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Household food security in a coastal rural community of South Africa: Status, causes and coping strategies

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Food insecurity is a challenge in rural South Africa. This paper employed descriptive statistics, household food accessibility index, and ordinal regression analysis on a sample of 159 randomly selected households to model the risk of inadequate access to food among households in a coastal-rural community of Hamburg, in the Eastern Cape Province of South Africa. Data was collected using household questionnaire survey. Inadequate access to food is elusive across all the villages in Hamburg as an insignificant proportion of the respondents were reported to have adequate access to food. This study showed that 9% of the households experience severe inadequate access to food, while 78% have moderate access to food and 13% have access to adequate food. Various differences were noticed between the socio-economic statuses of the three groups. Following risk modeling criteria, inter-alia, purchasing food from the market, accessing food from the environment, income level, receiving social grants, having a professional job, owning a business and practicing farmers emerged as the major predictors of adequate access to food. The results reinforce the importance of social grants, promotion of small businesses, farming and continued support of rural education, and recommend them as important in improving food access in Hamburg community.

Key words: Agriculture, adequate access to food, food insecurity, global food security index, risk modeling, risk of inadequate access to food.

INTRODUCTION

Inadequate access to food and poverty are prevalent problems in rural South Africa and poor families are increasingly failing to afford food. South Africa has ranked 40th out of 105 countries in a Global Food Security Index (Du Toit, 2011). Statistics South Africa's general household survey of 2009 reported that an estimated 20% of South African households have inadequate or severe inadequate food access (Du Toit, 2011). The rate level of household access to adequate food has been variable between 2009 and 2011 (John-Langba, 2012). In 2011, nearly 23% of the households in South Africa were considered to be in food deficit with

more than 5% facing severe inadequate access to food (John-Langba, 2012). There is a substantial spatial variation in food access in the country, with some of the poorest indicators found in North West, Eastern Cape and Mpumalanga provinces. Household experiencing inadequate access to food in the three aforementioned provinces were 33, 25 and 26%, respectively (John-Langba, 2012). For some, the unbalanced nature of food security in South Africa is not changing as it reflects the country's continuing social and economic inequities stemming from the pre 1994 apartheid era (Ndhleve and Obi, 2011).

A household is considered food insecure if it has limited or uncertain physical and economic access to secure sufficient quantities of nutritionally adequate and safe food in socially acceptable ways, without resorting to

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charitable emergency food programs, scavenging, stealing, or other unusual coping strategies to allow household members to sustain active and healthy living (Osei et al., 2010; Meyers et al., 2005; FAO, 1996). The risk of inadequate access to food is determined by household's capacity to produce food, household purchasing power and several other socio-economic factors that directly or indirectly affect these three major factors (Lokosang et al., 2011). According to Jacobs (2009), the broad make up of a food security target needs to factor in, among other food security determinants, household consumption, geographic location, wealth generating and livelihoods activities.

In South Africa, many studies that have examined household food security status focusing on describing the indicators and their distribution, and very little has been done with regard to analysis of the determinants of food security.

Moreover, these studies were carried at National or provincial level, resulting in limited data on various important community level variables related to food security. There is a wide distinction between food security at national, community and household level and the approach to assess it differ according to levels (Anderson, 1990; Du Toit, 2011). Food security at national level refers to the condition whereby the nation is able to manufacture, import, retain and sustain food needed to support its population with minimum per capita nutritional standards. At household level food security refers to the availability of food in one's home which one has access (Du Toit, 2011). Hart et al. (2009) supported the argument that South Africa seems to be food secure at national level but the same cannot be said at households in rural areas (Du Toit, 2011). The relationship between household food insecurity and various food security determinants in Eastern Cape is not yet clear. This paper therefore explores the prevalence of inadequate access to food at household level, as well as the determinants of inadequate access to food. The paper concludes by highlighting households' coping strategies in time of food shortages and the implications of the findings for improving access to adequate food in Eastern Cape.

