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On Statistical and Methodological Inadequacies in “Using Financial Reporting to Enhance Partnership in Community Development”

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Abstract

This paper addresses the statistical and methodological inadequacies in a widely published paper titled “Using Financial Reporting to Enhance Partnership in Community Development”. The inadequacies are in the areas of Research Objectives, Research Questions, Research Hypotheses, Research Design and Analyses. The inadequacies are pointed out and possible corrections given. These inadequacies are not peculiar to the publication under reference since the authors themselves acknowledged that “the analysis draws its methodology largely from previous studies that are built on the extensive research literature on PPP accounting”. This motivated the research. The paper concludes by requesting Publishers of academic Journals that are not in Statistics to include Statisticians in their Editorial Boards in order to correct, before publication, the wrong use of statistical methods that are applied by Researchers since such researches are for public consumption.

Keywords: *Chi-Square, financial reporting, ICAN Students’ Journal, Logit, Methodological Inadequacies, Test of Independence.*

1.0. Introduction

The above article in quotation marks is a leading article of an ICAN Students’ Journal of April/June 2014 which was advertised on the cover page of the journal. The article was written by Yohanna and Okafor (2014). It was observed that a similar paper had been presented by the same Authors as ‘Financial Reporting – An Ante Dote for Enhancing Sustainable Partnership in Community Development: A study of Community and Social Development Agencies in Nigeria’, on November 16th 2011, at a conference organized by the Faculty of Management Sciences, Nnamdi Azikiwe University, Awka, Anambara State, Nigeria [2].

According to the Authors of the above article in quotation marks, financial reporting is an 'antedote' for enhancing sustainable partnership in community development. The Authors opined that the aim of the study was to encourage the use of financial reporting for promoting Public-Private Partnership (PPP). They defined PPP as relating to perceptions and practices affecting public-private sector relationships in ensuring national/global health, development and wellbeing of society, and the conceptual aspects of such relationships, including the role of the key players in collaborating to make these partnerships successful or otherwise.

The Authors went on to report that PPPs could become the government's policy for financing infrastructure; and, as such, attracting PPPs and making them work 'seems(sic) to have been an objective that has to be achieved at any cost'. The report went further to state that 'donor agencies usually demand and insist on transparency and accountability through financial reporting, unfortunately though, most communities in these countries do not have the capacity to meet these demands, firstly, as a result of illiteracy, and secondly, as a result of lack of adequate financial reporting culture'.

To actualize their study, five objectives, five research questions and two hypotheses were considered. When the hypotheses were tested using Chi-Square Test of Independence, it was discovered that: (a) the maintenance of financial records had significant effect on the promotion of community-driven development; and (b) the relationship of partners in community development would be affected negatively for lack of adequate financial reporting.

The Authors concluded by stating that: 'financial records should be maintained in every community-driven development project. Organizations that have entered into partnership with communities for the purpose of undertaking community projects, should ensure proper financial records-keeping as this will help to avoid marring the good relationship that has been established'.

The Researchers, however, found some statistical and methodological inadequacies in the study. The need to highlight them is because the Authors themselves reported thus: 'the analysis draws its methodology *largely from previous studies* (italics ours) that are built on the extensive research literature on PPP accounting'. Failure to address these inadequacies therefore, would lead to continuous use of this wrong methodology especially as Students' Journals are meant to be avenues for students' learning.

Moreover, it appears to be an accepted methodology in Accounting Research Literatures. Clearly, if the methodology of an article is poorly written, then, it will not allow for valid inferences to be made from the article.

The inadequacies are in (i) the statements of Research Objectives/Research Questions/Research Hypotheses (ii) the Research Design, and (iii) the testing of the Research Hypotheses.

Some of these inadequacies are not peculiar to the Authors' study but also to most studies in the areas of Management Sciences (Ugwuanyim [1999]).

