

## **HIV prevalence and orphan household distribution in a rural Malawi district**

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## Introduction

Orphanhood, already relatively common in sub-Saharan Africa prior to AIDS, is now increasingly so. According to UNAIDS estimates, one in nine sub-Saharan African children under 15 years of age lost a parent in 2001 (UNAIDS). Given the transmission of HIV from one spouse to another, there is also an increase in the prevalence of “double orphans”, that is, those without any living biological parents.

This growth in the orphan population has generated considerable interest among researchers, leading to considerable progress in identifying and resolving problems related to the measurement of orphans, the first step towards accurately diagnosing the scale of the orphanhood phenomenon, and its broader socioeconomic effects (Bicego et al 2003; Grassley et al 2004; Monasch and Boerma 2004; Zaba et al 2005).<sup>1</sup> But the missing piece in this emerging literature is related to the distribution of orphans. We cannot yet say, in any systematic way, how orphans are fostered, by whom, under what circumstances, with which siblings, at what age, and so on.

Answering these questions—or at least beginning the process—is our key aim in this paper. We use a variety of sources of data from Malawi, a country whose HIV prevalence is estimated at 14.2% (Population Reference Bureau, 2005). Specifically, we draw on a household survey—including geocodes collected in 2004 (by recording household longitudes and latitudes with handheld Global Position System [GPS] units)—data on respondent's HIV status, orphan rosters maintained by village chiefs, and qualitative interviews from a rural district in central Malawi. Analysis proceeds in three stages. First, we explore issues related to the care and distribution of orphans that emerge from qualitative interviews. Second, we compare the prevalence and distribution of households containing orphans with HIV prevalence by village as well as living arrangements of orphans. We also explore orphan prevalence by variance in household material composition, age and gender of head of household, and HIV prevalence by village to better understand how adult mortality related to AIDS may play a role in orphan distribution. Third, drawing on the GPS data, we explore the spatial distribution of orphans, comparing it to the spatial distribution of other factors including HIV prevalence and the availability of a range of development-related infrastructure. We conclude by considering a number of methodological issues that arise from the analysis, focusing in particular on survey designs that could improve the identification of and reporting of orphans and their residential arrangements amongst populations with high HIV/AIDS prevalence.

## Data and Methods

This paper uses geocoding, household demographic, as well as HIV biomarker data gathered from May to June 2004 in a rural district named Balaka in the Central Region of Malawi. The geocoded data was collected in succession with the household demographic

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<sup>1</sup> There have also been significant increases in the attention devoted to this issue by researchers affiliated with aid communities and related groups (e.g., investigative journalists).

data during a household listing of 18 villages (2679 HH) in the Balaka District (Figure 1). From the identical 18 villages, HIV biomarker data was collected from 1042 respondents sampled from amongst 1150 households by the Malawi Diffusion and Ideational Change Project (MDICP).<sup>2</sup> The sample is taken from a rural location where antenatal clinic HIV testing is uncommon. The closest antenatal testing clinic is 50 kilometers away in Mangochi, a semi-urban site where HIV sero-prevalence in 2001 was reported to be 16.4% (National AIDS Control Programme, 2001). We restrict attention to “orphans”, which we define as less than 15 years of age whose mother has died, father has died, or both.

Present estimates for national HIV prevalence is 14.2% (Population Reference Bureau, 2005). The MDICP HIV biomarker data was collected in 2004 from 1042 respondents sampled from amongst 1150 households. Greater than 90% of MDICP respondents who were found agreed to be tested (Thornton et al., 2005). In the MDICP Balaka sample, HIV prevalence was 9.1% on women and 7.2% in men (Table 1). HIV prevalence by village ranges from 0% to 17.5% (Table 2, Figure 2). This HIV data allows us to create spatial maps which compare each variable presented in this paper with HIV prevalence by village.

This 2005, qualitative interviews were conducted in a sample of the same Balaka villages with individuals who were caretakers of at least one orphan. Our aim was to better understand individual and family responses to an orphan’s parent death, financial expenses, inter/intra family negotiations, child care strategies, orphanages, and social network stresses placed on care holders by orphans. These qualitative interviews allow us to better understand issues related to the care and distribution of orphans.

