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Insights from Poverty Maps for Development and Food Relief Program Targeting

An Application to Malawi

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Abstract

Poverty mapping applies models of household welfare developed from detailed household consumption and expenditure surveys to the extensive but less detailed data from national censuses. A poverty map for Malawi, developed by drawing upon information from the 1997–98 Malawi Integrated Household Survey with the 1998 Malawi Population and Housing Census, provides aggregate estimates of household welfare and poverty at a highly disaggregated level—down to the level of local government wards. Given the close association between welfare and food security in most Malawi households, such a detailed poverty map can be of considerable value to development and relief organizations, as they plan and target activities to improve the ability of poor households to cope with food scarcity.

This paper assesses the value of the Malawi poverty map with reference to two activities of the World Food Programme (WFP) in Malawi: the Food for Assets and Development (FFASD) public works program and the Vulnerability Analysis and Mapping (VAM) food insecurity information generation system. First, the poverty targeting efficiency of the FFASD program is evaluated using the poverty map to determine whether the FFASD projects are preferentially located in areas where disproportionate numbers of the poor are found. This is done in part by comparing the poverty targeting efficiency of the WFP program to that of the Malawi Social Action Fund Public Works Programme projects. Second, WFP employs the VAM methodology to determine how and where to employ its resources from year to year. The potential value of the poverty map as a component of the VAM process in Malawi is then considered.

The results indicate that the poverty map is an effective and objective way to geographically target projects and programs on a poverty basis in Malawi. In assessing household vulnerability to food insecurity, the poverty map serves as a useful proxy indicator of spatial variability in the ability of the population to cope with food scarcity. Poverty maps, in those countries were they are available, should be a privileged data

source for undertaking any national vulnerability analyses. However, the poverty map needs to be used with complementary data to better understand the risks households face that might result in food scarcity and the actual mechanisms households use to cope with such stresses.

Key words: poverty mapping, food security, Malawi

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Acknowledgments

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1. Introduction

Poverty reduction has in recent years constituted the expressed motivational core of Malawi government policy. Yet identifying the poor in order to direct poverty programs to them is problematic. Geographical targeting of the poor is one method by which such efforts might be implemented more efficiently, directing poverty reduction projects to those areas that contain disproportionate numbers of the poor (Bigman and Fofack 2000). Such geographical targeting is particularly appropriate where there are sharp differences in poverty levels within regions.

Information on poverty incidence at local levels is difficult to acquire. Most poverty analyses of household surveys only permit estimates of poverty to be made at the survey stratum level—typically the district or province. However, small-area estimate poverty mapping (Elbers, Lanjouw, and Lanjouw 2001) provides a way to estimate poverty levels for population groupings as small as 1,000 households. Using a consumption-based definition of poverty, this method has been used to develop a poverty map of Malawi at the local government ward level, a subdistrict spatial unit.

Public works employment programs in developing countries—commonly called food-for- work or food-for-assets programs—are frequently used to build economic and social infrastructure and as income transfer components of safety net programs for the poorest in society. These programs are most effective where they provide infrastructure and employment in those areas of the country where the poorest reside. Geographical targeting using the poverty map potentially is an important means to ensure that such programs reach the poorest areas and the poorest people.

Parallel to its efforts at alleviating poverty, the Malawi government is committed to alleviate problems of food scarcity when they arise in the country. Vulnerability to household food deficits is typically a characteristic of the poor. The World Food Programmme (WFP), working with the government of Malawi, has developed a Vulnerability Analysis and Mapping (VAM) methodology for Malawi to identify populations most at risk of having insufficient food to meet their needs, following

agricultural production shortfalls or economic shocks (Morinière, Chimwaza, and Weiss 1996; Recalde 2000). The VAM has been used to guide government's response in the short term to localized emerging famines across Malawi and, in the context of development, for the targeting of WFP public works program projects. In this regard, the poverty map is potentially an important source of information for the VAM.

The research here considers how the poverty map for Malawi can be used to add value to two aspects of the work in Malawi that the WFP undertakes alongside the government. First, the poverty map is used to undertake a retrospective assessment of how well WFP's Food for Assets and Development (FFASD) public works program targeted poorer areas of the country. This is done on a comparative basis by undertaking a similar assessment of a larger public works program—the Malawi Social Action Fund's (MASAF's) Public Works Programme (PWP)—and assessing the poverty incidence in the subdistrict units in which individual projects within the two programs were carried out. Second, an appraisal is made of how the VAM methodology can use the poverty mapping results to identify food insecure and vulnerable areas and population groups.

This paper is organized as follows. The poverty mapping technique used to estimate poverty incidence is presented in the next section. The public works programs are described and their poverty targeting efficiency is considered in Section 3. In Section 4, the VAM methodology, as used in Malawi, is described with attention to how the poverty map can strengthen the analysis. The final section offers conclusions on the value of poverty mapping for the targeting of food relief and development programs.

2. Poverty Mapping in Malawi

A quantitative understanding of the significance of poverty in Malawi and the characteristics of the poor have been emerging since 2000 with the detailed poverty analysis of and subsequent poverty profile from the 1997–98 Malawi Integrated Household Survey (IHS) (National Economic Council 2000). The poverty analysis, which used a standard household consumption-based measure of welfare and a cost of

basic needs poverty line, showed that just over 65 percent of the population of Malawi is poor. The analysis also provided aggregate district estimates of welfare and poverty. Poverty headcounts for districts and urban areas ranged from 38 to 84 percent. However, a more local assessment of the incidence of poverty could not be done as the IHS was designed to be representative only at the district and broader spatial scales. For many programs, particularly large poverty reduction programs, district-level geographical targeting is adequate. However, for programs that are implemented at the community scale, such as public works programs, more local targeting is required to ensure that most beneficiaries of the programs are indeed poor.

A poverty map of Malawi was completed that provides estimates of poverty for the population of spatial units considerably smaller than the district (Benson, Kanyanda, and Chinula 2002). This poverty map was developed by applying data collected from the 2.2 million households enumerated in the 1998 Census to 23 separate stratum-specific models of household welfare developed from a detailed analysis of the IHS. Based on the resultant household welfare estimates, poverty and welfare inequality measures were calculated for the approximately 850 local government wards of the country.

Poverty Mapping Method

Poverty mapping takes advantage of both the poverty analysis and wealth of detail in the household survey and the universal coverage of the census. Models of household welfare are developed using the household survey data; typically there are separate models for each stratum of the household survey. The dependent variable for these models is the natural log of the household welfare indicator—real total daily per capita consumption and expenditure by the household—calculated as part of the earlier poverty analysis of the household survey. The independent variables are those household characteristics that are found in *both* the household survey and the census. Once suitable models are developed using the household survey, those models are then applied to the census data in order to estimate the household welfare level of each household in the

census. Poverty incidence and other poverty and welfare inequality measures for groups of villages and other local areas can then be determined.