2.0. Research Objectives/Research Questions/Research Hypotheses

It was observed that the Research Objectives/Research Questions/Research Hypotheses were not logically stated. For instance:

- (a) The first objective stated as follows: 'to establish whether or not financial records are maintained in communities that have entered into partnership with the agency'. The research question following this objective stated: 'what are the financial records maintained in communities which have entered into partnership with an agency?' To 'establish whether or not financial records are maintained' is different from the type of 'financial records maintained'.
- (b) The stated hypotheses are totally at variance with the research objectives and/or research questions. For instance, in hypothesis one, there is no place it was written in the research objectives and/or research questions that those Authors wanted to investigate whether or not 'the maintenance of financial records has significant effects on the promotion of community-driven development'. We say this, because, a research hypothesis is a tentative answer to a research question.

Also, in hypothesis two, there is no place it was written in the research objectives and/or research questions that those Authors tended to investigate whether or not 'the relationship of partners in community development will be affected negatively by lack of adequate financial reporting'.

3.0. The Research Design

The Authors did not mention any research design in the work. They rather stated that ‘the sampling was both purposive and random’. They continued: ‘The communities have eight management committee members, which gives (sic) a total of 288 expected respondents as our sample size. Unfortunately, some members were not on ground at the time of our visit, so only 180 were interviewed using a structured questionnaire and interview’. The foregoing demonstrates that no probability sampling scheme was used for this study and therefore no probability statements can be made with the data. Again, there was no method of calculating the sample size, except that ‘some members were not on ground at the time of our visit, so only 180 were interviewed’. Again, the Authors claimed that ‘financial records’ were reviewed; but in the study, there was nothing to show that ‘financial records’ were used. Also, the research instrument (the questionnaire) used for the study was not tested for reliability and validity.

4.0. Testing of the Research Hypotheses

- (i) As we stated in 2(b), the hypotheses are at variance with the objectives of study.
- (ii) Even if they agree with the research objectives, one only sees one of the two variables under consideration in the questionnaire (in the case of hypothesis one) – ‘Maintenance of Financial Records’, the independent variable, but does not see ‘Community-driven Development’, the dependent variable; but the Authors went ahead to wrongly use the Chi-Square Test of Independence to test their hypothesis using the data in the following unmarked Table which in this paper is marked ‘Table 1’:

Table 1: Responses to Questions One and Five of the Questionnaire

| Question | Yes | No | Total |
|-----------------|------------|------------|--------------|
| One | 120 | 60 | 180 |
| Five | 20 | 160 | 180 |
| Total | 140 | 220 | 360 |

Questions one and five are in the questionnaire which are reproduced here in Appendix 1 and which represent ‘Maintenance of Financial Records’. They went

ahead to conclude: ‘from the calculation above, the value of our X^2 exceeds the critical value of 3.841 under one degree of freedom. We reject the null hypothesis (H_0) and accept the alternate (sic) hypothesis that says “the maintenance of financial records has significant effect on the promotion of community-driven development”’.

One was not told however, what the level of significance is. Again, this test is inappropriate because from their Table, they were testing whether or not the responses were independent of the questions. And, the responses not being independent of the questions do not in any way prove that ‘the maintenance of financial records has significant effect on the promotion of community-driven development’.

Also, in the case of hypothesis two, what were shown on their unnumbered Table were the responses to the questions as regards the ill-disposition of the funders towards the community as a result of their failure to keep financial records (see questions ten and eleven of the questionnaire included here as Appendix 1) ignoring the question on financial reporting (see question eight of the questionnaire also included here as Appendix 1). This again they tested using Chi-Square Test of Independence erroneously and arrived at the conclusion that: ‘from the calculation above, the value of our X^2 exceeds the critical value of 3.841 under one degree of freedom. We reject the null hypothesis (H_0) and accept the alternative hypothesis that says that “the relationship of partners in community development will be affected negatively for lack of adequate financial reporting”’.

5.0. The Way Forward

This section shall be written in three subsections – 5.1, assuming that the Authors’ stated hypotheses were correct, how does one test them; 5.2, assuming the Authors’ stated hypotheses were not correct with regard to the stated objectives, how does one re-state and test the hypotheses; and 5.3, the possible sampling scheme to be adopted and the calculation of the sample size.

5.1. Assuming that the Authors’ Stated Hypotheses Are Correct, How Does One Test Them?

To make the hypotheses of study be in tandem with the research objectives, the research objectives should be re-stated as:

To find out: (i) if the maintenance of financial records has significant effects on the promotion of community-driven development, and (ii) if the relationship of partners in community development will be affected negatively for lack of adequate financial reporting.