The longitudinal and latitudinal geographic locations of households were recorded in 2004 in succession with the household survey. All survey and HIV data has been merged with these geocodes by identifying MDICP respondents and matching their IDs with household IDs. Demographic research is moving inexorably from its long-standing pattern of spatial awareness to an increased appreciation for the value and utility of spatial analysis (Weeks, 2001).

In countries most impacted by the HIV/AIDS epidemic (East and Southern Africa), double orphan prevalence is disproportionately high: 10–17 percent of all orphans have lost both parents, compared to 4–8 percent in most other countries (West and Central Africa). Table 3 and Figure 3 show the proportion of children under age 15 living in households who have lost their mother, their father, both parents, and either parent. Paternal orphan prevalence ranges from 2.7 percent to 18.3 percent and is on average more than three times that of maternal orphan prevalence. We found that overall paternal orphanhood is 6.3%, maternal orphanhood 1.8%, one or more parent dead 5.0%, and either parent dead at 13.1%. Malawi DHS 2000 data found overall paternal orphanhood

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<sup>2</sup> Both data sets were collected by the Malawi Diffusion Ideational and Change Project (MDICP), managed by the University of Pennsylvania’s Population Studies Center. Sample sites were chosen because they have been longitudinally surveyed by MDICP since 1998. Geocoding was not conducted before 2004 for this project. Support for this project is from the National Institute of Child Health and Human Development (NICHD), grant R01-HD37276, and the Rockefeller Foundation, grant RF-99009#199.

to be 8.3%, maternal orphanhood 4.9%, one or more parent dead 1.9%, and either parent dead at 11.3% (Bicego et al., 2003). By comparing our findings from 2004 with those of DHS in 2000, it is clear that we found higher orphan prevalence than did DHS in each category as well as a larger ratio of paternal to maternal orphanhood (ratio of 3.5 to 1.7). These findings support the suggestion that DHS under-estimated orphanhood prevalence (Grassly et al., 2004). This combination of a high level of double orphans along with a larger ratio of paternal to maternal orphanhood supports the hypothesis that high adult mortality is due to AIDS.

In order to determine spatial the spatial distribution of orphans we examined whether households with orphans are distributed randomly. For this purpose we use the Weighted K-function (Getis and Ord, 1992) to test for the spatial clustering of the households in respect to the level of orphanhood within and between villages. The L(d) Random values in Table 4 represents the expected spatial pattern for randomly distributed households. This graph of the K function (Figure 4) and the results shown in Table 3 indicate that there is some significant spatial clustering between households with orphans, especially among households within a distance of 800 meters or more.

Using the  $G_i^*$  statistics (Ord and Getis, 1995) we tested for statistically significant local spatial clustering to detect hot spots and to identify in what villages households with orphans are more often present and clustered together, i.e. sharing some common characteristics in respect to the mortality of their children. We compute first the  $G_i^*$  scores for the villages based on the number of orphans per household in 2004 using a starting distance of 200 meters and a distance increment of 200 meters. We present here the result for a distance of 800 meters between households, but the results are similar up to a distance of 1800 meters (Figure 5). We find with high statistical certitude (Z-score above 1.96) that the distribution of households with orphans in three villages (12, 18 and 11) in the northern part of our survey area far exceed what might exist completely at random.

Figure 6 displays the linear relationship between HIV prevalence and orphan prevalence.

$$y = 0.0016x + 0.1279$$

$$R^2 = 0.0158$$

[x=HIV prevalence, y=orphan prevalence, report slope and  $R^2$ ]

Table 6 shows the percentage distribution of children under age 15 living in different type of households. Age is a useful criterion to identify more vulnerable households. In this analysis, we focused on elderly, and we used as selection criteria the households whose heads were 60 years old or more.

By focusing on survey design while exploiting various analytic methods with quantitative and qualitative data, we expect to contribute to a better knowledge to improve the identification of and reporting of orphans and their residential arrangements in populations with high HIV/AIDS prevalence.