MATERIAL AND METHODS

Study area

This study was done in Hamburg, a small rural coastal community with around 3,000 inhabitants located approximately 70 km south west of East London in the Eastern Cape, South Africa. It is under Ngqushwa local municipality which is Amatole district municipality. The Hamburg community was selected for baseline study because of its heterogeneity nature. It possesses both coastal and rural and least developed community in the Eastern Cape Province. Hamburg is one of the least developed coastal areas in South Africa. The community borders the mouth of the Keiskamma River on the north east side, the beach and the Indian Ocean on the south east side and the rural areas of the Eastern Cape to the west.

Some of the activities common in the area include artisanal and recreational fishing and subsistence farming, including animal husbandry. The climate in Hamburg is cool humid sub-tropical. The climate is characterized by moderate rainfall with an annual average of 700 mm with about 60% of rainfall occurring in summer and peaks being in October and February.

Sampling procedure and data collection

A random sampling procedure was used in this study. Within the community, 159 households were randomly selected. The person who is most involved with the food acquisition and preparation was interviewed at his/her homestead by trained enumerators under the supervision of the researcher in January 2012. In the absence of this person, another adult who was present and ate in the household for the past 4 weeks was interviewed.

A pre-tested structure questionnaire was the main instrument that was used for data collection. The questionnaire encompassed demographic, household socio-economic information as well as information of food accessibility. Households were asked to determine how often a food insecurity condition occurred. Questions related to strategies adopted by households in order to address the problem of food shortages were also comprehensively captured in the questionnaire. The respondent answered all the questions on behalf of the household and all its members. In this study, a 30 day recall period was used mainly due to accurate and reliable responses associate with a shorter recall period.

Data analysis

Combined of analytical tools were employed in this study. These included descriptive statistics (means, standard deviation and frequencies), household food accessibility index and ordinal regression analysis. Descriptive statistics was used to examine the socio-economic characteristics of the selected households. The need for such analysis is predicated on the fact that households' food accessibility status and the perceived food security status are largely a function of households' social and economic characteristics.

Food accessibility

The Household Food Accessibility Scale adopted for this study employs a set of question that captured the main variants of household food accessibility. The method assess whether households have experienced problems with accessing food in the past. The selected indicators were drawn from an extensive review of the literature representing both the household's past experiences and the socio-economic conditions. Weights that are guided by theory and the importance of each variant to food accessibility were attached to each indicator following the response provided by the household representative. It is important to note that there is inevitably an element of judgment or arbitrariness when constructing this index and weighting is guided by the simple premise stating that households respond to food insecurity in a universal way. The individual indicators chosen for working out the composite index are given a value of 1 if the household shows adequate access to or a higher value depending on the magnitude to which the household is at risk of failing to access adequate food. The food accessibility scale termed the "risk of failure to access adequate food" in this study was reached by summing up each household's responses. The resulting summative food accessibility score ranged from seven to twenty two; representing the least and most risky household, respectively. Based on the sum of scores and simple distribution, households' risk of inadequate access to food was

categorized using the following cut-off points, (1) Adequate access (<14 points); (2) moderate access to food (14 to 20 points); and (3) severe inadequate access to food (21 to 22 points). Based on the observed scores, households' food accessibility factor status was categorized into three groups, those with adequate access to food, severe inadequate access to food, and those with moderate access to food.

Ordinal regression model for food accessibility

With the view of tracking the determinants of risk of inadequate access to food, an equation was modeled for this. Some of the more widely used are: linear-by-linear models, continuation ratio logits, and proportional odds (Lokosang et al., 2011). The Proportional Odds Model is a generalization of a binary logistic regression model used when the response variable has more than two ordinal categories. It is used to estimate the odds of being at or below a particular level of the response variable (Liu, 2008). For example, if there are j levels of ordinal outcomes, the model makes $j-1$ predictions, each estimating the cumulative probabilities at or below the j^{th} level of the outcome variable. This model can estimate the odds of being at or beyond a particular level of the response variable as well, because below and beyond a particular category are just two complementary directions.

Assuming a latent variable, F^* exists, we can define $F^* = x\beta + \varepsilon$,

$$\log \text{it} \left[\pi(Y \leq j | x_1, x_2, \dots, x_p) \right] = \ln \left(\frac{\pi(Y \leq j | x_1, x_2, \dots, x_p)}{\pi(Y > j | x_1, x_2, \dots, x_p)} \right) = \alpha_j + (-\beta_1 X_1 - \beta_2 X_2 - \dots - \beta_p X_p),$$

where α_j 's are the thresholds, and $\beta_1, \beta_2, \dots, \beta_p$ are the logit coefficients; $j = 1, 2, j-1$.