To test the hypotheses, first, in the case of hypothesis 1, let X_1 , the independent variable be ‘Financial Records’ which corresponds to questions 1 and 5 of the questionnaire; and Y_1 , the dependent variable be ‘Community-Driven Development’. Y_1 could have been measured in terms of the projects’ liquidity, viability and stability (see the Authors’ ‘Statement of Problem’) and an appropriate regression analysis method used to test the effect of X_1 on Y_1 . Since there is no such data, let us assume that questions 6 – 9 can stand as some measure of Y_1 , in that, as in questions 6 and 7, some knowledge has been acquired by community members; questions 8 and 9 show that some developmental activities are going on. Then, a logit regression analysis can be used to measure the effect of X_1 on Y_1 . In this case, a dichotomous logit regression can be applied to test the null hypothesis since the Y_1 values can be recoded to be either 0 or 1 corresponding respectively to ‘No’ or ‘Yes’.

The logit model as given in Pongsapukdee & Kumsiri [4] is:

$$p(x_j) = \frac{\exp\left(\beta_o + \sum_{i=1}^k \beta_i x_{ij}\right)}{1 + \exp\left(\beta_o + \sum_{i=1}^k \beta_i x_{ij}\right)}; \quad j = 1, 2, \dots, n. \tag{1}$$

Where:

$p(x_j) = \Pr(Y = 1 | X = x_j) = E(Y = 1 | X = x_j)$ denote the expected probability value of Y given x

$x_{ij} = (x_{oj}, x_{1j}, \dots, x_{kj})$ denote the j th setting of values of k explanatory variables,

$i = 1, 2, \dots, k, j = 1, 2, \dots, n$, for which $x_{oj} = 1, k$ is a constant

n = the sample size

$\beta_i, i = 0, 1, 2, \dots, k$ are the model parameters.

Again, if one wants to measure the agreement between X_1 and Y_1 as defined in this section, then, one should properly do a Chi-Square test and measure the contingency coefficient C , in order to determine the degree of association.

Contingency coefficient as given in Cleff [2014] is:

$$C = \sqrt{\frac{\chi^2}{\chi^2 + n}} \tag{2}$$

The contingency coefficient assumes the value of zero when there is no association between the variables and ‘never assumes a value larger than one’. Its only disadvantage though is that C ‘never assumes the value of one under perfect association’.

Secondly, in the case of hypothesis 2, X_2 which corresponds to question 8 of the questionnaire is the independent variable, while Y_2 which corresponds to questions 9 and 10 of the same questionnaire is the dependent variable. We label Y_2 ‘Ill-Disposition’ of the donors. We use also the logit regression to run the analysis as well as use properly the Chi-Square test of independence to ascertain their relationship (2) will also be used to determine the degree of relationship.

The analyses were run using the statistical software, STATA 13.0. All tests were carried out at 5% level of significance using the Authors’ data on the ‘Discussion of Findings’ and ‘Appendix B’ of their article. The data are reproduced here as Appendix 2. The results are shown as Tables 2 to 5 respectively.

Table 2: A Logistic Regression of Hypothesis 1

| Logistic Regression | | Number of obs | 180 | | | |
|-----------------------------------|----------|-------------------|--------|-------|----------------------|----------|
| | | Wald chi2(1) | 0.06 | | | |
| | | Prob > Chi2 | 0.8113 | | | |
| Log pseudolikelihood = -68.756949 | | Pseudo R2 | 0.0004 | | | |
| Y1 | Coef. | Robust Std. Error | z | P> z | [95% Conf. Interval] | |
| X1 | 0.11652 | 0.488116 | 0.24 | 0.811 | -0.84017 | 1.07321 |
| _cons | 1.838279 | 0.408056 | 4.50 | 0.000 | 1.038505 | 2.638054 |

Where $Y_1 = Y_1 =$ Community-Driven Development

$X_1 = X_1 =$ Financial Records

The analysis shows that Maintenance of Financial Records does not have any effect on Community-Driven Development because the p-value (5th column of Table 2) is 0.811 which is greater than 0.05. On the other hand, the analysis shows that there are other significant factors that contribute to Community-Driven Development since the constant term ($_cons$) is significant. A close examination of the Table shows that the p-value of the Wald-Chi2 is 0.811 which also shows that X_1 does not explain Y_1 . Again, the Pseudo R^2 is 0.004 which is very low. It should be noted, however, that in logit models, goodness-of-fit is of secondary importance. What matters are the expected signs of the regression coefficients and their statistical and/or practical significance (Gujarati [2003]).

