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The Effect of Smaller Prisoner Numbers at a Prison on The Prisoners' Access to Food: a Case of Malawi's Prisons

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Abstract

While Malawi's per capita cereal production may be higher than her per capita cereal consumption, Malawi is a net cereal importer and thus food insecure. The food situation is much worse in Malawi's prisons because inmates generally eat one meal per day.

The general objective of this study was to determine the effect of smaller prisoner numbers at a prison on the inmates' access to food. This was done by comparing food insecurity in small prisons with that in big institutions. An institution housing less than 400 inmates was considered a small prison while one housing more than 400 prisoners was considered a big institution. Using structured questionnaires in face to face interviews, the study collected data from 1000 inmates and 30 officers-in-charge from all prisons in the country. The data was analysed using Stata 12 and employed the probit and the Foster-Greer-Thorbecke (FGT) models as analytical tools.

Results from the analysis showed that practically all inmates in Malawi's prisons were food insecure. There was, however, a higher perception of food insecurity in big prisons than there was in small ones. Conditions of severe food insecurity were experienced more in big institutions than in small ones, and more inmates in big prisons depended on food brought to

them from their homes. Food insecurity was more prevalent in big prisons than in small ones.

Keywords: Malawi's prisons, occurrence of food insecurity, severity of food insecurity.

1. Introduction

Politically, Malawi is divided into four regions, these being the Northern, the Central, the Eastern and the Southern regions. There are six prisons with a prisoner population of 1,717 in the Northern region. In the Central region, there are eight prisons with a prisoner population of 3,784. The Eastern region has eight prisons with 4,072 prisoners, while the Southern region has 3,025 prisoners in eight prisons. There were 12,598 prisoners in Malawi's 30 prisons in 2016 when this study was conducted. Out of these prisons, five, namely, Chichiri, Zomba Central, Maula, Mzimba and Mzuzu prisons were considered big prisons, while the remaining twenty five were considered small prisons. A prisons was arbitrarily considered a small prison if it housed less than 400 inmates and a big prison if it housed more than 400 prisoners.

Statement of the Problem: Although Malawi is generally food insecure, it is common in Malawi that most people consume three meals per day. What differs is mainly the quality, quantity and variety of the food that they eat. Inmates in Malawi's prisons, however, generally eat one meal per day (African Commission on Human and Peoples' Rights, 2002; Penal Reform International 2005). These reports mention food issues as observations made in relation to health and human rights. None of these reports showed evidence of any studies having been conducted to analyse prisoners' access to food in small prisons compared to that in big prisons. This study identified this as a problem. The study, therefore, intended to make this comparison and fill this knowledge gap.

Justification of the Study: The overall objective of Malawi's Food and Nutrition Security Policy is to significantly improve the food and nutrition security of the Malawi population (Malawi Government, 2005). The specific objective of the Food Security Policy is to guarantee that all men, women and youth in Malawi have, at all times, physical and economic access to sufficient nutritious food required to lead a healthy and active life (Malawi Government, 2006). Since prisons accommodate about 0.08 percent of the Malawi population, it is important that prisons are food secure and that every prisoner has access to not less than the minimum meal requirement. Given the Malawi Government's commitment to ensuring food security, it was important that this study be carried out so that issues of prisoners' access to food are analysed and comparisons made between big prisons and small prisons. It was important to study and understand these parameters in order to lay the foundation upon which efforts to improve and re-engineer the food situation in Malawi's prisons could be based. This would enable policy makers and prison management to take appropriate policy and budgetary measures regarding prison subvention, strategic resource allocation, food production or procurement, and food demand and consumption levels to accurately address the problem and ensure prison food preparedness and improve prison food security. Also, since no study had been conducted in this area, it was important to conduct this study so that the existing knowledge gap could be filled.

Objectives of the Study: The general objective of this study was to determine prisoner's access to food in small prisons compared to that in big prisons. The specific objectives of the study were:

i. To determine the number of meals per week that prisoners received from home in small prisons compared to that in big prisons;
ii. To analyse the perception of food sufficiency in prisoners incarcerated in small prisons compared to that in big prisons; and
iii. To determine food security occurrences and frequencies in small prisons compared to that in big prisons.