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Tables and Figures

Figure 1. Study Location

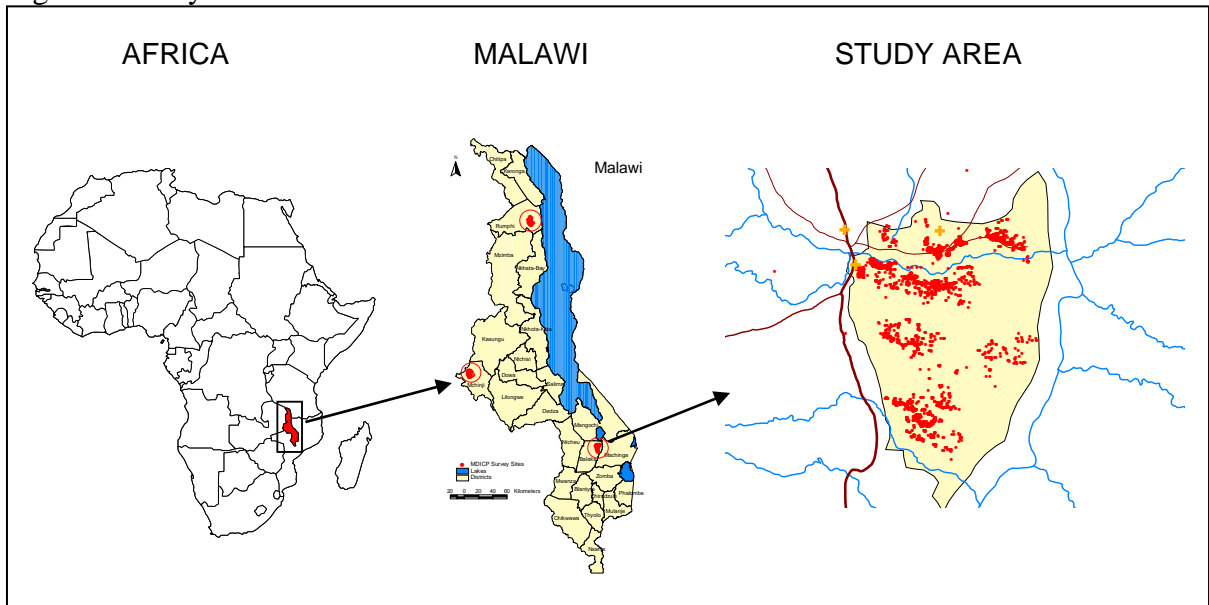


Table 1. HIV prevalence by sex in the 2004 MDICP Balaka sample (respondents aged 15+ years)

	TOTAL		MEN		WOMEN	
	%	N	%	N	%	N
Balaka	8.0	1042	7.2	462	9.1	580

Table 2. HIV prevalence by village in the 2004 MDICP Balaka sample

village number	number tested	Number HIV+	percent HIV+
1	28	0	0.0%
2	43	2	4.7%
3	75	10	13.3%
4	NA	NA	NA
5	22	0	0.0%
6	94	4	4.3%
7	55	2	3.6%
8	77	10	13.0%
9	57	10	17.5%
10	105	7	6.7%
11	119	12	10.1%
12	62	4	6.5%
13	34	3	8.8%
14	86	8	9.3%
15	36	1	2.8%
16	54	4	7.4%
17	72	6	8.3%
18	23	0	0.0%
TOTAL	1042	83	8.0%