Briefly, the steps taken in the poverty mapping analysis using the IHS and the Malawi census were as follows:

1. The household survey and census data sets were assembled. To ensure that the variables extracted from the survey were measuring the same thing as seemingly similar variables from the census, the two data sets were subject to rigorous means comparison tests.
2. Having done the comparisons and come up with a final set of potential household variables, models of household welfare based on the IHS household survey data were developed for each stratum. Twenty-three separate models were developed, one for each of the 22 IHS analytical strata (made up of 10 single districts, 8 groupings of districts, and the 4 urban areas of Malawi), together with an additional stratum made up of census enumeration areas, which, although found in rural areas, are essentially urban in character.[1]

   A stepwise regression analysis of the IHS data was used for each stratum to select those household variables that best explained variation in the logged household welfare indicator. This resulted in a set of 23 models made up wholly of household variables.
3. Enumeration area (EA) variables were then added to each model to improve their predictive power and to eliminate some econometric problems, such as spatial autocorrelation. A stepwise regression procedure was again used to select the EA variables most useful for explaining the variation in the household welfare indicator not explained by the previously selected household variables. The EA

[1] The IHS was designed to be representative at the level of the district and urban centers, of which there were 29 at the time of the survey. However, upon cleaning the data in preparation for the poverty analysis, problems were found with the consumption data for about 40 percent of the survey households. Consequently, the sample size for several districts was sharply reduced, necessitating the amalgamation of some adjoining districts as strata for the analysis. Moreover, since the IHS was completed, two new districts have been formed—Balaka out of Machinga District and Likoma out of Nkhata Bay.

variables include some distance variables, such as the distance from the center point of the EA to the nearest urban center, developed using a Geographic Information System (GIS). Other EA variables are census means for the enumeration areas, such as the percentage of households in an EA with improved toilets, the mean maximum education level in households in an EA, and so on.

4. Finally, after the base model for use with the census data for each stratum was established, in order to improve the predictive power of the models, a secondary model was developed of the error in the base model using the base model residuals as the dependent variable.

The models for each stratum were then used with the census data from that stratum in order to predict the level of the household welfare indicator for all households in the census. A computer program had been developed to do this final step (Demombynes 2001). Included in the input items for this program was the poverty line for Malawi and spatial identifier codes to assign each census household to a district, a traditional authority (TA) (the principal subdistrict administrative unit), and a local government ward. The program uses this information to calculate aggregate poverty measures for the household's resident in each of these spatial units across the country.[2]

Poverty Mapping Results

The number of household- and community-level variables in each model range in total from 7 to 23. Variables found in more than one-third of the 23 models include

- household composition variables (number of members in the household according to sex and age);
- characteristics of the household head: age, years of education, and employment;

[2] An important strength of this program is that it accounts for the error in the calculated poverty measures by employing a bootstrapping method. The standard errors generated can be used to assess whether differences in poverty measures between the populations in different spatial units are statistically significant.

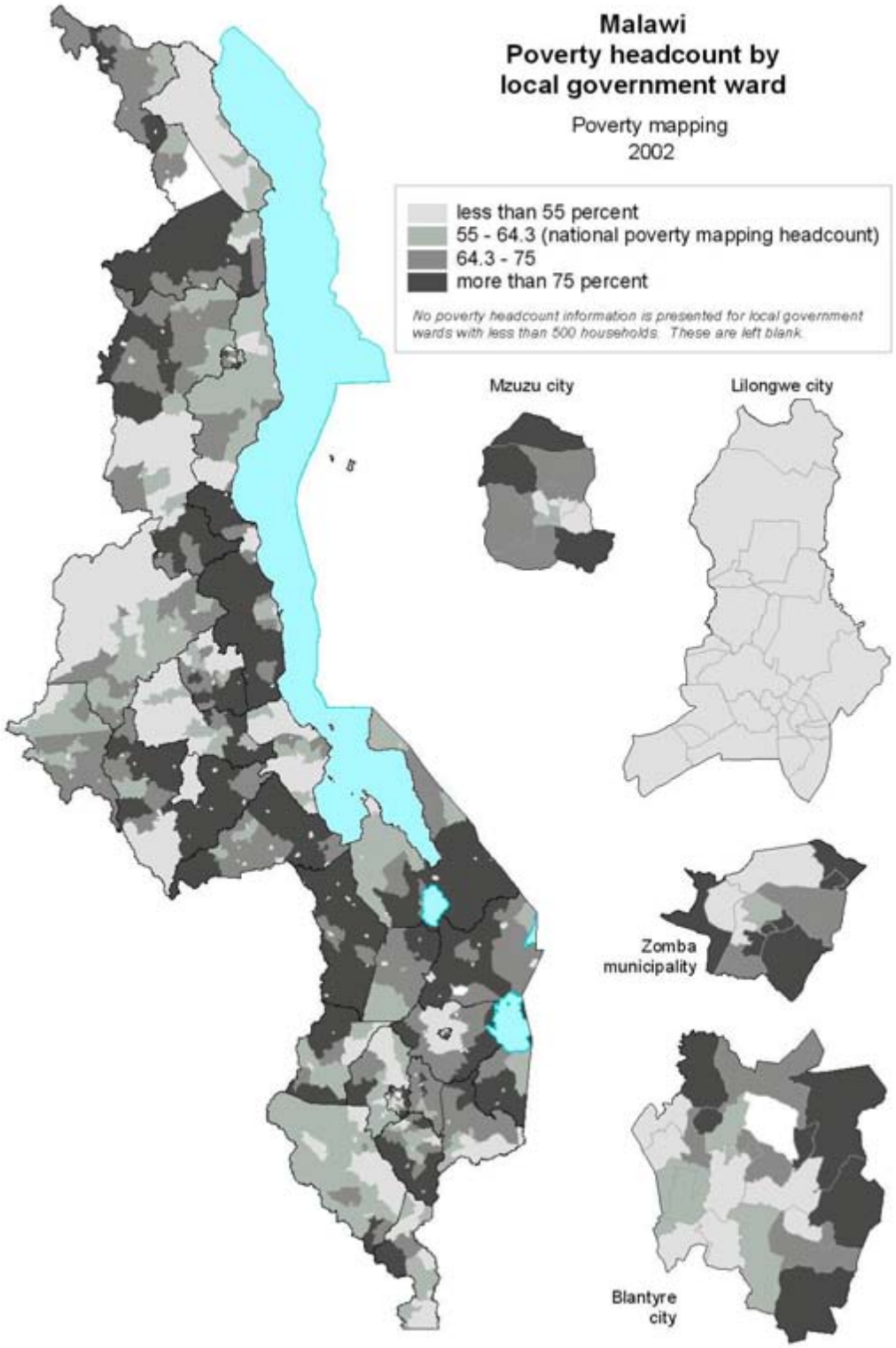
- maximum educational level of women in the household;
- bicycle ownership;
- whether the household uses paraffin for lighting;
- mean maximum education level of households in the EA;
- net enrollment rate in the EA; and
- proportion of households in the EA residing in housing made of permanent building materials (iron roofs, concrete blocks, and so forth).

Note that most of the variables used to predict household welfare reflect relatively stable characteristics of the household—demographic makeup, educational attainment, and physical assets. Consequently, the Malawi poverty map is more useful in assessing baseline conditions of household welfare than in estimating the effects on household well-being of short-term shocks, such as shocks from a poor harvest or a natural disaster.