The above model was chosen because the response variable has more than two ordinal categories. These categories were treated against the potential variables, which are assumed to affect the risk of inadequate access to food. Potential variables which may influence the risk of inadequate food access by any household were acquired from literature (Meyres et al., 2005; Athreyet et al., 2010; Osei et al., 2010 and Lokosang et al., 2011). The demographic variables, namely: household size, gender of household head, level of education, employment status, and information on whether the household practice agriculture or not are consistently included in food security surveys. The influence of each predictor was determined by examining both the value of the coefficient and the sign. A negative coefficient implies that the factor reduces the risk of failure to access adequate food.

RESULTS AND DISCUSSION

The food accessibility factor summary implies that the "severe inadequate food access" group was the smallest with 9.4% ($n=15$), followed by the "adequate access" group with 12.6% ($n=20$) and the largest group being "moderate food access" group with 78% ($n=124$), Figure 1. This study showed a high prevalence of inadequate access to food among households in Hamburg community. The percentages are higher than the national estimates reported by John-Langba (2012). Considering that Hamburg is located in one of the poorest province in South Africa, Eastern Cape and is an underdeveloped coastal area, the high rates of inadequate access to food

where x is a row vector ($1 \times k$) containing no constant, β is a column vector ($k \times 1$) of structural coefficients, and ε is random error with standard normal distribution: $\varepsilon \sim N(0, 1)$.

Let F^* (Food accessibility index) be divided by some cut points (thresholds): $\alpha_1, \alpha_2, \alpha_3, \dots, \alpha_j$, and $\alpha_1 < \alpha_2 < \alpha_3 < \dots < \alpha_j$. Considering the observed level of risk of inadequate access to food is the ordinal outcome, f , ranging from 1 to 3, where 1= least risk of inadequate access to food, 2= moderately risk of inadequate access to food, 3 = severe risky of inadequate access, we define:

$$F = \begin{cases} 1 & \text{if } f^* \leq \alpha_1 \\ 2 & \text{if } \alpha_1 < f^* \leq \alpha_2 \\ 3 & \text{if } \alpha_2 < f^* \leq \alpha_3 \end{cases}$$

Therefore, we can compute the probability of a household of each level of risk. For example:

$$\begin{aligned} P(f=1) &= P(f^* \leq \alpha_1) = P(x\beta + \varepsilon \leq \alpha_1) = F(\alpha_1 - x\beta) \\ P(f=2) &= P(\alpha_1 < f^* \leq \alpha_2) = F(\alpha_2 - x\beta) - F(\alpha_1 - x\beta) \\ P(f=3) &= P(\alpha_2 < f^* \leq \infty) = 1 - F(\alpha_2 - x\beta) \end{aligned}$$

Cumulative probabilities can also be constructed using the form: $P(F \leq j) = F(\alpha_j - x\beta)$

The analysis in this text was done using SPSS and it takes the form:

are not surprising.

In Table 1, household characteristics were split according to food accessibility status on the methodology. There is no marked disparity in the distribution of households according to both age and gender of head of household across the three groups. There is substantial evidence that women play an important role in improving household access to food in Africa (Jacobs, 2009). However, whereas woman may be important contributors to household food accessibility, there are some important factors also necessary for women to fulfill this role like household income generated by the husband and even assistance from the male household members.

The three groups differed substantially on socio-economic and demographic status (Table 1). Both severe inadequate food access group and moderate food access category had on average bigger household size (more than 5 members) than the adequate food access group. Typical food insecure family had slightly more than five members whereas the typical food secure family has less than four members (Table 1). This implies that the accessed food was inadequate to support big families. While this difference is large, it not only requires income growth, but increased access to food from own production. Regassa (2011) establishes that a higher family size is positively related with the number coping strategies adopted in times of food shortages. Many studies suggest that food insecure households have a lower socio-economic status than the food secure



Figure 1. Households food accessibility status.

households (Osei et al., 2010; FAO, 1996; Lokosang et al., 2011).

