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SOCIAL ECONOMICS, POLICY AND DEVELOPMENT

Working Paper No. 51

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Assessment of Rural Poverty and
Inequality be Useful in Botswana?**

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Can Subjective Measures for Rapid Assessment of Rural Poverty and Inequality be Useful in Botswana?

ABSTRACT

Although middle income countries such as Botswana are credited with reliable data that are used in poverty measures, it is sometimes argued that the time lags between data generations or surveys are too wide. The Household Income and Expenditure Survey (HIES) in Botswana takes place every 10 years. The major constraints are capacity and budget considerations. In this article, we propose two subjective measures that have been successfully used elsewhere for adaptation in Botswana. We use data from Nshakazhogwe village case study to test whether these alternative measures of poverty and deprivation are correlated with objective measures of economic deprivation. The Pearson Chi-square tests of independence are applied to examine the independence and the results show that the null-hypothesis that subjective and objective measures of deprivation are independent should be rejected. These results are statistically significant and imply the relationship between the proposed subjective measures and objective variables are systematic in rural Botswana. Even though subjective measures seem to be fairly imprecise indicators of poverty and social disadvantage, the fact that they are statistically significant discriminators is encouraging. If changes in the incidence of poverty using the subjective measures are positively associated with changes based on objective measures, the results could indicate trends in poverty incidence and trigger timely relevant policy responses to address emerging poverty concerns. Finally, the problem of relying only on data generated between long-time intervals from normal in depth statistical surveys that are skill intensive and high cost would be reduced.

Can Subjective Measures for Rapid Assessment of Rural Poverty and Inequality be Useful in Botswana?

1. Introduction

Botswana has produced regular poverty assessments through household income and expenditure surveys since 1985/86. This survey was followed by the 1993/94 survey and the latest was in 2003/04 (Central Statistics Office Botswana 2004). The latest survey results reveal that the poverty trends in rural and non-rural areas are a contrast, with poverty in rural areas showing a worsening situation. It is not known whether the increase in rural poverty is just a statistical mirage or real. What is more important is that, when such developments are only detected after every ten years, then providing appropriate responses to emerging problems might not be possible. The main constraint is that conventional tools for poverty assessment are both resource-intensive and time-consuming, which limits the availability of information about poverty in many developing countries. Such constraints in Botswana have influenced this study to develop and propose reliable alternative methods of collecting information through rapid poverty assessments in order to provide useful poverty indicators to trigger timely policy response. This article will present and examine whether subjective poverty measures obtained from rapid rural poverty assessments can provide reliable indicators comparable to objective poverty measures.

The analysis in this article is based on a survey of Nshakazhogwe village conducted in the period September -November, 2005. This village was purposively chosen as a representative cluster from a short list of rural villages in the rural north east region of Botswana. A face-to-face personal interview of all heads of household in the case study village was used for data collection. The number of households interviewed is 330 and the response rate was nearly 98 per cent. This article makes comparisons of the effectiveness of a subjective measure of economic deprivation considered by Firdausy and Tisdell (1992) and Tisdell et al (2001) and the consumption adequacy method outlined from Pradhan and Ravallion (2000), with some objective measures of

economic deprivation and poverty. Since a prospective sampling design was applied, standard statistical procedures will be used in this analysis. Chi-square tests of association between the subjective deprivation method and other indicators of economic deprivation and poverty will be conducted.

We argue that if a reliable low cost subjective measure of deprivation is available, production of regular poverty indicators will complement objective measures that become available every 10 years. This will assist policy-makers with relevant information to respond in time and appropriately to emerging poverty and deprivation problems. This article will begin with a review of the theoretical aspects of subjective poverty measures and the choice of the one used in this study. After we present the methodology, this will be followed by the presentation of results and their discussion.

2. Some Background on Subjective Poverty Measures

Subjective poverty measures have been successfully applied to indicate the extent of poverty problems (Goedhart et al. 1977). Subjective poverty measures can be useful to provide reasonable information about economic deprivation and poverty in situations where incomes are not clearly defined. In rural Botswana, where most households depend on multiple sources of income, some of which are informal, subjective poverty measures can be used to complement results of objective poverty measures. Colasanto et al. (1984) claim that an individual who knows the income level below which one cannot make ends meet can state the minimal income level necessary for meeting the individual's needs. An individual's stated minimum income is subjective because individuals face different personal circumstances, prices for necessities, reference groups and background consumption levels and therefore, such an income is a judgement reference to the individual's own situation. However, the criterion for setting a subjective poverty line is an assessment of individual opinions about their own living situations (Colasanto et al. 1984). Such a poverty line might reflect their feelings and not necessarily fall below an objectively determined poverty line that has been set by experts. Hence a major problem with subjective methods is a possible perception bias. In rural Botswana where communications networks are relatively developed, and travel from one place to another is frequent, reliance on an individual's opinion about their living conditions can be potentially misleading

because individuals might compare themselves with people living in distant places and who depend on a different economic base.