The adjusted-R^2s for the 23 models of household welfare developed for the poverty map ranged from 0.25 to 0.59, with a mean of 0.38. The resultant aggregate poverty measures are quite close to those developed from the poverty analysis of the IHS. For example, while the IHS poverty analysis estimated the national poverty headcount at 65.3 percent, the poverty mapping analysis estimated it at 64.3 percent. Figure 1 is a map of the estimated poverty headcount by local government ward for the country. This is the smallest, widely recognized spatial unit for which poverty measures could be calculated. Similar maps for other poverty measures and welfare indicators are available but are not presented here.[3]

[3] Detailed tabular poverty measures for local government wards and TAs are presented in Benson, Kanyanda, and Chinula 2002.

Figure 1—Poverty map of Malawi—Poverty headcount, by local government ward



3. Poverty Targeting Efficiency of Public Works Programs

The poverty targeting efficiency of the WFP public works program in Malawi is evaluated using the poverty map. This evaluation provides an indication of how the use of the poverty map for targeting might have performed relative to the method actually used. Additional insights are gained into the targeting efficiency of the WFP program and the value of the poverty map for geographical targeting by also assessing the targeting efficiency of a larger poverty-oriented public works program, the MASAF Public Works Programme. The locations of projects under the two programs were mapped and a spatial analysis conducted to assess the poverty incidence and depth of poverty in the local government wards within which the projects were undertaken.

The WFP and MASAF Public Works Programs

WFP Food for Assets and Development Program

The Malawi country program of the World Food Programme states as one of its objectives "increased food security among the rural and urban poor through the creation and rehabilitation of community and household assets in food-insecure areas" (WFP 2001, 6). The primary means by which WFP seeks to achieve this objective is through the Food for Assets and Development Program. This program seeks to increase food production among smallholder farmers by creating or rehabilitating small-scale irrigation schemes; to improve access to markets by rehabilitating roads; to improve sanitation through improved drainage systems; to safeguard the resource base of communities by establishing community forests and soil conservation practices; and to improve the capacity of communities to mitigate and manage natural disasters. WFP contributes to these community efforts by distributing family food rations to participants engaged in these activities.

The geographical targeting criteria used by WFP–Malawi in carrying out all of its activities are based on the periodic VAM exercises. The VAM considers food insecurity, poverty, malnutrition, levels of school enrollment, HIV/AIDS prevalence, and the incidence of natural disasters in determining the areas to which program activities will be targeted. By design, however, the FFASD program has been restricted to only about half of the districts of Malawi. Representatives from a range of government institutions sit on the FFASD Activity Technical Committee. Yet it is not explicit in the project documents exactly how the actual project sites and activities at those sites were chosen.

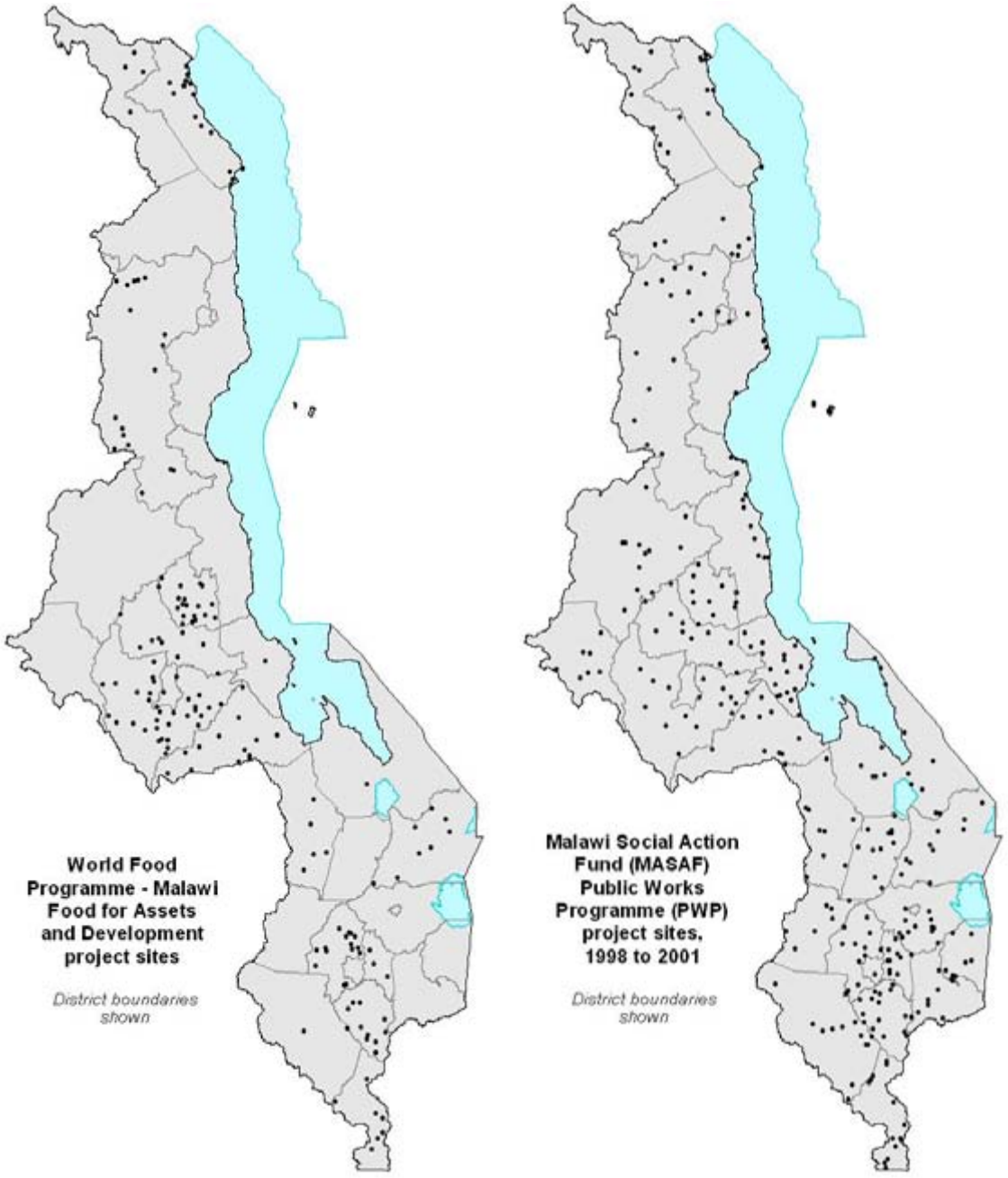
The WFP–Malawi country office provided a list of 171 FFASD projects that have been located and mapped. A map of the FFASD sites is shown at left in Figure 2. Most projects involved rural road building and afforestation. No statistics were provided on the number of beneficiaries, the cost of the projects, or on the amount of food distributed to the participants. These projects were implemented between 1996 and early 2002.[4]

MASAF Public Works Programme

The Malawi Social Action Fund was launched in 1996 by the government of Malawi as a key component of its Poverty Alleviation Programme. It was designed to finance self-help community projects across the country to improve access to economic and social infrastructure and create employment, as well as to improve the quality of life of the most disadvantaged in society through safety net activities. Since its launch, MASAF project communities have built over 2,000 classrooms, sunk 2,000 borehole wells, and constructed a number of health centers, post offices, and market facilities. The World Bank provides financial support for the Fund. Although MASAF works in close collaboration with government, in its day-to-day operations it functions in an autonomous manner.

