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APPLICATION OF RANDOMIZED RESPONSE TECHNIQUE ON A SURVEY SAMPLING OF YEAST INFECTION AMONG NIGERIAN FEMALE UNDERGRADUATES

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ABSTRACT

In this paper, randomized response technique was adopted to determine the proportion of female undergraduates at the Federal University of Technology Akure that have had yeast infection at a point in time, the age range that has the most number of yeast infection cases as well as the female hostel with the highest number of yeast infection cases. Questionnaires were used to collect data from the respondents. Z-tests were used in hypothesis testing. All comparisons involving randomized response data used the estimated proportion of girls with yeast infection and the sampling variance to calculate the z-score. The results of the study indicated that Jadesola female hostel has the most number of yeast infection cases proportion 99.8% while the proportion of yeast infection cases in Jibowu hostel is 66.8%. The result also shows that 90% of the female undergraduates between the age range of 16 and 18 years contracted the infection.

Keywords: Randomized response technique, yeast infection, z-test, sensitive characteristic

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1. INTRODUCTION

The randomized response technique is a survey method especially developed to improve the accuracy of answers to sensitive questions. When sensitive topics are studied, respondents often

react in ways that negatively affect the validity of the data. Such a threat to the validity of the results is the respondents' tendency to give socially desirable answers to avoid social embarrassment with a view to projecting a positive self-image. Warner [1] reasoned that the reluctance of the respondents to reveal sensitive or probably harmful information would diminish when respondents could be convinced that their anonymity was guaranteed. In the Warner proposal, the respondents are given two logically opposite questions and are instructed to answer one or the other depending on the result of a randomizing device. For example, suppose the sensitive characteristic is yeast infection. The respondent may be asked to toss a dice, and the result determines which question they answer.

Question 1: Have you had yeast infection before?

Question 2: Have you not had yeast infection before?

Some of the notable authors who had extensively worked on the survey of sensitive characteristics using randomized response technique include Horvitz *et al*. [2], Greenberg *et al*. [3], Greenberg *et al*. [4], Moors [5], Tracy and Fox [6], Mangat and Singh [7], Mangat [8], Singh *et al*. [9], Christofides [10], Kim and Warde [11], Hussain and Shabbir [12], Adepetun and Adebola [13], Adebola *et al*. [14], Ewemooje *et al*. [15] respectively.

In this study, a survey sampling on yeast infection among female undergraduates of Federal University of Technology, Akure, Ondo State, Nigeria was conducted to determine the population proportion of sexually active female undergraduates in the University who have contracted the infection.

2. MATERIAL AND METHOD

This study involves administering structured survey questionnaires on the incidence of vagina yeast infection among some sexually active female undergraduates in the University using randomized response technique for effective data analysis. A total of three hundred (300) questionnaires were printed and administered equally across the two hostels under study. Respondents were randomly selected across some rooms in both hostels and have been assured that the procedure has been designed to protect their privacy. The questionnaire has some normal and regular questions such as asking for their age, school, religion, and hostel in which they stay. After answering the normal questions, the respondents were told to read carefully the randomized response technique condition: For each of the following questions, please toss the

coin given to you once. If the coin shows a head, respond a yes or no in the space indicated only with respect to statement A. If the coin shows a tail for that question, respond a yes or no in the space indicated only with respect to statement B.

A. I have never had yeast infection at any point in time (a) Yes (b) No

B. I have had yeast infection at a point in time (a) Yes (b) No

While the respondent tosses the coin, the interviewer turns his back, so he would not know the outcome of the tossing.

3. ANALYSIS AND RESULTS

Three hundred questionnaires were distributed in this survey. 84.7% of the respondents returned their questionnaires (254 out of 300). The lack of representative data for this group introduced some cultural bias into the data.

The second aspect of the survey completed by respondents applied the randomized response technique to estimate number of female undergraduates who have actually had the infection before.