With regard to employment status, 21% (n=10) of the employed population reported severe inadequate access to food. This might not be surprising in the sense that Labadarios et al. (2009) found that low income jobs, high food prices and being employed will not help much in improving the access to food. Labadarios et al. (2009) highlights that more recent steep increase in food prices place severe pressure on ordinary South Africans already struggling to meet their basic household needs.

The adequate and moderate food access groups were substantially more likely to be educated to secondary level. Approximately 14% reported that they have attained at least primary education but they are still facing severe inadequate access to food access. The level of education is positively related to food access through its effects on employment (Labadarios et al., 2009).

As anticipated, the severe inadequate food access group was more disadvantaged economically than moderate food access group and the adequate food access group. Average monthly gross income of the severe inadequate access group was found to be R496-00, which was about R2000-00 less than moderate food access group and more than R6700-00 less than the adequate food access group. In part, this reflects the importance of income in promoting food access and the potential of high income in reducing the risk of inadequate access to food (van der Merwe, 2011; Labadarios et al., 2009). About 45% of the moderate food access group has earnings in the form of social grants. This probably reflects that the social grant does not alleviate the risk of inadequate access to food.

None of the respondents that practice farming was reported to be adequately food secure.

FAO (1996), Labadarios et al. (2009) and van der Merwe (2011) conveyed positive and optimistic work

about how farming provides good access to food for the poor. The finding probably implies that agriculture is failing to sustain households' food requirements.

Table 2 provides the factors explaining the risk of inadequate access to food. In an ordinal regression analysis adjusted for nine independent variables, only four variables were found to influence the risk of inadequate access to food of the Hamburger community ($p < 0.05$).

The achievement of food security depends upon food availability which refers to ensuring sufficient quantity and diversity of food is available for consumption from the farm, the market place or elsewhere (Fanzo, 2012). Purchasing food from the market significantly affect household food access. Households accessing the highest proportion of the food from the market are at low risk of inadequate access to food. This was expected as more households are dependent on purchasing food from the market. Household accessing food from the environment reduces the risk of food shortage by more than four times relative to their counterparts. Hamburg is a coastal community enriched with natural resources in the form of fish. This result was expected, as fish can be consumed, provide cash through selling or can be used as a means of exchange. The household can use the extra money to acquire other food items.

Household with social grants as the main source of income were at a lower risk of inadequate access to food and the result was significant. This indicates the effectiveness of social grants. Professional job and having own business also reduces the risk of inadequate access to food. Contract jobs do not significantly reduce the risk of inadequate access to food. This could be because of the scarcity of contract jobs and the fact that this is usually resorted to as a mitigation measure. van der Merwe (2011) confirmed this finding by asserting that households need stable and constant level of income to ensure food security for themselves and their families.

Despite commonly reported low returns from agriculture, practising farming as the main source of income may reduce the risk of food shortage significantly. Thus, the opportunity exists to tap in the agricultural sector and reduces the risk of inadequate access to food. Labadarios et al. (2009) and van der Merwe (2011) emphasize the importance of agriculture in improving food access.

The results reinforce the importance of social grants, promotion of small businesses, farming and promotion of education as strategies to reduce the risk of food shortage. Surprisingly, being in a low income group reduces the risk of inadequate access to food but higher income does not lead to a proportional reduction in the risk of inadequate access to food. This pattern can be attributed to the required threshold income to spend on food. The poor spend about 65% of their income on food (Labadarios et al., 2009). This might not be surprising in the sense that income influences consumption up to a

Table 1. Baseline characters of Households across food accessibility status: Food Secure and Food Insecure, Hamburg, South Africa.

Variables of interest	Severe inadequate access (%/mean)	Moderate food access (%/mean)	Adequate food access (%/mean)
Gender			
Males	9	64	8
Females	11	60	7
Age	55.06	60.25	55.13
Household size	5.11	5.56	3.55
Employment status			
Employed	10	26	6
Unemployed	8	11	9
Highest level of education			
Uneducated	6	5	0
Primary	11	7	0
Secondary	0	92	12
Tertiary	0	3	22
Household income (R)	496-00	2673-54	7259-67
Main source of income			
Social grants	3	72	2
Professional job	0	0	12
Own business	0	2	3
Contract job	1	8	21
Farming	13	19	0

Source: Computed from own data. Blank responses were ignored in all calculations.