Rural people in Botswana have a culture of understating their actual incomes to people who seek the information and are unknown to them. For example, when heads of households in a rural area are asked how many livestock they hold, they are most likely to respond that they do not own any or have very few even though they might own many (Kupka 2004). Therefore, it can be difficult for an outsider or researcher to demonstrate that the information they collected is correct. In some cases cattle owners might loan part of livestock for long periods to their relatives or to others who are less well-off (*Mafisa* system). Such livestock may be claimed by their owners for coping with household disasters like funerals expenses and rituals. Livestock are often slaughtered for celebrations such as weddings, and livestock are sold during drought for consumption smoothing. Therefore, their ownership of such assets might not be easily detected with consumption expenditure questions or observations around the household dwellings of their owners. Understating one's wealth value could be a coping strategy for embarrassment if their wealth possessions become depleted as a result of the recurrence of drought and animal diseases such as foot-and-mouth disease. Therefore, income responses from individuals subject to a high risk environment might be characterised by overstating their poverty problems with the hope of attracting welfare assistance to strengthen their risk-coping strategies.

Despite the common use of the Minimum Income Questionnaire (MIQ) in developed countries (Bellido et al. 1999), there have been few attempts to apply the MIQ in developing countries because income is not well-defined in many of these countries (Ravallion 2007). In our case study of Nshakazhogwe village, we decided that an MIQ should not be used because rural incomes, in Botswana, are not clearly defined. Secondly, a question about whether a household head considered his/her household to be poor or not was not asked because it had a potential to result in overestimation of the poverty problem. It was, therefore, considered that responses to a MIQ in Botswana might not attract information that would provide reliable estimates of relative economic deprivation and poverty.

In Botswana, household income and expenditure surveys (HIES) take place after every 10 years and this creates a long-gap between each survey. This situation compels policy-makers to use old information that is sometimes not relevant after five years from the time of the survey. The 2003/04 HIES results reveal contrary outcomes in poverty trends where poverty rates have risen in rural areas and fallen in non-rural areas. We are of the view that such contrasts need to be detected in a shorter time frame and not after 10 years as has been the case. Hence, our suggestion that cheaper and appropriate methods such as the two subjective methods we propose can provide early warning indicators of emerging poverty trends in Botswana. In this article, we test whether two subjective methods of measuring deprivation and poverty results are consistent with the objective measures of poverty results in Nshakazhogwe village case study. Although the subjective measures that we choose are rarely applied as methods of subjective economic deprivation, they have been successfully used in the previous works of Tisdell et al.(2001) and Firdausy and Tisdell (1992). Our aim is to find out how useful these subjective measures are for the purpose of rapid rural poverty assessments in Botswana. The consumption adequacy method is another subjective method of measuring poverty that is chosen and applied in the Nshakazhogwe case study because it has yielded robust results in developing countries of Jamaica and Nepal (Pradhan and Ravallion 2000).

3. Methodology and Analysis Used in this Case Study

3.1 Suggested Subjective Deprivation Method

Subjective methods of measuring poverty have produced reliable results in countries that have a strong economic background (Sen 1979). The Botswana economy is also considered relatively strong (Bank of Botswana 2007a; Bank of Botswana 2007b; The World Bank 2007). In this study, a specific question was devised to determine the level of relative household deprivation occurring in the case study village based on the opinions of the heads of the households. This question is adapted from a similar questionnaire that was used in a survey of the incidence of rural poverty in villages surveyed in Bali, Indonesia (Firdausy and Tisdell 1992). The question was worded and asked as follows:

“Do you consider your household to be amongst the 20 per cent of the least well-off households in your village?”

The pre-coded choice of answers was:

“Yes” or “No”.

During the survey, the question was also explained to respondents as follows, in recognition of the general low literacy rates among heads of household in rural Botswana.

“If the village is divided into five (5) equal-sized income groups such that, Group 1 consists of the lowest income households, Group 2 comprises the less than average income households, Group 3 are average income households, Group 4 are above average households and Group 5 are high income households, do you consider your household to belong to Group 1, the lowest income household group?”

A primary objective of this question was to determine the approximate economic deprivation situation in the village based on the subjective responses provided by the respondents. The design of this question aimed to separate the less well-off from the better-off households in the case study village. As a subjective measure of relative deprivation, it was expected that all of the people who said they belonged to the bottom 20 per cent less well-off households were also in poverty.

The data used here are binary because a household is either amongst the 20 per cent least well-off households or is not, and at the same time the household can be classified as either poor or not being poor using objective deprivation. Two-way contingency tables (2 X 2 tables) that compare two groups of binary raw data were used to analyse the 330 households from the Nshakazhogwe village case study. The objective was to test the null hypothesis that the expected number of household heads that responded that their household belonged to the 20 per cent least well-off is independent from the expected frequency of households that are below an objective

economic deprivation line or not. Only responses of heads of household were recorded.

3.2 Test of Independence between Subjective and Objective Measures of Deprivation

In order to find out how well subjective measures of economic deprivation and poverty correspond to various objective indicators of rural household economic deprivation and rural poverty in the rural northeast Botswana, Chi-squared tests of independence will be used. An investigation using 2 by 2 contingency tables will form the basis for examining the existence of association between subjective and objective measures. The results of the Chi-square tests of independence in this article will provide information about whether the proposed null hypothesis is rejected on the basis of the evidence from the survey (Agresti 1996).