Limitations of the Study: There were two major limitations to the study. The first was that all interviewees were male. This was because, for security reasons, the research team was only allowed to access prisoners that committed less serious offenses. Such prisoners were allowed to go out for farming activities because they were considered a lower security risk. The research team was advised to interview the sampled ones as they carried out their farming chores. The second limitation was that no female prisoners were in this category, not necessarily because they committed serious crimes, but because female prisoners were not allowed to go out for farming duties and the research team was not allowed to enter into the female side of the prison. As a result of these two limitations only 1000 male prisoners, instead of the required 1418 prisoners were interviewed.

The food situation in Malawi: The Millennium Development Goals (MDGs) through the medium term development strategy, the Malawi Growth and Development Strategy (MGDS), identified nine key priority development goals (Malawi Government, 2010). The first of these development goals was to eradicate extreme poverty and hunger. To achieve this, the Government's target was to halve, between 1990 and 2015, the proportion of people who suffered from hunger. One of the indicators for monitoring hunger was the proportion of the population living below the minimum level of dietary energy consumption of 2,100 kilocalories per person per day (Ecker & Qaim, 2008; Malawi Government, 1999).

Malawi is an aggregate net exporter of food. The bulk of the food exports, however, are non-cereals such as tea and sugar and so although the country is a net food exporter, it remains a net importer of cereals and thus food insecure. Maize is the staple food in Malawi (De Graaff, 1985; Kidane, et al., 2006; World Bank, 2008; FAO, 2010; IFPRI, 2012; FAO, 2015).

The food situation in Malawi's prisons: It is a requirement of the United Nations that every prisoner should be provided, by the administration at the usual hours, with food of nutritional value adequate for health and strength, of wholesome quality and well prepared and served (Medecins Sans Frontieres, 2009). The Malawi Prison Act Cap. 9:02, (1983) provides a dietary schedule for prisoners belonging to various categories of prisons. Despite these legally binding dietary guidelines, the practice on the ground is different. The African Commission on Human and Peoples' Rights (2002) observed that Malawian prisoners received only one meal per day and that meals were not balanced as prisoners ate the same food every day. The report also observed that the meals comprised of maize (*nsima*) and

boiled beans and sometimes pigeon peas or vegetables. Neither meat nor fish was provided but salt was available in all prisons. This is a typical case of food insecurity.

2. Materials and Methods

Data Collection Techniques: Both primary and secondary data were collected using questionnaires, one administered to prisoners, and the other to prison officers-in-charge. A total of 1,000 male prisoners from all the 30 prisons were randomly selected and interviewed using questionnaires administered in face to face interviews. Secondary data were collected from official records obtained from the Malawi Prison Service Headquarters and the various prisons that were visited.

Data Analysis: Data were entered in Excel and analysed using Stata 12. The output from the analysis was reported using descriptive statistics such as means, proportions and percentages.

Sampling Methods: All prisons in Malawi formed the field of study and every inmate, except those that had been in prison for less than four weeks, was an eligible interviewee. The four-week requirement is a normal procedure followed by the USAID-funded Food and Nutrition Technical Assistance (FANTA) project which developed a questionnaire (Maxwel & Frankenberger, 1992; Swindale & Bilinsky, 2006) upon which the questionnaires used in this study were based. In order to select respondents from the population of inmates, the stratified random sampling and simple random sampling methods were used. The stratified random sampling method was applied to select *n* units out of *N* sub-populations called strata. In this case, each prison was a strata and from each strata *n* number of inmates were selected using simple random sampling in order to give each prisoner an equal chance of being selected (Bryars, 1983; Agresti, 1996; Zikmund, 1997; McGill et al., 2000). In order to select participating inmates, tables of random numbers (Magnani, 1997) were used. In selecting prison officers for the interview, the purposive sampling method was used.