[4] That some of the FFASD projects were implemented before the survey and census used to construct the poverty map does introduce the possibility of endogeneity in accounting for poverty levels at such sites—that is, the projects may have determined in some way the level of poverty observed at those sites. Information on the start date of each of the 171 projects was not provided.

Figure 2—Locations of WFP-Malawi Food for Assets and Development and MASAF Public Works Programme project sites



The Public Works Programme (PWP) is one of four components of MASAF's activities under the second phase of the project. The MASAF II project document for the World Bank states

> This [PWP] component finances labor-intensive works as a safety net scheme in targeted poor rural and urban areas. In so doing, the works would create temporary employment, which would generate cash income to poor households. These works are selected from already identified government projects which include, inter alia: road rehabilitation and maintenance; land husbandry and afforestation; water supply, sanitation, and drainage schemes; and rainwater collection. Beneficiary participation is fostered at all stages of the project (World Bank 1998, 6–7).

The MASAF management unit provided a list of all PWP projects carried out between 1998 and 2001. Using this listing, the 290 project sites were located and mapped.[5] This map is shown at right in Figure 2. The bulk of the projects consisted of labor-intensive road building, afforestation, and environmental rehabilitation projects. More than $12 million was spent on these projects, much of it on wages for the community participants. Employment was provided for over 85,000 individuals.

Poverty Targeting Efficiency of the Programs

To assess the efficiency of the poverty targeting of these two public works programs, maps of the project sites are used to determine the local government ward in which each project is found. Using the population-weighted mean poverty headcount and severity of poverty levels from the Malawi poverty map as measures, the local government wards that have the public works program projects are compared with wards

[5] Project listings provided for both programs included the community name, district, and agricultural Extension Planning Area (EPA) in which the project was located. This information was used with several geographical listings of places in Malawi to assign geographical coordinates to the projects. While most project sites for both programs were readily located, 10 to 20 percent of the projects required some best-guess techniques to locate them within a district or EPA. As these projects may have been attributed to local government wards other than the ones in which they were actually located, this is a potential source of error in the analysis.

that do not have them.[6] The purpose is to judge whether the projects were sited in those wards within districts and the nation where poverty is most prevalent and severe.[7]

The results for the WFP–Malawi Food for Assets and Development projects are shown in Table 1, while those for the MASAF Public Works Programme are shown in Table 2.

Two separate assessments are done. The first is at the national level to provide a broad appraisal of the poverty targeting of the programs. The second assessment is done at the district level. The poverty map of Malawi shows that, while poverty rates are quite high across the country, there is significant intradistrict variability nevertheless. The second assessment is to show how well the programs are targeted within a district. Are the poorest areas in a district more likely to receive public works projects?

In addition to the actual poverty headcount and severity of poverty estimates for the project and nonproject areas, standardized headcount and severity of poverty values are also employed to make comparisons. This is done to allow comparisons of poverty targeting efficiency to be made across districts that may have quite dissimilar levels of poverty incidence or severity. The standardization is done district by district. In standardizing, the weighted mean headcount or severity of poverty measure for all wards within the district as a whole is given a value of zero. Local government ward poverty measures are standardized based on their difference from the weighted mean district measure in units of the poverty measure standard error for the district as a whole. The

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[6] These two poverty measures are two of the three most commonly used Foster-Greer-Thorbecke (FGT) class of poverty measures (Foster, Greer, and Thorbecke 1984). The poverty headcount ($p0$) is simply the proportion of the individuals in the population in question whose level of consumption is below the poverty line. The severity of poverty measure ($p2$) is the mean of the *squared* poverty gap for the population. The poverty gap is the difference between the level of consumption of an individual and the poverty line when that difference is expressed as a proportion of the poverty line. Nonpoor households have a poverty gap of zero. Poorer households receive greater weight than less poor households in calculating this index. Although the other FGT measure, the poverty gap or depth of poverty measure ($p1$), is calculated for the poverty map, it is not used here.

[7] Note that this is not the same as assessing whether the projects were located in those wards where the greatest number of poor individuals are found—that is, areas of high poverty density. Poverty density is an alternative criterion that could be used for assessing the poverty targeting efficiency of the two programs, but it is not used here.

Table 1—Assessment of poverty targeting for WFP–Malawi Food for Assets and Development projects

	Poverty headcount							Severity of poverty measure									
	Weighted mean measure (percent)				Weighted mean (ward) standardized			Weighted mean measure				Weighted mean (ward) standardized			*Ward count*		
District or urban center	**Wards without projects**	**Wards with projects**	**All wards**	**Difference**	**Wards without projects**	**Wards with projects**	**Difference**	**Wards without projects**	**Wards with projects**	**All wards**	**Difference**	**Wards without projects**	**Wards with projects**	**Difference**	***Wards without projects***	***Wards with projects***	***Total***
Blantyre	53.7	59.0	55.3	5.4	-0.436	0.980	1.415	0.092	0.109	0.097	0.017	-0.363	0.817	1.180	*17*	*6*	*23*
Chikwawa	54.8	56.1	54.9	1.3	-0.028	0.232	0.260	0.122	0.127	0.122	0.005	-0.023	0.196	0.219	*25*	*2*	*27*
Chiradzulu	69.3	66.6	69.1	-2.8	0.053	-0.613	-0.666	0.163	0.156	0.162	-0.007	0.025	-0.293	-0.318	*27*	*3*	*30*
Chitipa	65.6	69.9	66.6	4.4	-0.169	0.536	0.705	0.130	0.137	0.132	0.007	-0.059	0.186	0.245	*19*	*5*	*24*
Dedza	73.6	71.5	72.8	-2.2	0.168	-0.297	-0.465	0.187	0.208	0.195	0.021	-0.239	0.424	0.663	*23*	*13*	*36*
Dowa	50.6	47.6	49.8	-3.0	0.101	-0.303	-0.404	0.119	0.113	0.117	-0.006	0.045	-0.136	-0.181	*26*	*8*	*34*
Karonga	47.0	50.5	48.5	3.4	-0.195	0.255	0.451	0.088	0.097	0.092	0.009	-0.131	0.171	0.302	*19*	*11*	*30*
Lilongwe	76.7	76.7	76.7	0.0	-0.001	0.001	0.002	0.216	0.213	0.214	-0.003	0.034	-0.028	-0.061	*19*	*24*	*43*
Lilongwe city	43.9	47.4	44.1	3.5	-0.051	0.756	0.807	0.083	0.094	0.084	0.010	-0.042	0.622	0.664	*25*	*2*	*27*
Machinga	69.4	74.5	71.4	5.1	-0.403	0.626	1.029	0.161	0.178	0.167	0.017	-0.268	0.416	0.684	*17*	*7*	*24*
Mangochi	69.3	76.6	69.6	7.3	-0.048	1.406	1.454	0.169	0.195	0.170	0.026	-0.033	0.979	1.013	*43*	*1*	*44*
Mzimba	61.3	70.8	63.2	9.5	-0.311	1.264	1.575	0.135	0.173	0.142	0.039	-0.297	1.209	1.507	*38*	*11*	*49*
Nsanje	48.5	52.5	49.5	4.1	-0.177	0.540	0.718	0.096	0.129	0.104	0.033	-0.385	1.171	1.556	*18*	*6*	*24*
Ntcheu	79.0	82.6	79.6	3.6	-0.139	0.711	0.850	0.253	0.277	0.257	0.024	-0.106	0.544	0.650	*26*	*5*	*31*
Ntchisi	54.9	71.7	64.8	16.8	-1.116	0.780	1.896	0.140	0.230	0.193	0.090	-1.123	0.785	1.908	*12*	*15*	*27*
Salima	50.5	62.0	50.9	11.5	-0.052	1.460	1.511	0.098	0.117	0.099	0.019	-0.025	0.701	0.725	*33*	*1*	*34*
Thyolo	68.3	78.3	71.5	10.0	-0.331	0.722	1.054	0.173	0.227	0.190	0.054	-0.314	0.685	0.999	*24*	*10*	*34*
Malawi	**63.1**	**69.7**	**64.3**	**6.6**	**-0.191**	**0.927**	**1.118**	**0.151**	**0.185**	**0.157**	**0.034**	**-0.188**	**0.910**	**1.098**	***411***	***130***	***541***