The subjective economic deprivation measurement method applied in this study used the perception of the head of the household to indicate whether their household belonged to the 20 per cent least well-off i.e. the bottom or poorest 20 per cent households. The responses of the head are categorical in the form of a simple 'yes' or 'no' to the question. The responses of the heads of household to subjective questions will be treated as dependent variables. The median and mean income and expenditure variables from the case study will be used to indicate the cut-off point between households facing economic deprivation and those that are not. Any household below a chosen measure of central tendency is assumed to face economic deprivation, which implies a household earning income below the average income or the median income and is not necessarily poor. 'Objective' absolute and relative poverty measures from the case study village are compared and contrasted with those derived using the subjective deprivation method used in this study. This approach will be repeated in our analysis of a consumption food adequacy approach.

The Pearson Chi-squared statistic for testing H_0 is adopted from Agresti (1996) and Selvanathan et al. (2000) as follows. A contingency table, as presented in Table 1, is used to calculate the Chi-square statistic χ^2 .

Table.1: Contingency Table

Subjective Measure	Objective Measure	
	No = 0	Yes=1
No = 0	n_{00}	n_{01}
Yes = 1	n_{10}	n_{11}

$$\chi^2 = \sum_i \sum_j \frac{(n_{ij} - \mu_{ij})^2}{\mu_{ij}} \quad (1)$$

where:

$i=0, 1$. Here, 0 represents the head of household's response that a household does not belong to the 20 per cent least well-off households, and 1 represents a response that the household does belong to the 20 per cent least well-off households.

$j=0, 1$. Here, 0 represents that the household is above a specified cut-off point for economic deprivation or poverty line and 1 indicates a household is below an objective measure of economic deprivation or poverty line.

n_{ij} = The cell entries of a contingency table that represent observed frequencies or responses of heads of household to the subjective question in the i^{th} row and how they are classified by objective methods in the j^{th} column. For example, n_{00} can represent the number of heads of household who responded that their household was not among the 20 per cent least well-off and that these households were not classified below the mean income poverty line.

μ_{ij} = The expected frequencies of the cell in row i and column j . These expected frequencies were derived by multiplying the total of column j by the total of row i and dividing by the total number of households in the case study. The expected frequencies are derived under the null hypothesis of independence of the two criteria as considered.

Given that the size of 330 households is a large sample size and that all the expected frequencies are greater than five ($\mu_{ij} \geq 5$), the χ^2 test statistic approximately follows a chi-squared distribution (Selvanathan et al. 2000). The degrees of freedom (df) of this chi-squared distribution is a non-negative difference between the number of parameters in the alternative and the null hypotheses. The p-value of the chi-squared test is the null probability that χ^2 is at least as large as the observed value and is the chi-squared right hand tail probability above the observed χ^2 value (Agresti 1996). Hence the p-value of a χ^2 statistic describes the evidence against the null hypothesis. The p-value is the lowest significance level at which a null hypothesis can be rejected, and the smaller the p-value, the stronger the evidence against the null hypothesis.

3.3 Suggested Hypothesis Testing and Choice of Explanatory Variables

General specifications of the null and alternative hypothesis are:

H_0 : Subjective and objective assessments of deprivation/poverty are independent.

H_1 : H_0 is false.

Variations of H_0 and H_1 , can be stated depending on which aspect of objective assessment is used. The following is a list of alternative objective measures of deprivation and poverty used in the specification of the null hypothesis H_0 .

- a) Below the median household income
- b) Below the mean household income
- c) Below the median household expenditure
- d) Below the mean household expenditure
- e) Below the median poverty line
- f) Below the mean income level by 60% or more
- g) Below the median expenditure poverty line
- h) Below the mean expenditure poverty line
- i) Less than adequate food consumption

4. Results and Discussion

4.1 Overview of the Results

A total of 40.3 per cent of all heads of households interviewed for this study reported that their households were amongst the 20 per cent of the least well-off households in the village. This result is clearly an overestimate of the actual 20 per cent least well-off households which was expected because people's perceptions are likely to be biased and also based on comparison of households not in a similar economic situation. However, the 40 per cent of all households said to be among the 20 per cent least well-off are comparable to the 37 per cent of households in the rural north east Botswana who are said to be below the mean income poverty line (Central Statistics Office 2007). Therefore, in terms of the mean income, it can be concluded that the subjective economic deprivation method used in this study distinguishes effectively between the less well-off and the better off households. However, compared to other measures of economic deprivation and poverty results such as the consumption basket based poverty line, the median income poverty line and the US\$1.00 based poverty lines of approximately 28 to 30 per cent poverty rate, the result of this subjective measure of economic deprivation is not a perfect measure of poverty and is likely to overestimate poverty. However, this subjective measure can be considered as a rough indicator of the existence of poverty.