Sample Size: For more precision on sample size calculation, when population size and population proportions are known, the formula given below is used (Kothari, 2004).

$$n = \frac{z^2}{e^2} \frac{p.q.N}{(N-1)+ z^2.p.q} \quad \textbf{(1)}$$

where n = sample size, z = 1.96 = z-value yielding 95% confidence level, p = proportion of the population of interest, q = 1 – p, N = 12,598 = the population of interest, e = 5% = absolute error in estimating p.

The population proportion for each prison was calculated as in Equation **(2).**

$$\text{Prison proportion, } p = \frac{\text{Number of prisoners at a given prison}}{\text{Total prisoner population in Malawi}} \quad \textbf{(2)}$$

In 2016, the total number of, both convicted and un-convicted, inmates in Malawi's prisons was 12,598 (Malawi Government, 2016), while the population of Malawi as given by the

UNDP in its 2011 Human Development Report was 15,380,900 (UNDP, 2011). Following the reasoning articulated above and applying Equation **(1)**, the value of *n*, the sample size, was found to be 1418. However, only 1,000 inmates were interviewed because of the study limitations.

Data were collected by three trained interviewers using a questionnaire that had been reviewed by a group of key informants, refined by eight prisoners that were representative of the survey population but who were not part of the survey sample, and pretested on fifteen prisoners through a preliminary survey. Data collected were subjected to regression and correlation analysis and results summarized.

3. Model Specification

Data from the prisoner questionnaire were entered in SPSS and then imported into STATA 11 for analysis using the probit model in order to analyse prisoners' perceptions of food sufficiency and determine the number of meals received from home. The Foster Greer Thorbeck model was used to determine prisoners' food security occurrences and frequencies.

The Probit Model

Data from the questionnaire that was administered on inmates were analysed using the probit model in order to establish relationships between and among variables. The probit model was considered appropriate because the questionnaire resulted in dichotomous variables which could easily be analysed using this model. The prisons were categorized in terms of whether a prison was a small prison or a big prison. A prison was considered small if it housed less than 400 inmates and otherwise, if it housed more than that.

Following the arguments presented by (Maddala, 1992; Wooldridge, 2002; Verbeck, 2004; Gujarati D. , 2004; Greene, 2003), a regression model shown in Equation (3) was assumed.

$$y_i^* = \beta_0 + \sum_{j=1}^{k} \beta_j X_{ij} + U_i \quad \textbf{(3)}$$

where y_i^* is not observed, in which case it is a "latent" variable, then what is observed is a dummy variable *y*, defined by Equation (4).

$$y_i = 1 \text{ if } y^* > 0 \quad \textbf{(4)}$$

$y_i = 0$ otherwise

This was the basis of the probit model. In equation (3) it is assumed that a latent variable exists for which a dichotomous realization is observed. For example, if the observed dummy variable is whether or not the prisoner is food secure, y_i^* would be defined as "prisoner's perception of being food secure".

From equation (4), multiplying y_i^* by any positive constant does not change y_i. So, if y_i was observed, the β's in (3) could be estimated only up to a positive multiple. As a result, it is customary to assume var(U_i) = 1. This fixes the scale of y_i^*. From equations (3) and (4), Equation (5) was obtained.

$$P_i = \text{Prob}(y_i = 1) = \text{Prob}[U_i > -(\beta_0 + \sum_{j=1}^{k}\beta_j X_{ij})] = 1 - \text{F}[-(\beta_0 + \sum_{j=1}^{k}\beta_j X_{ij})] \quad \textbf{(5)}$$

where F is the cumulative distribution function of *U*. Since the distribution of *U* is symmetric, given that 1 – F(-Z) = F(Z), then

$$P_i = \text{F}(\beta_0 + \sum_{j=1}^{k}\beta_j X_{ij}) \quad (6)$$

Because the observed y_i were realizations of a binomial process with probabilities given by (5), the likelihood function became

$$\text{L} = \prod_{vi=1} P_i \prod_{vi=0}(1 - P_i) \quad \textbf{(7)}$$

In (6), the functional form for F depended on the assumption made for the error term *U*. If the cumulative distribution of U_i was logistic, a logit model would be obtained. If the errors in U_i in (3) followed normal distribution, a probit model would be gotten. In that case Equation (8) would be gotten.

$$\text{F}(Z_t) = \int_{-\infty}^{\frac{Z_t}{\sigma}} \frac{1}{\sqrt{2\pi}} \exp(-\frac{t^2}{2})dt \quad \textbf{(8)}$$

The cumulative normal and logistic distributions are generally very close to each other, except at the tails, in that the logistic tail is slightly fatter than the probit tail as the normal curve approaches the *X* axis more quickly than the logistic curve.

