11	2	1	60	100
	Percent	76.67	18.33	3.33	1.67	100	

Table 7 shows that the Harare EMBA students who cheated their spouses or partners were frequently tested for HIV/AIDS, an indication that they were afraid of contracting HIV/AIDS or other STIs. The complex question to answer is "Why are the Harare EMBA students cheating their spouses or partners when they are afraid of contracting HIV/AIDS?" Of all the Harare EMBA students, 76.67% had not cheated and, as well, were frequently tested of HIV/AIDS.

Exactly, 95% of the Harare EMBA students who participated in the survey have been tested of HIV/AIDS at least once. Thus, one may be tempted to conclude that 95% of the Harare EMBA students are no longer afraid of discussing HIV/AIDS in public. This finding is contradicting the results on the research areas that the Harare EMBA students indicated to be sensitive. All the Harare EMBA students listed HIV/AIDS issues as sensitive areas that require the willingness of the participant in order for the researcher to gather accurate and reliable data.

CONCLUSION

The voluntary sampling design is simple and easy to understand but rigorous in implementation. Through the publication of the intent to conduct a sensitive survey, the Harare EMBA students were accorded the opportunity to research for the responses to give during the survey. The voluntary sampling design gathered accurate and reliable data from

HIV/AIDS survey. Although, the voluntary sampling design was popularized for gathering accurate and reliable data from sensitive researches, it can also be employed in any research survey and can undoubtedly gather high quality and reliable data. However, there is need to further implement and monitor the performance of the voluntary sampling design in other sensitive surveys.

DECLARATION OF CONFLICTING INTERESTS

The author declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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