Generally, a large discrepancy between the results of the subjective measures of economic deprivation and objective poverty results are expected (Pradhan and Ravallion 2000). In Botswana, the institutional situation of widespread welfare-support state might influence heads of household to overstate their poverty situation if they speculate that such information increases their chance to be eligible for potential future welfare programmes. Some households might have also stated that they belonged to the 20% least well-off because of their lack of knowledge of the income structure or distribution in the village. In some cases, responses of many household heads might be a result of a feeling that their style of living was equivalent, or little different, to the 20% least well-off in the village. This is possible because in Botswana approximately 50% of the rural population is reported to be poor based on the mean income poverty measure (Central Statistics Office Botswana 2004). In some

cases it is believed that better-off individuals in rural areas gain societal respect when their actual economic status is stated by other people rather than themselves. In that way better-off individuals in the village might avoid ridicule from society in the event of their current wealth disappearing. This tradition could have had an effect in overstating the number of households who believed that they were amongst the 20% least well-off in this village.

4.2 Independence Tests between Results of Subjective and Objective Deprivation Methods

The Chi-square tests results from testing the null hypothesis of independence of poverty status based on subjective and objective measures are summarised in Table 2. The various alternative economic indicators of deprivation and poverty lines used in this case study are listed in column 2. Column 3 shows the values of the Chi-square test statistics which are always positive because this statistic is the sum of squared values (Chou 1975). Column 4 shows the degrees of freedom which is equal to one for all the tests conducted here and this indicates that the Chi-square distributions in this study are highly skewed to the right. The last column shows the p-values associated with each of the tests. The lower the p-value the stronger the evidence against the null hypothesis. The null hypothesis is rejected at a given level of significance, α . According to Griffiths et al. (1998) when the $p > 0.10$, there is minimal evidence against H_0 , but when p is between 0.05 and 0.10, there is slight evidence that H_0 does not hold. When p is between 0.01 and 0.05, there is moderate evidence that H_0 does not hold, and when $p < 0.01$, there is strong evidence that the null hypothesis does not hold. The last two are commonly used.

Table 2 shows the results of the Chi-squared tests for the null hypothesis that the household heads' responses that their household belongs to the 20 per cent least well-off households in their village (perception deprivation) is independent of the classification of households that fall below the listed objective measures of economic deprivation and poverty. All the results are highly significant ($p < 0.005$), indicating strong evidence against the null hypotheses. In fact, there is a strong association between the outcomes of the two classification methods. Therefore this study rejects

the null hypotheses for all the tests. It concludes that there is significant evidence that household heads who stated that their households are below the 20 per cent least well-off households are not independent from households that were identified as less well-off by all other listed indicators of economic deprivation and poverty. Therefore, the subjective economic deprivation measure used in this study, even though not precise, is a good indicator of economic deprivation and poverty.

Table 2 Results of Chi-square Test between Subjective and Objective Indicators

List	Indicator of Economic Deprivation	Pearson's Chi-square values	Degrees of Freedom	p-value
	Income Measure			
1	Below the Median Income	12.104	1	0.001
2	Below the Mean Income	46.866	1	0.000
	Expenditure Measure			
3	Below the Median Expenditure	10.133	1	0.001
4	Below the Mean Expenditure	22.013	1	0.000
	Poverty Line Indicators			
5	Below Median Income Poverty Line	8.256	1	0.004
6	Below Mean Income Level by 60% or more	10.561	1	0.001
7	Below Median Expenditure Poverty Line	9.251	1	0.002
8	Below Mean Expenditure Poverty Line	38.255	1	0.000
	Consumption Adequacy Method			
9	Less than Adequate Food Consumption	34.83	1	0.000

4.3 Correspondence between Subjective and Listed Objective Methods

Results

The results in Table 3 provide measures of the degree of correspondence between subjective poverty measures and other indicators of economic deprivation and poverty derived from the Nshakazhogwe case study. Correspondence analysis can be based on

the 2 by 2 contingency tables because of their reliance on the row by column association model (Andersen 1997). The degree of correspondence, in this article, is the percentage of overlap between the responses of household heads who said that their households are amongst the 20 per cent least well-off and the number of heads of household who were classified below the poverty line in terms of the objective method. Such overlaps were extracted from the 2 by 2 contingency tables and these overlaps reported as percentages. The data are described in percentages because they are standardised cell frequencies so that it appears that there were 100 observations in each category of the independent variables (Connor-Linton 2003).

Table 3 Results of Correspondence between Subjective and Objective Indicators

List	Indicator of Economic Deprivation	Degree of Overlap (%)	Rank
Income Measure			
1	Below the Median Income	59	6
2	Below the Mean Income	53	8
Expenditure Measure			
3	Below the Median Expenditure	69	1
4	Below the Mean Expenditure	56	7
Poverty Line Indicators			
5	Below Median Income Poverty Line	61	4
6	Below Mean Income Level by 60% or more	61	4
Consumption Adequacy Method			
9	Less than Adequate Food Consumption	52	9