After estimating the parameters, β_i, it was important to predict the effects of changes in any of the independent variables on the probabilities of any observation of the dependent variable. These effects were called marginal effects, given by $\frac{dy}{dx'}$ in the probit analyses given in this study. Marginal effects were calculated at different levels of the independent variables to get an idea of the range of variation of the resulting changes in probabilities (Maddala 1992;

Gujarati, 2004).

The probit model has been used widely in analysing data in various research endeavours. For example, the probit model was used to analyse factors impacting adoption of genetically modified cotton (Banerjee & Martin, 2009). The model was also used to analyse the effects of some socio-demographic factors on the decision of the consumer to purchase packed or unpacked fluid milk in Sivas, Turkey. In that study, four estimators (household size, income, milk preferences, reason, and milk price) were found statistically significant (Uzunoz & Akcay, 2012). The probit models were also used in management research as analytical tools to the extent that they appeared in 15 per cent of all articles published in the *Strategic Management Journal* in 2005 (Hoetker, 2007).

Each of the food security conditions of “anxiety”, “insufficient quality”, “un-preferred food”, “limited variety”, “unwanted food”, “smaller meal”, “fewer meals”, “no-food-at-all”, “sleeping hungry”, “whole day and night”, “augmenting”, and “shameful means” was regressed against the independent variables of “age”, “education”, “how far”, “meals per week”, and “status”. Table 1 carries descriptions of the variables.

Table 1: Description of variables for the probit models

Dependent Variable	Variable Description
Anxiety	Anxiety And Worry That There Would Not Be Enough Food In Prison
Insufficientquality	Insufficient Food Quality
Unpreferredfood	Not Eating The Kinds Of Food That One Preferred Because Of Lack Of Food
Limitedvariety	Eating A Limited Variety Of Foods Due To Lack Of Food
Unwantedfood	Eating Unwanted Food Because There Was No Other Food To Eat
Smallermeal	Eating A Smaller Meal Than One Needed
Fewermeals	Eating Fewer Meals In A Day
Nofoodatall	Having No Food At All To Eat Because Food Was Not Available
Sleepinghungry	Going To Sleep At Night Hungry Because Food Was Not Available
Wholeday&night	Going A Whole Day And Night Without Eating
Augmenting	Augmenting Food Intake Through Outside Supply
Shamefulmeans	Acquiring Food Through Borrowing, Begging Or Stealing
Independent Variables	Variable Description
Age	Age Of Prisoner In Years
Education	Education Level Of Prisoner In Years
Howfar	How far the prisoner's home or relatives are from prison
Meals/week	Number Of Times Per Week Prisoner Received Meals From Home
Status	Social Status Of Prisoner, Eg, Rich/Important/Influential Or Poor
Prison	Prison Where Prisoner Is Incarcerated

The Foster-Greer-Thorbecke (FGT) model

The Foster-Greer-Thorbecke model was used to determine food security occurrences and frequencies in small prisons compared to those in big prisons. The FGT model is expressed as in Equation (9) (Gujarati, 2004).

$$F(\alpha) = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{(m-y_i)}{m}\right]^{\alpha} \quad (9)$$

where *n* is the number of sample prisoners; y_i is the food caloric intake per adult equivalent of the i^{th} prisoner; m is the cut-off between food security and insecurity (expressed in caloric requirements); q is the number of food-insecure prisoners; and α is the weight attached to the severity of food insecurity.