Figure 2. HIV prevalence by village in the 2004 MDICP Balaka sample

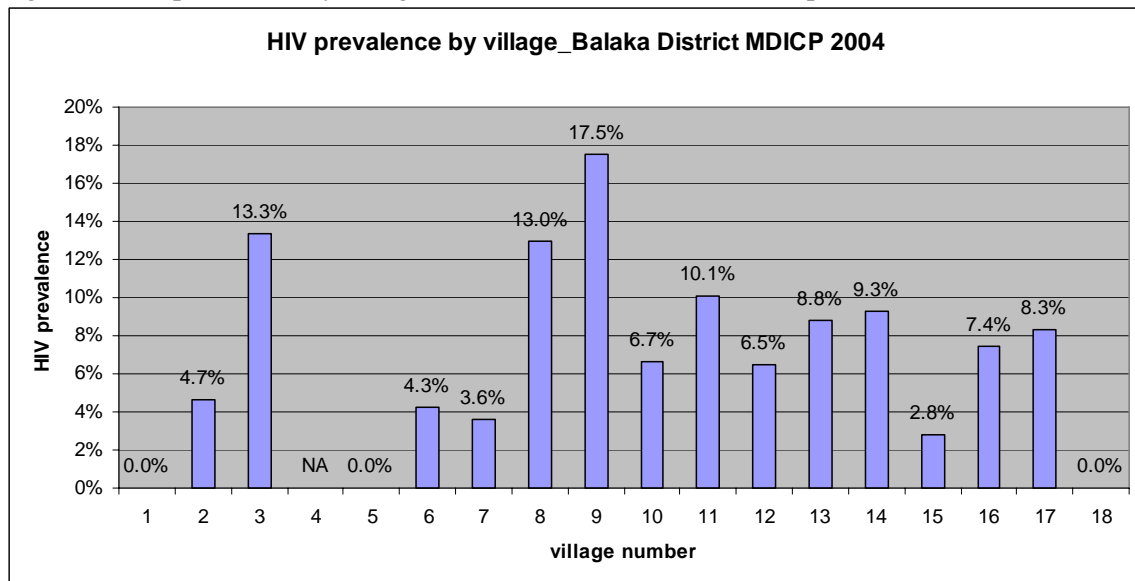




Table 3. Percentage of children under age 15 living in households who have lost their mother, their father or both parents by village in the 2004 Balaka Household Survey

Village number	Children under age 15	Mother dead	Father dead	Both parents dead	One or both parents dead	Conditional mean number of orphans per household	Wealth ranking	% orphans
16	190	1.1	2.7	2.7	6.5	1.67	14	6.5%
4	525	2.0	3.8	2.2	8.0	1.74	9	8.0%
7	167	1.3	3.1	3.8	8.2	2.16	11	8.2%
9	155	1.3	2.7	6.0	9.9	1.18	3	9.9%
6	387	1.8	5.3	4.0	11.1	1.68	8	11.0%
11	533	1.0	6.5	3.5	11.0	1.41	5	11.0%
17	308	2.2	7.3	1.6	11.0	1.30	16	11.1%
8	238	1.7	3.7	5.7	11.1	1.67	15	11.1%
14	298	1.1	6.0	4.6	11.6	1.88	4	11.6%
1	634	2.8	6.2	2.8	11.8	2.18	7	11.8%
15	381	1.9	6.6	3.6	12.0	1.87	2	12.0%
12	178	1.2	9.8	2.3	13.3	2.09	1	13.3%
5	242	0.9	9.5	3.5	13.8	2.00	18	13.8%
3	295	1.4	10.8	6.6	18.8	1.50	10	18.8%
13	62	0.0	11.5	8.2	19.7	1.69	13	19.7%
2	156	2.0	8.2	12.2	22.4	1.20	6	22.5%
10	364	2.1	3.8	18.4	24.3	1.50	12	24.3%
18	120	5.2	18.3	9.6	33.1	2.38	17	33.0%
Whole area	5233	1.8	6.3	5.0	13.1	1.72		13.1%

Figure 3. Percentage of children under age 15 living in households who have lost their mother, their father or both parents by village in the 2004 Balaka Household Survey