Table 3, shows the degree of correspondence between responses of heads of household about whether their household belongs to the 20 per cent least well-off households in the village and the status of their poverty as determined by several

objective measures of economic deprivation. The measures in Table 3 show a high degree of correspondence. For example, there is a 69 per cent overlap with the median household expenditure used as an objective measure of economic deprivation. The second highest degree of correspondence is 68 per cent for the case when the median expenditure poverty line is used as a measure of poverty. When the 'objective' poverty line indicators listed in Table 3 are indicators of economic deprivation, the degree of correspondence with the subjective measure of deprivation ranges between 61 and 68 per cent. These are ranked between 3 and 4 (rank 1 is the highest rank of correspondence in terms of this study's subjective poverty measurement method). The correspondence between the subjective measure used in this study and the mean household income and expenditure are 53 and 56 per cent respectively, and are ranked number 8 and 7 respectively. The lowest level of correspondence, a mere 52 per cent, occurs when the consumption adequacy method is applied.

The correspondence demonstrated between our study's subjective measure and the median income and expenditure measures of economic deprivation implies that this study's subjective method is reasonably effective in separating the less well-off from the well-off, based on the median criteria. However, when the criterion separating the less well-off from the well-off is the mean income or expenditure, this subjective method is less useful with correspondence rates ranging between 53 and 56 per cent. The results of correspondence between this study's subjective economic deprivation method and the objective indicators of poverty suggest that this method is useful in separating the poor from the non-poor. The over-estimates of poor households were expected because of the several factors such as institutional arrangements in Botswana, culture, and a high-risk agricultural environment.

The differences between the results of the mean income and expenditure methods, and median income and expenditure methods used to indicate economic deprivation occur because of the difference in the median and mean values of the relevant frequency distributions. The mean household income and expenditure are higher than the median household income and expenditure because income distribution in this case study is highly skewed to the left as is the case with income distributions. In addition, household food expenditure for most households is expected to be low because people generally use staple food, part of which is from their own production and might not be

adequately captured. Although the subjective economic deprivation measures used in this study substantially overestimate those in the bottom 20 per cent, it does effectively distinguish between those who are less well-off and those who are better-off, particularly if the median household expenditure and median expenditure poverty lines are used.

5. Consumption Adequacy Method

The consumption adequacy method is another subjective approach for estimating poverty. It was used in the USA (Blaylock and Smallwood 1986) and then further developed and applied in the developing countries of Jamaica and Nepal where the results were found to be robust (Pradhan and Ravallion 2000). Our study of Nshakazhogwe village considered the use of the consumption adequacy method to find out whether it could complement efforts to improve availability of reliable, regular low cost rural poverty information updates, which can complement the existing high cost national household income and expenditure surveys that are undertaken every 10 years. The assumptions for this method are that each individual has well-defined consumption norms at the time of the survey and that an individual's basic needs are met at the consumer's utility maximising consumption vector at prevailing incomes and prices. With this method, a respondent is asked a qualitative question of whether current consumption is adequate. In this study an attempt has been made to implement the Pradhan and Ravallion (Pradhan and Ravallion 2000) approach through appropriately framed questions on consumption adequacy as a part of the survey of households in Nshakazhogwe. Results of the implementation of this subjective method based on responses of heads of household to qualitative questions on consumption adequacy are presented in this section. The questions used in this part of the survey were presented in tabular form and are presented in Table 4.

Table 4: Questions in tabular form asked to household heads in Nshakazhogwe village, Botswana in order to apply the consumption adequacy method of poverty assessment.

I would like to ask your opinion of your household's standard of living:				
"Adequate" means no more or less than what the respondent considers to be the minimum consumption needs of the household. Please tick (✓) the appropriate box				
	Less than Adequate	Adequate	More than Adequate	Does not Apply
Concerning your household's food consumption over last year, which of the following is true?				
Concerning your household's housing over last year, which of the following is true?				
Concerning your household's clothing over last year, which of the following is true?				
Concerning health care your household gets, which of the following is true?				
Concerning the availability of schooling for your children, which of the following is true?				

The consumption adequacy method is similar to the subjective deprivation method because both are based on a self evaluation of the household situation by the household head. The consumption adequacy method is considered to be a more realistic subjective poverty measurement method in developing countries than the minimum income question. This observation is based on the expectation that the head of household's ability to assess the adequacy of their food supplies is easier than it is for them to give hypothetical income levels that are necessary for them to achieve a specified level of satisfaction (Blaylock and Smallwood 1986).

All households that selected option A, - "it was less than adequate for your household needs for food consumption" – as their response to the first question above, were classified as poor households. In this case, subjective poverty lines are connected to the perceived adequacy of food consumption alone and all other answers given to the

rest of the questions are ignored (Pradhan and Ravallion 2000). This is because food consumption constitutes a very high proportion of the budget in poor households and this method corresponds to the practice of constructing objective poverty lines where the poverty line is the level of total expenditure or income at which food expenditure is deemed nutritionally adequate by pre-determined “objective” criteria of requirements for good health and normal activity levels.