Table 3: A Chi-Square Test of Independence of X_1 and Y_1

| Community Development | Maintenance of Financial Records | | Total |
|-----------------------|----------------------------------|-----|-------|
| | No | Yes | |
| No | 7 | 16 | 23 |
| Yes | 44 | 113 | 157 |
| Total | 51 | 129 | 180 |

Pearson Chi2 (1) = 0.0573

Pr = 0.811

Like the result in Table 2, Table 3 shows that there is no relationship between Community Development and Maintenance of Financial Records since the p-value is 0.811 which is the same as that of Table 2. The Contingency coefficient value is 1.78% (using (2)) which also is very low suggesting lack of relationship between the two variables. The advantage of the logistic regression result above is that it would enable us to measure the effect of X_1 on Y_1 through the value of the coefficient of X_1 were it significant. Again, through it, we are able to know that there are some other significant factors other than X_1 which could lead to Community Development.

We next show the results of Hypothesis 2 in Tables 4 and 5:

Table 4: A Logistic Regression of Hypothesis 2

| | | |
|-----------------------------------|---------------|--------|
| Logistic Regression | Number of obs | 180 |
| | Wald chi2(1) | 1.30 |
| | Prob > Chi2 | 0.2548 |
| Log pseudolikelihood = -80.384804 | Pseudo R2 | 0.0088 |

| Y2 | Robust | | | | |
|-------|----------|------------|-------|-------|----------------------|
| | Coef. | Std. Error | z | P> z | [95% Conf. Interval] |
| X2 | 0.597837 | 0.5249973 | -1.14 | 0.255 | 1.626813 0.4311388 |
| _cons | 2.079442 | 0.4756648 | 4.37 | 0.000 | 1.147156 3.011727 |

Where $Y_2 = Y_2 = \text{Ill-Disposition}$

$X_2 = X_2 = \text{Financial Reports}$

The analysis also shows that making regular and timely financial reports does not have any relationship with the ill-dispositions of the donors since the p-value (5th column of Table 4) is 0.255 which is greater than 0.05. On the other hand, the analysis shows that there are other significant factors that contribute to ill-disposition of donors since the constant term (_cons) is significant. A close examination of the Table shows that the p-value of the Wald-Chi2 is 0.255 which also shows that X_2 does not explain Y_2 . Again, the Pseudo R^2 is 0.0088 which is very low, though, what matters are the expected signs of the regression coefficients and their statistical and/or practical significance (Gujarati [2003]) as already noted above.

Table 5: A Chi-Square Test of Independence of X_2 and Y_2

| Ill-Disposition | Financial Reports | | Total |
|-----------------|-------------------|-----|-------|
| | No | Yes | |
| No | 5 | 25 | 30 |
| Yes | 40 | 110 | 150 |
| Total | 45 | 135 | 180 |

Pearson Chi2 (1) = 1.3333 Pr = 0.248

Like also the result in Table 4, Table 5 shows that there is no relationship between 'Ill-Disposition' of donors and Provision of 'Financial Reports' since the p-value is 0.248 which is the same as that of Table 4. The Contingency Coefficient value is 8.57% (using (2)) which also is very low suggesting lack of relationship between the two variables. The advantage of the logistic regression result of Table 4 is that it would enable us to measure the effect of X_2 on Y_2 through the value of the coefficient of X_2 were it significant. For instance, was the effect significant, the negative sign of the coefficient would have suggested that an increase in making regular and financial reports to the donors would lead to less ill-feeling by the donors. Again, through it, we are able to know that there are some other significant factors other than X_2 which could lead to ill-disposition of donors.

5.2. Assuming the Authors' Stated Hypotheses Are Not Correct With Regard to the Stated Objectives, How Does One Re-State and Test the Hypotheses?