Notes: information is presented only for those districts and urban centers in which FFASD projects were located. Standardized poverty measure: For example, in a district that has an estimated poverty headcount of 50.0 percent, with a standard error of the estimate of 5.0 percent, a local government ward with an estimated poverty headcount of 57.5 percent would have a standardized headcount value of 1.50 ((57.5 - 50.0) ÷ 5.0). A ward in the same district with an estimated poverty headcount of 35.0 percent would have a standardized headcount value of –3.0 ((35.0 - 50.0) ÷ 5.0). It is important to note that the poverty measures and standard errors used to standardize the measures are the weighted means of the ward-level estimates. In consequence, the standardized poverty measures are not Z-scores, so one cannot use the difference between them to assess statistical significance directly. To generate Z-scores, the variance, and not the standard errors, of those ward-level estimates would have had to have been used in the standardization process.

Table 2—Assessment of poverty targeting for MASAF Public Works Programme (PWP) projects

	Poverty headcount							Severity of poverty measure									
	Weighted mean measure (percent)				Weighted mean (ward) standardized			Weighted mean measure				Weighted mean (ward) standardized			*Ward count*		
District or urban center	**Wards without projects**	**Wards with projects**	**All wards**	**Differ-ence**	**Wards without projects**	**Wards with projects**	**Differ-ence**	**Wards without projects**	**Wards with projects**	**All wards**	**Differ-ence**	**Wards without projects**	**Wards with projects**	**Differ-ence**	***Wards without projects***	***Wards with projects***	***Total***
Balaka	67.4	69.8	68.7	2.4	-0.251	0.225	0.476	0.160	0.168	0.164	0.008	-0.164	0.148	0.312	*9*	*9*	*18*
Blantyre	53.6	56.8	55.3	3.2	-0.458	0.379	0.836	0.096	0.098	0.097	0.002	-0.058	0.048	0.106	*12*	*11*	*23*
Blantyre city	63.6	43.7	62.9	-20.0	0.171	-4.240	-4.411	0.169	0.099	0.167	-0.071	0.105	-2.589	-2.694	*23*	*1*	*24*
Chikwawa	53.3	58.2	54.9	4.9	-0.327	0.652	0.979	0.117	0.134	0.122	0.017	-0.243	0.484	0.728	*20*	*7*	*27*
Chiradzulu	68.8	70.0	69.1	1.2	-0.071	0.218	0.289	0.161	0.167	0.162	0.006	-0.066	0.203	0.269	*23*	*7*	*30*
Chitipa	65.6	68.7	66.6	3.1	-0.159	0.333	0.492	0.125	0.146	0.132	0.021	-0.241	0.506	0.746	*17*	*7*	*24*
Dedza	72.3	74.3	72.8	2.0	-0.110	0.317	0.427	0.187	0.218	0.195	0.032	-0.261	0.752	1.013	*27*	*9*	*36*
Dowa	43.5	61.5	49.8	18.0	-0.851	1.581	2.431	0.091	0.167	0.117	0.076	-0.795	1.478	2.273	*22*	*12*	*34*
Karonga	50.2	42.6	48.5	-7.6	0.225	-0.776	-1.001	0.097	0.075	0.092	-0.021	0.166	-0.570	-0.735	*24*	*6*	*30*
Kasungu	53.6	54.9	54.0	1.3	-0.083	0.184	0.268	0.092	0.099	0.094	0.007	-0.127	0.282	0.409	*35*	*11*	*46*
Likoma	-	52.5	52.5	-	-	0.000	-	-	0.094	0.094	-	-	0.000	-	*0*	*2*	*2*
Lilongwe	76.4	77.2	76.7	0.8	-0.036	0.067	0.103	0.210	0.221	0.214	0.010	-0.072	0.133	0.205	*29*	*14*	*43*
Lilongwe city	44.1	-	44.1	-	0.000	-	-	0.084	-	0.084	-	0.000	-	-	*27*	*0*	*27*
Machinga	70.7	72.2	71.4	1.5	-0.135	0.169	0.304	0.165	0.170	0.167	0.005	-0.080	0.099	0.179	*15*	*9*	*24*
Mangochi	68.3	72.7	69.6	4.5	-0.260	0.629	0.889	0.165	0.182	0.170	0.017	-0.191	0.462	0.653	*34*	*10*	*44*
Mchinji	62.8	60.8	62.4	-2.0	0.057	-0.213	-0.270	0.137	0.132	0.136	-0.006	0.037	-0.140	-0.177	*24*	*6*	*30*
Mulanje	60.0	61.2	60.3	1.1	-0.072	0.203	0.275	0.132	0.142	0.134	0.010	-0.159	0.450	0.608	*20*	*6*	*26*
Mwanza	73.2	61.1	69.1	-12.1	0.946	-1.819	-2.766	0.192	0.112	0.165	-0.080	0.814	-1.564	-2.378	*14*	*6*	*20*
Mzimba	62.1	66.1	63.2	4.0	-0.184	0.482	0.667	0.139	0.152	0.142	0.014	-0.148	0.388	0.537	*36*	*13*	*49*
Mzuzu city	61.4	76.6	63.5	15.2	-0.466	2.813	3.280	0.127	0.198	0.137	0.071	-0.534	3.222	3.756	*12*	*2*	*14*
Nkhata Bay	60.7	58.6	60.2	-2.1	0.118	-0.339	-0.458	0.129	0.127	0.129	-0.003	0.037	-0.106	-0.143	*17*	*4*	*21*
Nkhotakota	67.8	68.4	68.0	0.6	-0.033	0.070	0.103	0.143	0.141	0.142	-0.002	0.016	-0.034	-0.050	*22*	*9*	*31*
Nsanje	48.0	51.3	49.5	3.4	-0.266	0.327	0.594	0.106	0.102	0.104	-0.004	0.089	-0.109	-0.198	*14*	*10*	*24*
Ntcheu	77.9	83.4	79.6	5.4	-0.392	0.893	1.285	0.241	0.293	0.257	0.051	-0.427	0.972	1.399	*21*	*10*	*31*
Ntchisi	64.2	65.7	64.8	1.5	-0.064	0.104	0.168	0.190	0.197	0.193	0.008	-0.063	0.101	0.164	*17*	*10*	*27*
Phalombe	77.9	78.2	78.1	0.2	-0.034	0.042	0.075	0.237	0.250	0.243	0.014	-0.214	0.267	0.481	*9*	*5*	*14*
Rumphi	64.3	73.3	66.6	9.0	-0.332	0.981	1.313	0.161	0.216	0.175	0.055	-0.372	1.098	1.470	*15*	*4*	*19*
Salima	50.4	51.7	50.9	1.4	-0.073	0.105	0.178	0.100	0.098	0.099	-0.003	0.040	-0.057	-0.097	*22*	*12*	*34*
Thyolo	68.8	74.3	71.5	5.5	-0.281	0.296	0.577	0.179	0.201	0.190	0.022	-0.193	0.204	0.396	*20*	*14*	*34*
Zomba	65.7	67.0	66.1	1.3	-0.047	0.101	0.148	0.183	0.177	0.181	-0.006	0.041	-0.087	-0.128	*21*	*8*	*29*
Zomba city	70.1	-	70.1	-	0.000	-	-	0.184	-	0.184	-	0.000	-	-	*13*	*0*	*13*
Malawi	**63.1**	**67.0**	**64.3**	**3.9**	**-0.205**	**0.462**	**0.667**	**0.152**	**0.168**	**0.157**	**0.016**	**-0.162**	**0.364**	**0.526**	***614***	***234***	***848***