In this article, the degree of correspondence of responses from heads of household that their household had less than adequate food consumption with ‘objective’ indicators of poverty in terms of the absolute poverty lines and relative poverty lines are presented. The cost of basic needs (CBN) consumption basket contains a minimum amount of goods and services that enable households to maintain an acceptable minimum standard of living. Such a basket is composed mainly of food consumption and some non-food consumption components required by a household in a year. The food energy index (FEI) is anchored on the Botswana destitute transfer programme whose definition is based on the requirement of the supply of food rations with food calories not less than 1,750 calories per adult per day. Both methods emphasise food consumption as a primary basis of their measurement of basic requirements that determine the poverty level.

5.1 Suggested Hypothesis Testing and Choice of Explanatory Variables

As is suggested in Section 2 above, general specifications of the null and alternative hypothesis are:

H_0 : Consumption Adequacy Method and objective assessments of deprivation/poverty are independent.

H_1 : H_0 is false.

Variations of H_0 , can also be stated depending on which aspect of objective assessment is used. The following is a list of alternative objective measures of deprivation and poverty that will be used:

- a) Below the cost of basic needs (CBN)
- b) Below the food energy index (FEI)
- c) Below the median income poverty line
- d) Below the mean income level by 60% or more
- e) Below the median expenditure poverty line
- f) Below the mean expenditure poverty line

5.2 *Results of Consumption Adequacy Method*

5.2.1 *Overview of Results*

Pradhan and Ravallion (2000) found that the results of the consumption adequacy method in poor areas appeared to overstate the poverty problem compared to the results from objective methods from the same areas. The responses to the question concerning the adequacy of a household's food consumption over the previous year constitute the basis for estimating poverty in this study because food is considered to represent the highest proportion of poor households' budgets. The answers to the survey questions of household consumption adequacy are summarised in Table 5. The percentages indicate the proportion of household heads out of the total population who identified themselves with a specified category. The heads of household that responded their households had less than adequate food consumption the previous year amount to 37 per cent of all households in the case study. This result is comparable to a mean income based 37.8 per cent poverty rate for rural north east Botswana in 2002/03 (Central Statistics Office 2007) but is higher than the 28 and 29 per cent poverty rate based on the CBN and FEI poverty lines that were derived from objective measurements from the Nshakazhogwe case study data.

For the education category, 30 per cent of households were not eligible because they had no school going children. Therefore, columns 2 and 3 were adjusted to reflect responses to this subjective question in terms of the proportion of heads of household that had school going children. In all the categories where household heads reported that their household had less than adequate consumption, the percentages range from 26 to 42 per cent. The education category has the lowest percentage and health the highest percentage. The reason for the lowest percentage in answers of "less than

adequate education consumption” could be that there was a free education system in Botswana in 2005 whereas the highest percentage in the “less than adequate consumption of health needs” could reflect high rates of HIV/AIDS prevalence in the country at the time of the survey. In terms of housing and clothing, 33 per cent and 29 per cent of households respectively reported that they had less than adequate consumption.

Table.5 Perceived Adequacy of Consumption in Nshakazhogwe (% of Households)

Percentages	Less than Adequate	Just Adequate	More than Adequate	Not Applicable
Food	37	57	5	0
Housing	33	58	9	0
Clothing	29	64	7	0
Health	42	56	2	0
Education	26*	62*	12*	30

Note: * Represents adjusted percentages indicating the proportion of eligible household heads

5.2.2 Independence Tests Results between Consumption Adequacy and Subjective Deprivation Methods

The Chi-square test results for a 2 by 2 cross-tabulation of household heads responses of whether their household was among the 20 per cent least well-off and other indicators were shown in Table 2. The results of hypothesis tests of association of responses of household heads to whether their household belonged to the 20 per cent least well-off and whether household heads said their household had less than adequate food consumption in that period are highly significant ($p < 0.005$). Pearson’s Chi-square value of 34.83 with one degree of freedom is high compared to most indicators of poverty. This indicates strong evidence against the null hypothesis of no association between the responses of household heads and their poverty status.

Table 3 (see the previous section) has also shown the degree of correspondence between households said to be in the 20 per cent least well-off category and the listed indicators of economic deprivation and poverty. It is shown that 52 per cent of household heads who responded that their household were amongst the 20 per cent least well-off households in the village also said that they had less than adequate food

consumption. Out of the nine other indicators of deprivation, the consumption adequacy method is ranked number 9 in terms of the degree of correspondence with households in the 20 per cent least well-off households and other indicators of economic deprivation. This means that 48 per cent of the heads of households who said their households were amongst the 20 per cent least well-off did not respond that their household had less than adequate food consumption.

This indicates that nearly half of the heads of household who considered their household to be amongst the bottom 20 per cent least well-off had adequate food consumption. This is possible as the results of the households perceived to be amongst the bottom 20 per cent least well-off are overestimated, which could imply that they included many households who were not poor. Secondly, institutional factors such as social welfare that target different vulnerable groups could be effective in ensuring that food is available to households that are less well-off. Therefore, it can be concluded that institutional arrangements in Botswana affect the applicability of consumption adequacy measure of poverty. Such results could also confirm that some of the heads of household that responded that their household was amongst the 20 per cent least well-off had understated their income status in line with their known tradition. In addition, some heads could have stated that their household were amongst the 20 per cent least well-off due to a lack of knowledge of the income distribution in the village or simply because they compared themselves with the rich households, when in fact they might not be in that category of households.