Table 1. Randomized Response Technique Survey Questions

RRT 1	I have never had yeast infection at any point in time (a) Yes (b) No
RRT 2	I have had yeast infection at a point in time (a) Yes (b) No

3.1 Data Analysis

The calculation of the proportion of female undergraduates that has yeast infection was obtained using the formula $\hat{\pi} = \frac{\hat{\varphi}+p-1}{2p-1}$ where π is the estimated proportion of 'yes' responses; $\hat{\varphi}$ is the observed proportion of 'yes' responses and p is the predetermined probability of answering the sensitive questions. In order to strike a balance between respondent jeopardy and estimation efficiency, $p = 0.75$ is chosen in this study.

Recall $\hat{\varphi} = \frac{x}{n}$ where *x* is the number of "yes" responses to the sensitive questions; and *n* is the total number of valid responses respectively.

3.2 Hypotheses Development

Guided by the results of previous studies, we set our hypotheses

H_o: Proportion of yeast infection is high in Jadesola Hostel.

versus

H_1: Proportion of yeast infection is low in Jadesola Hostel.

3.3 Statistical Procedures

Z-tests were applied in hypotheses testing. All comparisons involving randomized response data applied the estimated proportion of female undergraduates with yeast infection and the sampling variance to evaluate the z-score using the standard formula

$$Z = \frac{X_1 - X_2 - \cdots - X_n}{\left(Var(X_1) + Var(X_2) + \cdots + Var(X_n)\right)^{\frac{1}{2}}}$$

where *X* is the estimated proportion of the respondents admitting to have had yeast infection; Var (*X*) is the variance of the estimated proportion of female undergraduates who have had yeast infection according to Warner [1] and α is the level of significance (α = 0.05); $Z_\alpha = 1.96$

3.4 Decision Rule

Reject H_o if $Z_{tab} > Z_{cal,}$ otherwise do not reject H_o.

$Z_{tab}=Z_{\alpha/2} = 1.96$ at α = 0.05 level of significance.

Table 2. Proportion of female undergraduates that have yeast infection categorised according to their age groups

Randomized Response Questions	Age	Sensitive Response	Proportion of Yeast Infection	Z score
I have had yeast infection at a point in time	16-18	38	90.0%	-0.185
	19-24	63	77.2%	
	25-28	47	44.0%	
	29 and above	2	3.0%	
I have never had yeast infection at any point in time	16-18	51	99.8%	
	19-24	68	87.4%	
	25-28	57	74.0%	
	29 and above	4	11.0%	0.189

Table 3. Proportion of female undergraduates that have yeast infection categorised according to their age groups

Randomized Response Questions	Hostel	Sensitive Response	Proportion of Yeast Infection	Z score
I have had yeast infection at a point in time	Jibowu	82	68.8%	
	Jadesola	98	99.8%	0.645
I have never had yeast infection at any point in time	Jibowu	59	35.6%	
	Jadesola	91	95.6%	0.519

4. CONCLUSION

The randomized response technique used in the estimation of proportion of female undergraduates with yeast infection in the University has been effective in the area of response rate. The female undergraduates responded well to the survey questionnaires because of the level of privacy it guarantees.

From the analysis in table 2, the proportion of female undergraduates between the ages of 16 and 18 years that have had yeast infection is 90%, the proportion of female undergraduates between the ages of 19 and 24 that have had yeast infection is 77.2% and the proportion of female undergraduates between the ages of 25 and 28 that have had yeast infection is 44%. Also, the proportion of female undergraduates that have had yeast infection between the ages of 29 and above is 3%.

From the analysis in table 3 shows that Jadesola hostel has the most number of yeast infection cases with a proportion of 99.8% while the proportion of yeast infection cases in Jibowu hostel is 68.8%.

Similarly, the probability of having yeast infection in Jadesola hostel is 0.645 and therefore, we do not reject null hypothesis H_o since $Z_{tab} > Z_{cal}$. We have statistical reason to believe that Jadesola female hostel has the higher proportion of yeast infection cases between the two hostels.

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