It must be noted, however, that m - y_i = 0 if y_i > m. As for the weight α, giving no weight to the severity of food insecurity is equivalent to assuming that α = 0. If that were done, the formula would collapse to F(0) = $\frac{q}{n}$, which is called the head count ratio. The head count ratio or the incidence of food insecurity would be the share of the prison population whose food intake was below the food security threshold of 2,100 kilocalories. It was also possible for one using several food insecurity thresholds, say one for food insecure and another for extreme food insecure, to estimate the incidence of both food insecurity and extreme food insecurity. A weakness of the headcount ratio, however, is that it ignores the depth of food insecurity in that should the hungry become hungrier, the head count ratio would not change (United Nations, 2015).

Giving equal weight to the severity of food insecurity among all food insecure prisoners was equivalent to assuming that α = 1. If the sum of the numerator were taken, one would get the food insecurity gap, which when divided by m would give the food insecurity gap index (Gujarati, 2004). The food insecurity gap index would provide a better indication of the depth of food insecurity. It would also allow food insecurity comparisons and would provide an overall assessment of Malawi's prisons' progress in curbing food insecurity. The food insecurity gap index would also help in the evaluation of Malawi's prison policies related to food and other initiatives. By multiplying the prisons' food insecurity gap index by both the food security threshold and the total number of prisoners in the country one would get the total amount of food needed to bring the food insecure prisoners out of food insecurity and up to the food security threshold (Gujarati, 2004). This means that the food insecurity gap index is an important measure beyond the head count ratio. If there were two prisons having similar headcount ratios, but different food insecurity gap indexes, it would mean that the prison with a higher food insecurity gap index had more severe food insecurity. The food insecurity gap index is additive, meaning that the index can be used as an aggregate food insecurity measure, as well as decomposed for various sub-groups of the prisoners (Sen, 1976).

The index F(1) provided the possibility to estimate resources required to eliminate food insecurity. Giving weight to the severity of food insecurity among the most food insecure prisoners was equivalent to assuming that $\alpha > 1$. Therefore, allowing $\alpha = 2$, gave rise to Equation (10).

$$F(2) = \frac{1}{n} \sum_{i=1}^{q} \left[\frac{(m - y_i)}{m}\right]^2 \quad \textbf{(10)}$$

This yielded the severity of food insecurity. The severity of food insecurity took into account not only the distance separating the food insecure from the food security threshold but also the inequality among the food insecure. That is, a higher weight was placed on those who were further away from the food security threshold (Foster, Greer, & Thorbecke, 1984).

So, F(0) was the percentage of food insecure prisoners, F(1) the food insecurity gap and F(2) the severity of food insecurity.

4. Results and Discussion

The specific objectives of this study were: to determine the number of meals per week that prisoners received from home in small prisons compared to that in big prisons, to analyse the perception of food sufficiency in prisoners incarcerated in small prisons compared to that in big prisons, and to determine food security occurrences and frequencies in small prisons compared to that in big prisons. Results were presented following the specific objectives.

Meals per week received from home. Most prisoners did not receive meals from outside prison, and less than one percent received such meals every day of the week, irrespective of the size of their prison. About 87 per cent of prisoners from big prisons received no meal at all from home while a total of 13 per cent of them received home meals on various days of the week. About 79 per cent of prisoners from small prisons did not receive home meals at all while a total of 21 per cent of them received home meals on various days of the week. These results were an indication of general food insufficiency in Malawi's prisons. The fact that more prisons from big prisons did not receive home meals at all was expected considering that more prisoners in big prisons came from far-away places (Moloko, et al 2017). This seemed to suggest that receiving outside meals was dependant on how far away the prisoner's home or relatives were from the prison. Table 2 shows the number of meals per week that a prisoner received from home in the various prison categories.