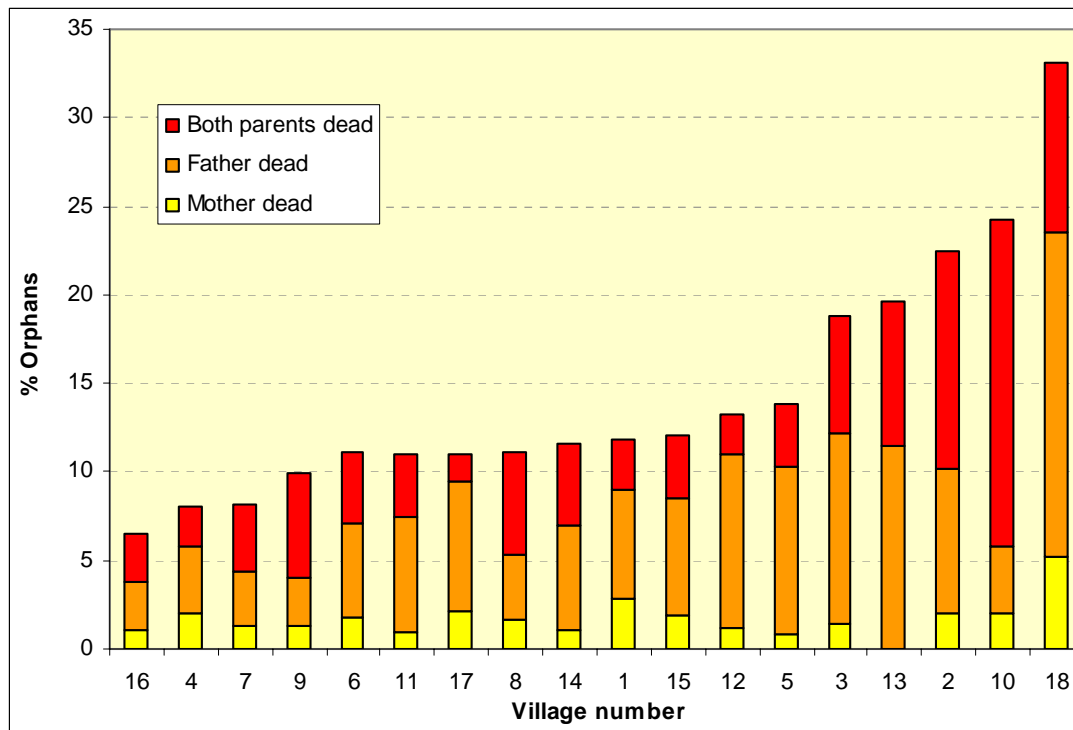


Table 4. Orphans: K-function analysis (in meters) with 100 meters increments

ltr	L(d)Random	L(d)obs	Cum dif	L(d)min	L(d)max	Dif
1	100.0	455.8	455.8	105.9	124.7	331.1
2	200.0	624.6	168.8	171.3	195.8	428.9
3	300.0	823.3	198.7	285.8	314.5	508.8
4	400.0	968.4	145.2	358.4	396.6	571.8
5	500.0	1123.0	154.6	453.2	489.3	633.7
6	600.0	1239.3	116.3	537.1	578.2	661.1
7	700.0	1335.5	96.1	622.4	667.2	668.3
8	800.0	1431.5	96.1	703.5	750.2	681.3
9	900.0	1549.9	118.4	803.3	844.6	705.3
10	1000.0	1652.5	102.6	873.5	918.5	734.1