Table 2. Ordinal regression modeling and 95% significant values.

Variable	Coefficient	P value
Household size	-0.029	0.837
Male vs female	-0.150	0.816
Employed vs unemployed	-0.231	0.737
Educational level: Primary	-2.280	0.266
Secondary	0.945	0.741
Tertiary	-0.185	0.836
Source of food: Purchase	-4.266	0.024*
Own production	-0.1042	0.525
Accessing food from environment	-4.106	0.002*
Income category: Low	-9.278	0.038*
Middle	-4.402	0.006*
Main source of income: Social grants	-13.166	0.000*
Professional job	-8.767	0.000*
Own business	-5.006	0.000*
Contract job	-6.464	0.629
Farming	-2.145	0.080*
Ownership of vegetable gardens	-2.87	0.685

The Dependent Variable is: Food Access category (coded as 0-3): where zero indicates severe inadequate access to food, 2 indicates moderate access to food and 3 indicates adequate access to food. Source: Computed from own data. *Significant at the 5% level of significance.

Table 3. Strategies for food security in Hamburg.

Mitigation measures	Frequency % (n)
Borrow food from shops for future payment	80.2 (128)
Reduces the number of meals consumed in one day	73 (116)
Borrow money from friends or relatives	77.2 (123)
Petty jobs/ Petty trading	65.8 (105)
Diversified sources of food	89 (142)
Resort to the environment	15.7 (25)

certain level on which after that level its effect on access to food will be insignificant. This also indicates the effectiveness of access to income.

The United Nation Development Programme (UNDP, 1996) report of 2006 pointed out that food insecurity is closely linked to agriculture, poverty, income and unemployment. FAO (1996) pinpoint that agriculture is key to food security in many parts of the world. The finding that important determinants of food access like being employed, access to own produced food and ownership of vegetable gardens did not reduce the risk of inadequate access to food appears contrary to expectations. Nevertheless, this can be explained by the economic structure of the province and the state of agriculture. Individuals are employed in low income jobs and in most cases their incomes are not enough to influence access to food. The operated small gardens generate insufficient food for the household and this also not enough to influence the level of access to food.

Strategies for food security in Hamburg

South Africa's rural households are exposed to risk of experiencing food shortages. This study indicates that there is prevalence of food insecurity experienced by the Hamburg households. To escape the reality of living under food insecurity, many households mentioned that they have adopted several survival strategies. Table 3 shows the percentage of respondents that adopted different strategies for cushioning food shortages at various stages.

Borrowing food from the nearest shops emerged as the only institution willing to extend food credit when a household is stranded and among the coping mechanisms examined for dealing with inadequate access to food, it was mentioned most often. In Botswana, Swaziland and Zimbabwe households employ similar coping strategies to deal with food shortages, with the most commonly used strategies being limiting the size portions of food and reducing the number of meals per day (Maxwell and Caldwell, 2008). Maxwell and Caldwell (2008) posit that cultural practices and beliefs of the households play a major role in defining the kind of strategy that is adopted to address food access. In the investigated community,

the most common strategy was borrowing food from shops for future payment.

Conclusion

Villagers are at high risk of inadequate access to food. Households that were at higher risk of inadequate access to food were less educated, earn low income and have an unstable source of income. The regression analysis demonstrated that accessing food from both the market and the environment reduces the risk of inadequate access to food. Furthermore, high income which is also stable reduces the risk of inadequate access to food. Majority of rural households purchase a higher proportion of their food. There are several policy implications. First, food security policy must take into account the long term effect of improving the purchasing power of the villagers through increasing their income and promoting stable sources of income. It is important to support grocery shops across rural communities to improve access to reasonably priced food items. In times of food shortages, food lending shops act as the "lender-of-last-resort" and help contain food insecurity and are therefore a key component of rural food security. They should be supported. It is not inconceivable, however, that the local shops' role in the investigated communities could someday extend, to financing rural agriculture and other rural enterprises. For the sake of drawing more concrete policy recommendations, it is important to undertake studies on the possibility of promoting own production of food by villagers.

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