Notes: information is presented for all districts and urban centers. However, no PWP projects were located in Lilongwe city or Zomba city and both wards in Likoma district have projects. Standardized poverty measure: see note at bottom of Table 1.

standard error used is the weighted mean standard error for each poverty measure for the wards in the district. Positive standardized headcount or severity of poverty values indicates areas that are poorer or where more severe poverty is found than is the district norm, respectively, whereas negative values are less poor or less severe.

National Assessment

As the bottom rows in both Table 1 and Table 2 show, at the broad, national scale both programs do relatively well at targeting poorer areas. Local government wards in which WFP FFASD projects are found have an average poverty headcount that is 6.6 percent higher and a severity of poverty measure 0.034 higher than in the wards in which no such projects were located. The standard measure differences are 1.118 and 1.098, respectively.

Wards in which MASAF PWP projects are located have an aggregate poverty headcount 3.9 percent higher and a severity of poverty rating 0.016 greater than in those wards in which projects are not found. The standardized headcount and severity of poverty differences are 0.667 and 0.526, respectively, confirming that the MASAF projects, overall, are sited with a pro-poor orientation.

For both programs, the differences in both the average poverty headcount and the severity of poverty measures between wards with and without projects are unlikely to be *statistically* significant at the national level and for most districts. Being based on the weighted mean standard errors of the ward-level estimates, and not the variance of those estimates, the standardized poverty measures presented in Table 1 and Table 2 are not Z-scores, so one cannot use the difference between them to assess statistical significance directly. However, in this retrospective assessment of targeting efficiency, that there is a difference in poverty levels between where the program is and is not found, with, in most cases, program sites having worse poverty measures, is operationally significant, even if the differences observed are not statistically significant.

Within-District Assessment

At the district level, the results are somewhat mixed. Looking at the poverty headcount values in Table 1 in only one district, Chiradzulu, can strong criticism be made of the location of the FFASD projects, although better performance should also be expected in Dedza and Dowa? (The map in Figure 3 shows the locations of the districts and urban centers.) The wards in which projects are located in these three districts are clearly not among the poorest. In contrast, in seven districts—Blantyre, Machinga, Mangochi, Mzimba, Ntchisi, Salima, and Thyolo—the FFASD projects have been established in some of the poorest wards in these districts. Projects in the remaining seven districts tend to be located in poor areas, but more efficient targeting on a poverty basis is possible.

How well do the FFASD projects target the poorest in the population, based on the severity of poverty measure? Projects in Dowa and Chiradzulu are the most problematic. In contrast, performance in placing projects where the poorest reside is particularly good in Mzimba, Nsanje, and Ntchisi districts.

For the MASAF PWP projects, overall, the results are good. As shown in Table 2, projects in Dowa, Mzuzu City, and Rumphi districts are predominantly found in poorer wards. In contrast, Karonga and Mwanza districts are notable for having many projects located in less poor wards of the districts. (The one project located in Blantyre city also is in a distinctly nonpoor ward.) PWP projects in the other 24 districts and urban centers for which comparisons can be made tend to be located in areas that are poor but not distinctively so.

Turning to the severity of poverty measure for the PWP projects, the pattern seen with the headcount measure is confirmed. Dedza is an exception, where it appears that PWP projects were targeted to wards with a greater severity of poverty than would be expected by simply considering the poverty headcount measure. However, in comparing the two programs overall as to how well the poorest were targeted, the WFP FFASD is seen to have done a better job than the PWP. In the column in Table 2 on the PWP

Figure 3—The districts and urban areas of Malawi

projects showing the difference in the weighted mean standardized severity of poverty measure, one sees proportionally more districts in which the difference is close to zero or negative than is seen for the FFASD program in Table 1.

There are several reasons why the poverty targeting efficiency of both of these programs is mixed at the district level. First, the programs have multiple targeting criteria: poverty, while it is highlighted as being a dominant concern in the documentation on both programs, is not the sole concern in locating the program projects. Several other targeting criteria or program requirements may work against projects being located in the poorest areas within a district.

- Both programs require community participation. Projects will not be located in communities that are unable to sufficiently organize themselves to mount a project. Poor communities may be less able to organize themselves than other communities.
- The PWP projects are selected from already identified government projects. The criteria upon which these projects were originally identified may not have required any consideration of poverty incidence in the project area.
- Political considerations likely operate at the district level, just as they do at the national level. Moreover, it should be expected that logistics and convenience considerations also played a part in deciding where programs were sited within districts.
- WFP projects in Malawi are targeted based on the multifaceted VAM vulnerability assessment. Poverty also is a multifaceted concept. Consequently, we should expect that in many ways the spatial pattern of the VAM used by WFP in Malawi would replicate in important respects the poverty map used here. This may account for the quite efficient poverty targeting seen in the FFASD.