Figure 4. Orphans: K-function analysis (in meters) with 100 meters increments

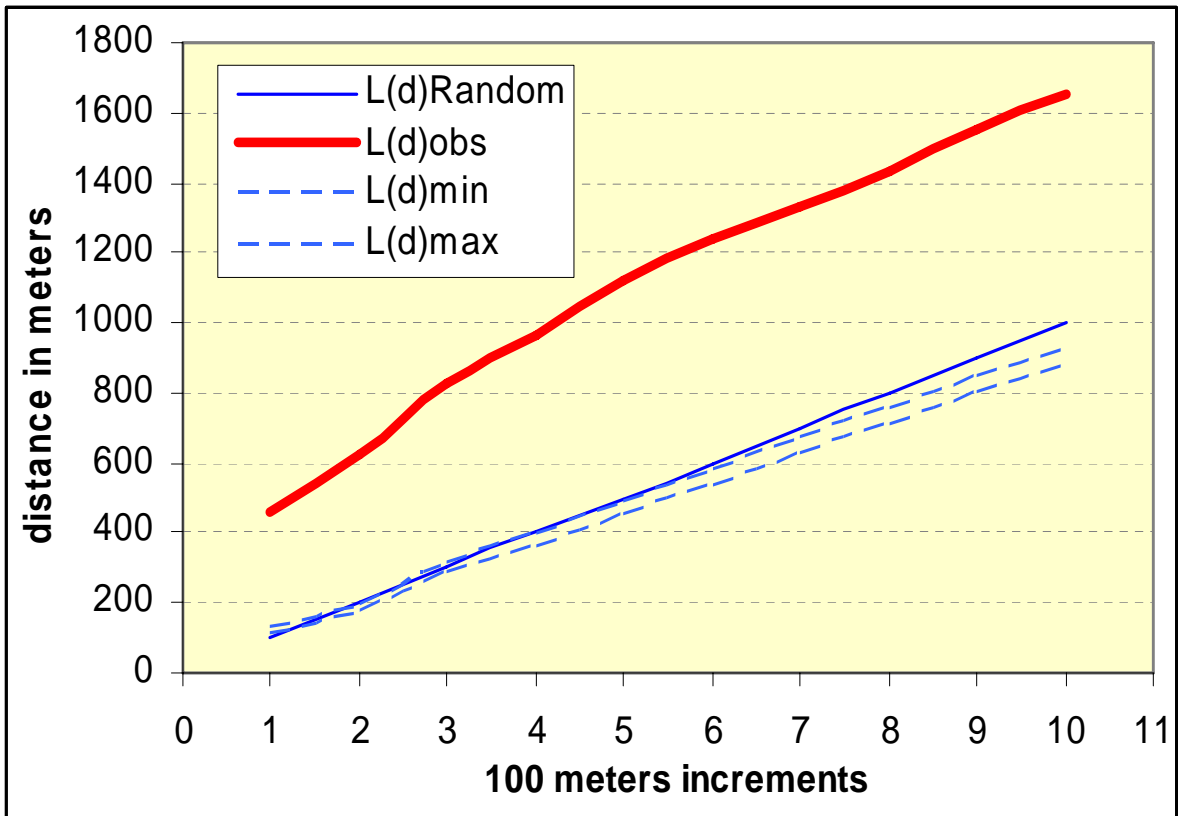


Figure 5. Distribution of households by number of orphans and Z-scores for Gi\* statistics

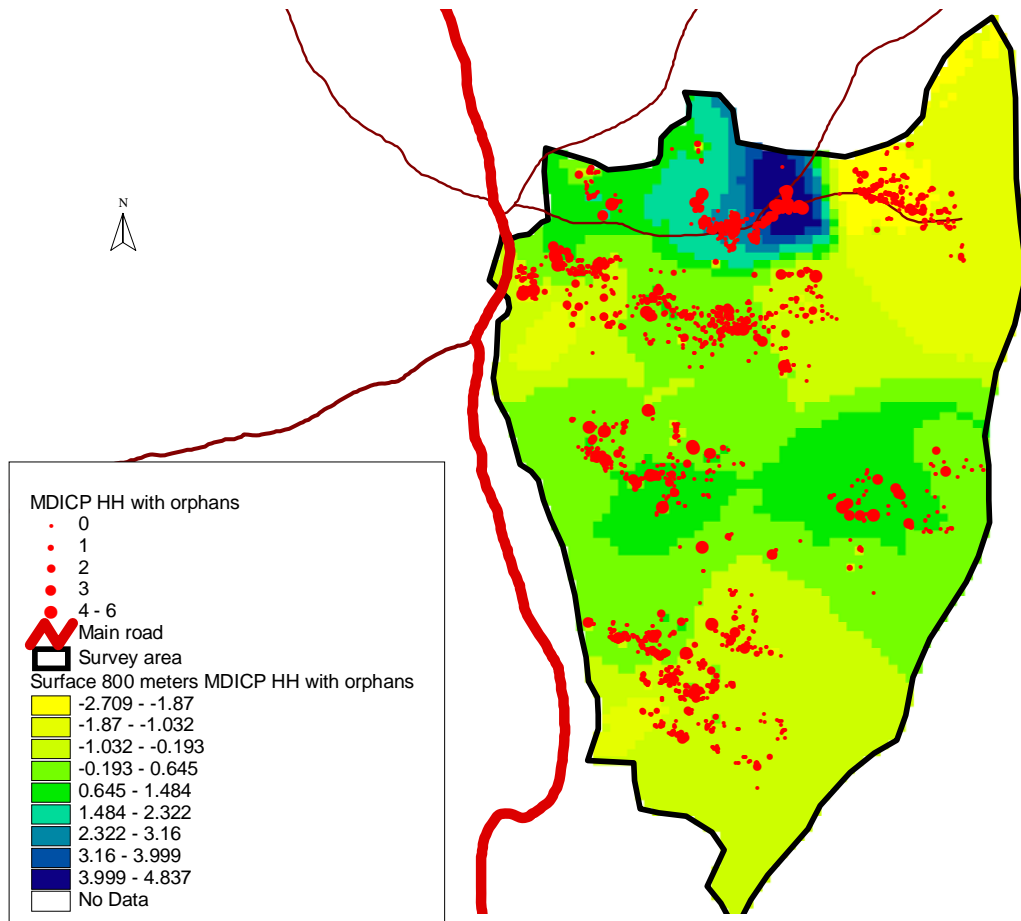


Table 5. HIV prevalence and orphan prevalence in the 2004 Balaka Household Survey