With regard to the study, the hypotheses of study should be stated as follows:

1. Ho: Financial records are not maintained in communities that have entered into partnership with an agency.
H₁: Less financial records are maintained in communities that have entered into partnership with an agency.

2. Ho: Participating communities do not maintain records for each source of funding for the same project (in cases of more than one source of project).
H₁: Participating communities maintain records for each source of funding for the same project (in cases of more than one source of project).

3. Ho: Members charged with the management of project funds do not understand some basic financial guidelines regarding implementation of community projects.
H₁: Members charged with the management of project funds understand some basic financial guidelines regarding implementation of community projects.

4. Ho: Participating and benefitting communities do not make regular and timely financial reporting to the funding agencies.
H₁: Participating and benefitting communities make regular and timely financial reporting to the funding agencies.

5. Ho: Project Accounts are not audited as, at, and when due.

H₁: Project Accounts are audited as, at, and when due.

In order to test the above hypotheses, appeal is made to test of proportions which can proceed as stated in Walpole [7] as follows:

- i. State Ho.
- ii. State H₁.
- iii. Specify the value of α .
- iv. State the test statistic $Z = \frac{\hat{P} - p}{\sqrt{\frac{\hat{P}\hat{Q}}{n}}}$; where \hat{P} is the sample proportion, p is the hypothesized population proportion, $\hat{Q} = 1 - \hat{P}$ and n is the sample size. Specify the critical region.
- v. Compute (iv).
- vi. Take decision on the basis of (v).

We exemplify this procedure using hypothesis 5.2(1). Following the steps above, we proceed as follows:

- i. Ho: $p = 0.5$ (since 0.5 is a median value which does not point to the fact that more or less people maintain financial records).
- ii. H₁: $p < 0.5$ (since the sample proportion, 0.39, suggests that less people in the population maintain financial records)
- iii. $\alpha = 0.05$
- iv. Test Statistic $Z = \frac{\hat{P} - p}{\sqrt{\frac{\hat{P}\hat{Q}}{n}}}$

where p is the population proportion of those who maintain financial records.

Critical Region, $z < -1.645$

v. Computation:
$$z = \frac{\frac{140}{360} - 0.5}{\sqrt{\frac{(0.39)(0.61)}{360}}}$$

= -4.279.

vi. Decision: Since $-4.279 < -1.645$, we reject H_0 and conclude that less financial records are maintained in the communities that have entered into partnership with an agency.

One would have used a statistical package such as STATA 13.0 to test this hypothesis, but the use of the steps outlined above is for didactic reasons since the Journal has students as the target population. So repeating this same test using STATA 13.0, we obtain in Table 6 the following result:

Table 6: Test of Hypothesis 1 of Section 5.2

| | | | |
|-------------------------------|------------------------|------------------------|------------------------|
| One-Sample test of proportion | | x: Number of obs = 360 | |
| Variable | Mean | Std. Err. | [95% Conf. Interval] |
| x | 0.39 | 0.0257067 | 0.3396158 0.4403842 |
| p = proportion (x) | | z = -4.1742 | |
| Ho: p = 0.5 | | | |
| Ha: p < 0.5 | Ha: p != 0.5 | Ha: p > 0.5 | |
| Pr(Z < z) = 0.0000 | Pr(Z > z) = 0.0000 | Pr(Z > z) = 1.0000 | |

The result of 'z' is identical to that obtained above within rounding errors. The test is a one-tailed test, therefore, since the p-value is 0.0000 which is less than 0.05, we reject H_0 .

5.3. Research Design and Calculation of Sample Size

As we stated earlier, there was no sampling scheme adopted by the Authors and there was no sample size calculated. Also, the research design was not stated. The research design is a survey research design. If the Authors were interested in capturing certain segments of the population in the sample, then, they could use stratified random sampling

technique with possibly proportional allocation where each segment of the population is sampled in accordance with its size.

As regards sample size calculation, since from the remarks of the Authors in the 'Discussion of Findings', it was clear that the parameter of interest was 'proportion', then, the sample size can be calculated using the formula in Walpole [7] as:

$$n = \frac{Z_{\alpha/2}^2 pq}{e^2} . \quad (3)$$

Where:

n = sample size

p = the proportion of successes

q = $1 - p$

α = the level of significance; and

e = the allowable error in estimating the parameter, p with the statistic \hat{p} .