Table 2: Number of meals per week received from home

Meals per week (%) (n = 1000)								
No. of meals/week	**0**	**1**	**2**	**3**	**4**	**5**	**7**	**Total**
Small Prison	79.38	11.18	5.47	2.48	0.5	0.25	0.75	100
Big Prison	86.67	9.23	3.08	0.51	0	0	0.51	100
Pearson Chi-square	*7.8563*							

Prisoners' social status. Prisoners in all prison categories considered themselves poor. However, 76 per cent of prisoners in big prisons considered themselves poor while 68 per cent of the prisoners in small prisons considered themselves poor. This meant that there were more people of higher status incarcerated in small prisons than in big prisons. This was probably one of the reasons why there were more recipients of home meals in small prisons than in big prisons. Table 3 shows prisoner's social status.

Table 3: Prisoner's social status (n=1000)

Status	**(%)Poor**	**(%)Rich/ important**	**Total**
Small prison	67.95	32.05	100
Big prison	75.9	24.1	100
Pearson Chi-square	*4.677***		

Perception of food sufficiency. The perception of most prisoners in all prison categories in Malawi was that there was insufficient food in prison. This perception was significantly higher in big prisons where 86 per cent of the inmates felt that there was insufficient food in prison. In small prisons, 65 per cent of the inmates felt that there was insufficient food in prison. These results meant that one was better off food-wise if incarcerated at a small prison than at a big prison. Table 4 shows the prisoners' perception of food sufficiency in small prisons compared to that in big prisons.

Table 4: Prisoners' perceptions of food sufficiency (n = 1,000)

	Small prison	Big prison
Sufficient	35.16	13.85
Insufficient	64.84	86.15
Total	100	100

Prisoner food security occurrences and frequencies. Prisoners in big prisons suffered the most in all of the eleven conditions of food insecurity as the comparison between big prisons and small prisons showed that large percentages of prisoners in big prisons experienced high levels of food insecurity in all the eleven conditions. Smaller percentages of prisoners in small prisons experienced these conditions. This showed that one was worse off, food-wise, if imprisoned at a big prison. Table 5 presents prisoner food security occurrences and frequencies.

Table 5: Prisoner food security occurrences and frequencies

Perception	Big prison	Small prison
Anxious	73.85	58.26
Unpreferred food	83.59	81.86
Limited variety	88.72	79.01
Unwanted food	58.97	52.67
Small meal	90.26	72.67
Fewer meals	94.36	73.79
No food	16.92	7.95
Sleep hungry	32.31	18.26
Whole day & night	23.59	8.82
Augmenting	43.59	42.11
Shameful means	68.72	60.12

Food security prevalence. Prisoners in Malawi's prisons were found to be severely food insecure. The worst case scenario was prisoners in big prisons where 98 per cent of them were severely food insecure. On the other hand, the most food secure prisoners were those incarcerated in small prisons where six per cent of the prisoners were found to be food secure. Table 6 shows prisoner food security prevalence percentages.

Table 6: Food security prevalence

Status	Big prison	Small prison
Food secure	0.0	6.0
Mildly food insecure	0.3	1.2
Moderately food insecure	1.6	5.5
Severely food insecure	98.4	87.7

Note: Some columns do not add up to 100 % due to rounding off errors.

5. Conclusion

Only male prisoners were involved in this study because female prisoners were not allowed out of their confinement and researchers were not allowed to follow prisoners into restricted areas. Most prisoners did not receive meals from home or relatives such that less than one percent of the prisoners received home meals every day of the week. Prisoners in both small and big prisons considered themselves poor or unimportant and generally perceived that there was insufficient food in prison. This perception was higher in big prisons than in small prisons. Prisoners in big prisons suffered the most in all the eleven conditions of food insecurity as large percentages of prisoners in big prisons experienced high levels of food insecurity in all the eleven conditions while smaller percentages of prisoners in small prisons experienced these conditions. Prisoners in Malawi's prisons were found to be severely food insecure. Prisoners in big prisons were the most severely food insecure.

The findings of this study found that in terms of access to food, a prisoner was better supplied with food if incarcerated at a small prison with fewer prisoner numbers than if incarcerated at a big prison where prisoner numbers were large. Based on these findings, it is recommended that fewer prisoners should be housed at any prison in Malawi. This could be possible if more prisons were constructed in the country.

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