However, anticipating the discussion in the next section, the WFP's vulnerability assessment does consider several things that are not captured by the consumption-based measure of poverty in the poverty mapping. These include food insecurity and the occurrence of natural disasters. The poverty map is a cross-sectional, static representation of the incidence of poverty in Malawi—

specifically in 1997/98 when the IHS and Census were conducted. In contrast, the vulnerability assessment has a stronger temporal character—acute food insecurity and natural disasters are temporal phenomena. Consequently, one should expect that the vulnerability assessment WFP conducts in any given year would provide a different targeting scheme to that which is generated from the poverty map alone.

Use of the Poverty Map for Geographical Targeting of Public Works Programs

This retrospective assessment of the poverty targeting efficiency of the two public works programs using the Malawi poverty map demonstrates that both the WFP FFASD program and the MASAF PWP have done quite well in locating their projects in the poorer areas of the country. Although the use of the poverty map for targeting purposes is new, the information it provides is not radically different from the information that the program managers and their advisers possessed in deciding where to site projects. Although the poverty map would allow for some improvement in the targeting of projects in some districts, it is likely that the local government wards where the projects would be located, based on the poverty map, would not be all that different from where they were actually located.

However, an important advantage of using the poverty map to site projects is the ease with which poverty can now be employed as a criterion for geographical targeting. In deciding where to locate projects, program managers can use the poverty map to rank candidate locations and be quite confident in that ranking.[8] The method used is objective and can be defended on methodological grounds. Although the project documentation for both public works programs is not explicit as to how geographical targeting was done in the past, clearly local expert opinion played a large part. Such a subjective targeting procedure is valuable both for political reasons and for information triangulation

[8] The poverty map is most reliably used when one is ranking potential locations within a poverty map stratum. The same model is used to estimate the welfare of all households in a stratum. Across strata, however, the poverty map rankings will not be as reliable due to the application of different models to the households in the areas being ranked.

purposes and should continue to be used. However, both WFP and MASAF should find the Malawi poverty map equally valuable for targeting their projects. Its attributes of being easily used and objectively verifiable make it a particularly attractive tool for targeting in the often politically charged atmosphere of public works program implementation.

4. Value of Poverty Maps for Vulnerability Analysis and Mapping

In this section, opportunities for and constraints to incorporating the Malawi poverty map into the VAM methodology employed in Malawi will be considered.

The Malawi VAM—Organization, Method, and Tools

The Standard Analytical Framework used by WFP in carrying out VAM analyses in the countries in which it works invokes an ordered, iterative, and nested analytical framework that begins with a baseline assessment, followed by periodic monitoring (WFP 2002). The baseline assessment is primarily drawn from analysis of secondary data, which is then supplemented by community-level primary data collection to characterize particularly vulnerable food economy zones and to profile household dynamics of vulnerable populations within the zones. When food security emergencies arise, assessments are carried out to determine the scope of the emergency. These are followed by emergency monitoring activities. The baseline assessment is to be revisited from time to time.

The principal baseline assessment of Malawi that WFP and other institutions who are mandated to respond to food insecurity use is the 1996 document *A Quest for Causality* (Morinière, Chimwaza, and Weiss 1996). Using both a range of quantitative statistical techniques (principal components analysis and multiple linear regression) along with all available data and expert opinion on the causes of household food insecurity and vulnerability, the authors delineated five vulnerability clusters identified by the primary operative influences on livelihoods, food security, and food scarcity coping patterns in

each cluster. These clusters were spatially defined by the agricultural Extension Planning Areas (EPA), of which there are 154 in the country. The analysis went on to disaggregate the concept of vulnerability into three components—poverty, food deficiency, and malnutrition—and then to model the household and community determinants of each of these subcomponents at the cluster level. Finally, the authors examined macro- and meta-level predictors of household vulnerability in Malawi over the five years before the study, including rainfall patterns, the effects of economic liberalization, currency devaluation, and energy availability. In so doing, the research suggests policies that might be pursued to reduce household economic and food security vulnerability in each of the five clusters.[9]

A VAM technical working committee in the government of Malawi has been in existence since 1996. It brings together on a regular basis government, donor institutions, and NGOs involved in food security and disaster management, including WFP. Its secretariat is based in the Ministry of Economic Planning and Development in Lilongwe, within which a Food Security Unit has been operating since the early 1990s. It is charged with annually monitoring the food security situation in the country. Within the framework of the 1996 baseline report, the committee reviews crop and household food security assessments at the end of the cropping season to determine the current level of vulnerability across the country. If necessary, it undertakes follow-up field assessments in areas judged to be at risk of famine due to generally poor cropping conditions or natural disaster.

The principal source of temporal, seasonal information used by the committee are the detailed crop production estimates prepared at the EPA level by the Ministry of Agriculture and Irrigation three times during each cropping and postharvest season.

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[9] The 1996 VAM assessment document is a key source of information on the spatial patterns of household economic vulnerability in Malawi. However, there is need to update and to improve this core baseline documentation for vulnerability assessment. Beyond that the assessment reflects data from 1996, the analysis employed is relatively complex and presents results that are often difficult to relate to observations on the ground, particularly the principal components analysis. Moreover, at the core of the *quantitative* analysis are variables based on the opinions of a panel of experts on the causes of household vulnerability in Malawi—a subjective set of data that would be difficult to replicate.

Supplemental information is provided by the Malawi office of the USAID-supported famine early warning office (FEWS Net), which compiles rainfall and market price information from a variety of sources. It also undertakes some satellite image interpretation to provide additional information on the quality of the cropping season across the country.

Poverty Mapping and the Malawi VAM

In this section, we consider the value of poverty maps to comprehensive vulnerability assessments. First, it is useful to examine the concept of vulnerability. In the context of the VAM, vulnerability can be defined as the degree to which a household is likely to experience food shortages following exposure to any agricultural, economic, or health stress that reduces food availability. The likelihood of the household suffering food insufficiency is tied to two separate conditions: the *risk of exposure* to these stresses, and, more importantly in the context of the poverty map, the *coping ability* of the household. Although poverty does not perfectly correlate with a lack of resilience in coping with shocks that result in food scarcity, poverty is commonly used as a proxy for such vulnerability. Poor households are less able than the nonpoor to compensate for losses of food or income, whether they result from natural causes (drought, flood, illness, pests, and so forth) or human causes (macroeconomic shocks such as war and civil strife, for example). They are more likely than the nonpoor to suffer tragedy in the face of food scarcity.[10]

[10] Moreover, in rural areas, the consumption-based welfare indicator and poverty lines used in the Malawi poverty map primarily reflect food consumption. The poverty analysis of the 1997–98 IHS showed that 73.5 percent of the consumption of rural households is based on food. Moreover, the food poverty line, based on the recommended daily requirement for calories, makes up on average 82.5 percent of the three basic needs poverty lines in rural areas. Insufficient food consumption characterizes poverty in rural Malawi.