Use should be made of pilot study with a sample size of at least 30, in order to estimate p and q in (3).

6.0 Conclusion

This study set out to point out and correct some statistical and methodological inadequacies in the article under reference.

These inadequacies were pointed out in sections 2, 3 and 4. They were further corrected in section 5.

We emphasize that Researchers should not confuse Test of Proportions with Chi-Square Test of Independence; for in order to perform a Chi-Square Test of Independence, two variables, the dependent and independent variables, should be properly specified and measured.

We recommend that such studies make use of the logit regression if the data on the dependent variable are dichotomous as such regression analysis not only can measure the effect of the independent variable on the dependent but can also give one further pieces of information which the Chi-Square Test of Independence cannot give.

Finally, we recommend that Publishers of non-statistical Journals should include Statisticians in their Editorial Boards so as to minimize the wrong use of statistical techniques.

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Appendices

Appendix 1: The Authors' Questionnaire

Instructions: Choose either 'Yes' or 'No' by either underlining or circling accordingly.

| | | |
|----|--|--------|
| 1 | Do you maintain financial records for your micro projects? | Yes/No |
| 2 | If one above is 'Yes' indicate (by ticking) the kind of financial records you maintain please: i. Receipt Book () ii. Payment Vouchers () iii. Cash Book () iv. Petty Cash Book () v. Project Book (where detailed costs for each project are recorded) () | |
| 3 | Do you have other sources of Funding for the same micro project apart from your contribution and the contribution of the Agency (CSDA)? | Yes/No |
| 4 | If three above is 'Yes' indicate (by ticking) the source of funding please: i. State Government () ii. Local Government () iii. NGO () iv. Individual () v. Others (Specify, please) | |
| 5 | Do you maintain an account for each source of funding? | Yes/No |
| 6 | Have you gone through the Project Implementation Manual and other financial manuals provided by the Community and Social Development Agency? | Yes/No |
| 7 | Can you say you understand the basic financial guidelines regarding implementation of community projects? | Yes/No |
| 8 | Do you make regular and timely financial reports to the agency? | Yes/No |
| 9 | Are projects accounts audited as and when due? | Yes/No |
| 10 | Does the agency or your funder feel bad when you failed to keep some or all financial records? | Yes/No |
| 11 | Have you ever been sanction(sic) for failing to keep some or all financial records? | Yes/No |

Appendix 2: Responses to the Questionnaire As Given in the Authors' 'Discussion of Findings' And 'Appendix B' Used for this Article

| Q1 | Freq. | Percent | Cum. |
|-------|-------|---------|--------|
| No | 60 | 33.33 | 33.33 |
| Yes | 120 | 66.67 | 100.00 |
| Total | 180 | 100.00 | |

| Q5 | Freq. | Percent | Cum. |
|-------|-------|---------|--------|
| No | 160 | 88.89 | 88.89 |
| Yes | 20 | 11.11 | 100.00 |
| Total | 180 | 100.00 | |

| Q7 | Freq. | Percent | Cum. |
|-------|-------|---------|--------|
| No | 63 | 35.00 | 35.00 |
| Yes | 117 | 65.00 | 100.00 |
| Total | 180 | 100.00 | |

| Q8 | Freq. | Percent | Cum. |
|-------|-------|---------|--------|
| No | 45 | 25.00 | 25.00 |
| Yes | 135 | 75.00 | 100.00 |
| Total | 180 | 100.00 | |

| Q9 | Freq. | Percent | Cum. |
|-------|-------|---------|--------|
| No | 18 | 10.00 | 10.00 |
| Yes | 162 | 90.00 | 100.00 |
| Total | 180 | 100.00 | |

| Q10 | Freq. | Percent | Cum. |
|-------|-------|---------|--------|
| No | 30 | 16.67 | 16.67 |
| Yes | 150 | 83.33 | 100.00 |
| Total | 180 | 100.00 | |

| Q11 | Freq. | Percent | Cum. |
|-------|-------|---------|--------|
| No | 140 | 77.78 | 77.78 |
| Yes | 40 | 22.22 | 100.00 |
| Total | 180 | 100.00 | |

Q1 is read: 'Question 1', etc.