Village number	Wealth ranking	Average HH distance to main road (kms)	Number of households	Total population	HIV prevalence	Children under age 15	% orphans	Average HH standard of living (0-5)
1	7	2.4	333	1,314	0.0%	612	11.8%	3.38
2	6	2.2	79	342	4.7%	147	22.5%	3.38
3	10	3.0	151	620	13.3%	287	18.8%	3.50
4	9	8.1	287	1,115	NA	498	8.0%	3.43
5	18	1.2	114	468	0.0%	232	13.8%	3.84
6	8	3.2	211	815	4.3%	372	11.0%	3.40
7	11	2.2	89	334	3.6%	159	8.2%	3.50
8	15	1.8	125	534	13.0%	225	11.1%	3.60
9	3	0.7	77	366	17.5%	151	9.9%	3.33
10	12	6.1	174	736	6.7%	342	24.3%	3.51
11	5	4.5	266	1,067	10.1%	508	11.0%	3.36
12	1	5.9	78	347	6.5%	173	13.3%	3.23
13	13	4.5	31	121	8.8%	61	19.7%	3.53
14	4	3.3	159	613	9.3%	285	11.6%	3.35
15	2	5.0	232	836	2.8%	366	12.0%	3.29
16	14	2.5	97	390	7.4%	185	6.5%	3.54
17	16	5.7	140	631	8.3%	298	11.1%	3.63
18	17	5.6	42	235	0.0%	115	33.0%	3.63
Whole area		4.0	2,685	10,884	8.0%	5016	13.1%	3.45

Figure 6. HIV prevalence and orphan prevalence in the 2004 Balaka Household Survey

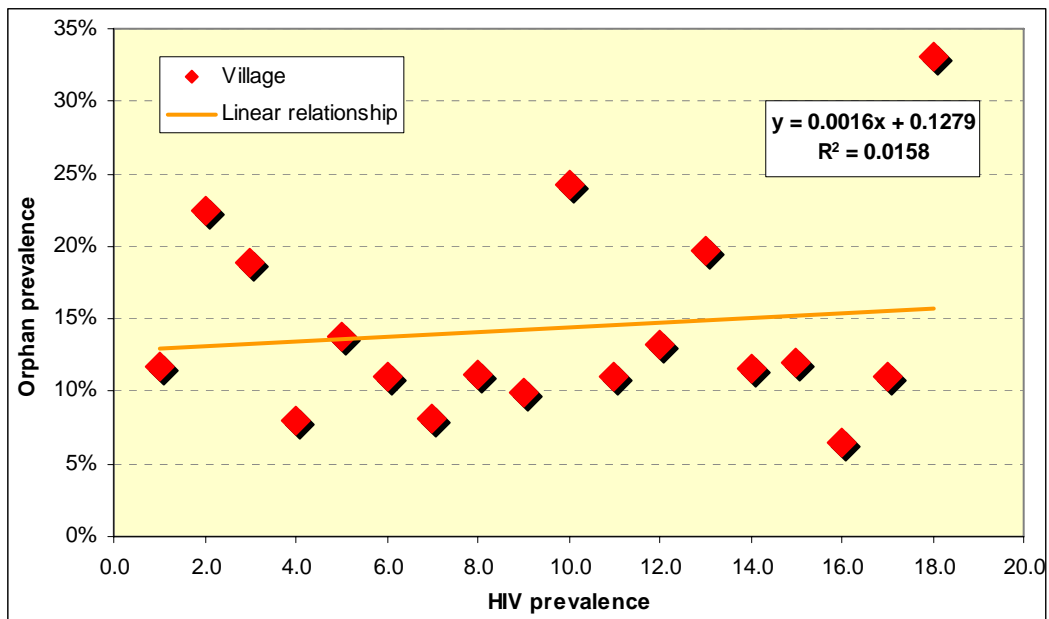


Table 6. Percentage distribution of children under age 15 living in different type of households in the 2004 Balaka Household Survey

	Number of households	Children under age 15	Both parents alive	Mother dead	Father dead	Both parents dead	One or both parents dead
Elderly HH							
No	1,551	2,961	90.1	68.7	81.2	76.3	88.3
Yes	302	391	10.0	31.3	18.8	23.7	11.7
Grand-parent HH							
No	2,460	4,104	94.2	67.4	86.2	79.8	92.5
Yes	225	253	5.8	32.6	13.8	20.2	7.5
Female HH							
Male Head of HH	1,982	3,490	81.3	64.0	39.2	73.0	77.9
Female Head of HH	653	803	18.7	36.0	60.8	27.0	22.1
Total	2,685	5,016	100,0	100,0	100,0	100,0	100,0