Furthermore, household heads that responded that their household had less than adequate food in the previous year might not perceive themselves as belonging to the bottom 20 per cent. Hence a lower correspondence between the two methods compared to the other methods of poverty assessment listed in Table 3. In addition, households that experienced less than adequate food consumption could have been for reasons other than their possible classification among the 20 per cent least well-off. These reasons could include drought, which was already declared in the country in the year of study, unemployment or failure by some households just above the poverty line to qualify for government assistance or implementation failure of welfare programmes. For example, one of the HIV/AIDs patients from the survey village complained that she had less than adequate food because the programme design

disqualified her from continuing to receive government supplementary feeding assistance after her CD4 count had improved above the cut-off point for assistance. As a result her health had worsened.

5.2.3 Degree of Correspondence between Consumption Adequacy and Listed Objective Methods' Results

Table 6 shows that the degree of correspondence of economic deprivation based on the food adequacy results and the results of the listed objective poverty indicators is highest when relative methods are used. The results of tests of correspondence between this subjective method and the listed indicators are 73 per cent with mean income poverty line, 72 per cent with both median income and expenditure poverty lines, and 71 per cent with mean expenditure poverty line. The results of test of correspondence of the household economic deprivation based on the results of food adequacy method and, food energy index (FEI) and cost of basic needs (CBN) poverty lines is 58 per cent in both instances. Although the lowest correspondence is with absolute poverty measures, they are useful in separating households in absolute poverty from the rest. The reasons why the food adequacy method appears to have the lowest correspondence with the results based on absolute measures is not clear. However, Pradhan and Ravallion (2000) have shown that in poor areas the consumption adequacy method tends to overstate the poverty rate compared to objective methods, which could mean that some of those that were identified not poor when absolute measures were used, indicated that they had inadequate food expenditure.

Overall, the results show that the consumption adequacy method is a good indicator of households that are classified poor by relative poverty measures. Even though the consumption adequacy method fairly identifies households that are classified poor by absolute poverty measures, the degree of overlap is lower than 60 per cent. Such results could mean that many households in rural Botswana who are poor in terms of absolute methods did not respond that they had food adequacy problems. This is possible in rural Botswana's environment where sharing of food between members of household across the income distribution is common. In addition, existing institutional

arrangements for welfare programmes might result in most poor household have sufficient food supplies from the government.

Table 6 Degree of Correspondence between Food Consumption Adequacy Responses and Other Indicators of Poverty

List	Indicator Of Economic Deprivation	Degree of Overlap (%)	Rank
	Poverty Line Indicators		
	Absolute Poverty Measures		
1	Below the Cost of Basic Needs	58	5
2	Below the Food Energy Index	58	6
	Relative Poverty Measures		
3	Below Median Income Poverty Line	73	1
4	Below Mean Income Poverty Line	72	4
5	Below Median Expenditure Poverty Line	71	2
6	Below Mean Expenditure Poverty Line	72	3

6 Limitations of the Results

Even though the results show that the subjective deprivation method used in this study has a strong association with classifications of the incidence of poverty based on the objective measures, subjective measures seem to be fairly imprecise indicators of the incidence of poverty and social disadvantage in the rural north east Botswana. More analysis needs to be carried out to test the strength of the association between this subjective method and objective methods. Nevertheless, the findings reported in this article show that a relationship between the subjective deprivation results and other indicators of economic deprivation and poverty results are systematic and not a result of random factors (Connor-Linton 2003).

The results of a statistically significant association between the subjective deprivation method and other indicators of rural households' deprivation and poverty methods are important because they permit this study to generalise the pattern of the distribution to the rest of the rural north east Botswana region (Connor-Linton 2003). This is

possible because a Chi-square test can be used to extrapolate a population characteristic such as the population mean income from the sampling characteristic such as this case study mean income, similarly to the way percentage standardises a frequency to a total column N of 100. The difference between Chi-square extrapolation and percentages is that the Chi-square method works within the frequencies that are derived from the sample and does not minimise the column and row totals. Therefore, there is a need to conduct regression analysis to establish a relationship between the binary dependent variable indicating the poverty status of the household with characteristics of the household.

The consumption adequacy method has produced strong results in this study but has proven less satisfactory as a poverty measure than was originally hoped for. In Botswana, the institutional arrangements such as social welfare programmes that target vulnerable groups to ensure adequate availability of food supplies in these households might lower the effectiveness of this method. Furthermore, some households which have indicated less-than adequate food may not be very poor but state that they have insufficient food in the hope that they can be considered for inclusion among the households targeted for government assistance.

A rapid appraisal method of assessing poverty that compares the bottom two deciles to the rest of society has been criticised for its failure to identify an increase in the extent of poverty in situations of economic crises such as falling standards of living, starvation and severe malnutrition (Sen 1979). Under the subjective approach, people use their knowledge of their own incomes status and that of other villagers to classify whether they themselves belong to the bottom 20 per cent least well-off households. Some of the limitations of subjective methods are that households have different reference groups in the village and do not take account of scale economies (Ravallion 2007). This implies that the likelihood that a person classifies themselves as poor or not poor depends on who they compare themselves with, which is itself a concept of relative poverty (Sen 1979).