Potential Contributions a Poverty Map Can Make to Vulnerability Analysis

A poverty map is efficient in providing insight into household economic and food security vulnerability in several respects. First, a poverty map integrates a range of household and community information to predict aggregate welfare levels at a disaggregated level. If one accepts that there is a close correlation between poverty and vulnerability to food insecurity, analysts in countries where poverty maps have been constructed will find the maps a useful tool for determining where households vulnerable to food security shocks are likely to be found and how many households may be affected. The measures beyond the poverty headcount generated by the poverty mapping analysis—the depth and severity of poverty measures—add additional value by identifying where the most vulnerable households are found.

Second, the ward-level poverty map of Malawi is at a finer level of geography than has previously been available for VAM assessments. The local scale of this information permits considerable flexibility of use because the maps can be aggregated to broader scales, whether the EPA, district, vulnerability cluster, or food economy zone (Earl and Moseley 1996). Moreover, the poverty map allows for a better understanding of heterogeneity in baseline food security conditions within development and food relief program areas. One can profitably use the poverty map for refined geographical targeting and logistical arrangements.

Finally, poverty maps are relatively easy to understand. This feature of poverty mapping is in contrast to some of the analysis found in the 1996 Malawi baseline vulnerability report. The poverty map is based on models correlating the level of household welfare with household and community characteristics. The relationships described by the models tend to reflect broad understanding of how welfare is correlated with such characteristics. Consequently, the acceptability of the poverty map results for use in making decisions of political consequence are likely to be greater than when decisions are based on more obscure modeling of vulnerability or on subjective evaluations.

Although poverty maps are relatively easy to understand, however, this does not imply that they are easy to construct. Large data sets are used and relatively sophisticated analytical techniques are employed. It would be inefficient for WFP to include the *development* of poverty maps as part of the standard analysis by which vulnerability assessments are carried out. Poverty map construction is best left to specialized economic institutions. However, if a poverty map exists for a country, it should be exploited in conducting vulnerability assessments there.

Limits on the Use of Poverty Maps in Vulnerability Analysis

A poverty map can make an important contribution to our understanding of the spatial distribution of vulnerability to household food insecurity in a country such as Malawi. However, their limits should also be considered.

First, the poverty map only provides a proxy indicator of coping ability. In itself, it does not answer several other important questions that should be answered if a vulnerability assessment is to be of much value: Why do conditions of food insecurity and vulnerability exist in an area or for a population? Which subpopulations within a vulnerable area are most at risk? And, what sort of action should be taken to safeguard the well-being of the households at risk, whether food aid or some other intervention? Vulnerability is more a characteristic of people and households than of places—a social phenomenon rather than geographic (Downing and Patwardhan 2002). The poverty map only provides restricted insights into the characteristics of the populations in the areas of interest. To answer these questions on vulnerability requires additional detailed, localized, socioeconomic investigation, involving primary data collection.

Second, the poverty map is static. It represents the aggregate welfare conditions of quite small populations across Malawi at one point in time—the survey period of the 1997–98 Integrated Household Survey, using, as noted earlier, relatively stable household and community characteristics. Vulnerability is dynamic, reflecting, in addition to

coping capacity, the exposure of households to stress.[11] In order to capture this, temporal information is required. The poverty map in itself can only provide baseline information on the coping ability of the population—*baseline vulnerability*.[12] The actual exposure to stresses to which Malawian households must respond requires different data, such as the crop production, agroecological, and market information used in the annual vulnerability assessments of the VAM committee, to assess *current vulnerability*. In the framework for the development of VAM analyses for the countries in which WFP operates, the poverty map is most useful as part of the secondary data analysis that takes place in the earlier stages of developing a national comprehensive vulnerability analysis. In this regard, the poverty map, although constructed using quite different methods, provides a baseline assessment for Malawi similar to that offered by 1996 VAM document described earlier.

Nevertheless, poverty maps are not as flexible as one might desire if one seeks to track the important seasonal changes in food security status and welfare that are seen in many rural, subsistence economies around the world. As noted earlier, the variables employed in the Malawi poverty map models will not vary greatly in the short term, being relatively stable characteristics of households. Moreover, the data set to which the poverty map models are applied, the census data set, is limited with regard to information on household characteristics, which would be expected to vary considerably in the short term. Physical assets may be an exception to this, but only four such assets are monitored in the Malawi census—housing, radios, bicycles, and ox carts. Consequently, the important contribution that poverty maps can make when one is undertaking vulnerability analyses is in establishing baseline vulnerability rather than in tracking shorter-term changes in welfare or vulnerability.

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[11] Moreover, food security vulnerability is not the only dynamic concept; household welfare itself is also dynamic. The poverty map represents aggregate welfare in1997–98. In the case of Malawi, its economy has stagnated in the interim. Therefore, we would not expect much improvement in general welfare since then. In other countries where poverty maps have been constructed, significant changes in welfare might have occurred.

[12] Assuming that the survey year can be considered reflective of "normal" baseline conditions in the country.

However, in the case of Malawi, other components of the full IHS poverty analyses, of which the poverty map is a part, should be useful at some of the stages beyond the baseline vulnerability assessment for the VAM: the poverty profiles to identify important household correlates of rural poverty (National Economic Council 2000; Poverty Monitoring System 2000; 2001); the aggregate correlates of analyses of poorer areas to more closely refine geographical targeting (Benson 2002); and the household-level proxy means test for the final targeting of households (Payongayong et al. 2002)—all are immediately relevant to the VAM. The poverty map is only one segment of a much wider assessment of the welfare conditions of the population of Malawi based on the 1997–98 IHS. These additional analyses and data sets allow for a better understanding of the capacity of households to deal with food scarcity than is provided by the poverty map alone.

5. Conclusions

This paper examines the targeting efficiency of two public works programs in Malawi and the manner in which the VAM process is conducted there. Both were judged to work reasonably well. However, the poverty-based targeting of both programs could be improved and simplified by using the poverty map that has been constructed for Malawi. The poverty map provides analysts with detailed information on where to find disproportionate numbers of poor Malawians who may require help to cope with periods of food scarcity and reduced welfare. Thus, the efficiency of planning and targeting projects to enhance food security should improve with the use of the poverty map.

However, while the poverty map should serve as a necessary information component for targeting relief and development programs in Malawi, it is not sufficient in itself. Poverty maps are not simple to construct; moreover, they provide a static view of welfare, albeit it at a disaggregated level. Particularly for food security interventions, information on seasonal agro-ecological and economic conditions must be integrated into targeting decisions. While the poverty map provides a cross-sectional view of household

welfare in Malawi, welfare and poverty are, in fact, not static. The VAM process provides a complementary set of dynamic criteria necessary to assess vulnerability. Poverty maps cannot wholly replace this process.

In sum, poverty mapping is a relevant and useful decisionmaking tool to employ in targeting relief and development programs. The poverty map integrates a range of household and community characteristics to estimate aggregate welfare levels in a manner that is easily understood by its users and of immediate relevance in considering the vulnerability to food insecurity that households face. When used with complementary data that are more temporal in nature, the information such maps provide should be acceptable for use in an objective and nonpolitical prioritization of areas for targeting poverty reduction projects and for implementing emergencies, food aid distributions, and other vulnerability mitigation efforts.

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