7 A Proposed Rapid Rural Poverty Assessment Method

On the basis of what has been presented already, our analysis has found that the results of two subjective questions that were used in the case study of Nshakazhogwe are reasonably consistent with the results from the conventional objective methods of measuring poverty. This article proposes that the following subjective questions constitute a major part of rapid rural poverty assessment method in Botswana. This method would be low cost and could be conducted more frequently from the current assessments low cost resources and can be conducted every two years. This rapid poverty assessment method could incorporate the following questions:

Question 1: “Do you consider your household to be amongst the 20 per cent of the least well-off households in your village?”

The pre-coded choice of answers is “Yes” or “No”.

and the set of questions listed in Table 4.

While the results reported here are encouraging, it would be helpful to know how well changes in the subjective measures track changes in the incidence of poverty when the objective measures are applied. It would be very useful if these changes are highly correlated and positively associated. This is because changes in the incidence of poverty using subjective measures would signal similar variations to those based on objective measures. Even if it could be established that the changes are normally in the same direction this would be valuable because subjective measures could be used to track changes in the incidence of poverty in between the major surveys based on objective measurement.

What is needed now is to establish time series to determine the relationship (or association) between the incidence of poverty based on subjective measures and those based on objective measures. This could be done initially for Nshakazhogwe and a sample of other villages in Botswana. If the results are favourable, then there would be a strong case for using subjective poverty measures to supplement and complement these objective measures. The subjective measures might be applied to a sample of

rural villages. This would allow more timely policy decisions to be made about changes in the incidence of rural poverty in Botswana than is now the case.

8 Concluding Remarks

The results from Nshakazhogwe case study show that although the subjective economic deprivation measurement method overestimates households in the bottom (least well-off) 20 per cent, it effectively distinguishes the well-off from the less well-off. This subjective measure has a strong association with objective measures of deprivation and if it is repeated overtime, the observed underlying poverty trends might be used to provide low cost interim rapid poverty assessments in between the extensive and costly 10-year household and expenditure surveys. In general, results of investigations that involve perceptions are likely to be biased; therefore the overestimation of households who are 20 per cent less well-off is consistent with results reported in other studies that used alternative subjective measurement (Pradhan and Ravallion 2000). In the case of rural Botswana, the existence of institutional arrangements that provide support for vulnerable households could have influenced households that are around the poverty line and are necessarily poor to claim that they were less well-off if they had an expectation of benefiting from potentially new welfare programmes.

Even though subjective measures seem to be fairly imprecise indicators of poverty and social disadvantage, the fact that they are statistically significant discriminators is encouraging. If the distribution of responses (the degree of precision in aggregate) remains fairly stable (stationary), then subjective measures, if applied over time, would indicate trends, for example, in the incidence of poverty. If such information about rural poverty is readily available, it could trigger policy response to address these issues on a timely basis and reduce the problem of poverty trends that are not uniform across the country despite good macro-economic performance. We need to know if trends in subjective measures of the incidence of poverty and those based on objective measures are positively associated. This aspect needs further research.

The results of a consumption adequacy method overemphasise the poverty situation compared to the absolute poverty estimates, which is consistent with earlier results in

Jamaica and Nepal which showed that households living in poor rural areas tend to overestimate their situation compared to the results of objective measures (Pradhan and Ravallion 2000). However, in the case of Nshakazhogwe village in Botswana, the results of the consumption adequacy method were comparable with the results of the objective poverty method based on the mean income distribution poverty line and also comparable with the official results based on the mean income method.

Nevertheless, in general, classification of households as having less than adequate food consumption had a weak correspondence with those households who have indicated that they were amongst the 20 per cent least well-off and those that fall below the cost of basic needs poverty line or food energy index poverty line. This might be partly due to the overestimation of responding households that responded they were among the 20 per cent least well-off and institutional factors that include wide coverage welfare programme for vulnerable groups.

An effective low cost way of implementing a rapid poverty assessment method suggested in this article could be an important interim poverty indicator that can provide a useful input into policy responses to be based on a continuous rural poverty monitoring system. Such a method can complement both the current early warning system for food security and long-term poverty reduction objectives by ensuring that rural households, especially the most affected households are appropriately targeted for support that will ensure that they get their share of the growth dividends, while ensuring that the economy remains sustainable. This article's proposed deprivation measurement method can be a basis for a rapid poverty assessment whose results might trigger timely and appropriate responses to reduce the problem of rural poverty in Botswana. This approach might be integrated into an early warning system for food security in Botswana and complement information from yearly rapid drought assessments. The Botswana early warning system has been successful in drought proofing the rural economy from starvation and famines. Consequently, the present development coordinating structures in Botswana's Ministry of Finance and Development Planning and the Central Statistics Office might consider taking on board the role of implementing rapid subjective poverty assessments in addition to the drought assessment activities that are already implemented.

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