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Household Vulnerability Index (HVI) for Quantifying Impact of HIV and AIDS on Rural Livelihoods

Report compiled for FANRPAN by

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1. Introduction

HIV and AIDS has increased the humanitarian crisis being faced in the Southern African region. Save the Children, 2002 noted that the pandemic is threatening the lives of some 16 million people in the region. UNAIDS (2002) report that of the 25.3 million infected people in the world, 70% of the total is in sub-Saharan Africa. The report also states that of the entire infected population of adults in Africa, 20% come from only nine southern African countries – Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. Such a situation in the region is alarming and has called for greater efforts in understanding how the disease affects the livelihoods of the African communities and hence inform policy on actions that need to be taken to reverse the impact of the pandemic especially on agriculture and food security. This has resulted in several HIV and AIDS impact related studies being undertaken by various stakeholders in the region. These studies have focused mainly on increasing knowledge as regards the pandemic and its effects on livelihoods and the mitigation or response efforts that need to be undertaken.

Hence the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) in collaboration with SADC and EU also undertook a regional study in 2004 that focused on the *Impact of HIV and AIDS on Agriculture and Food Security* in seven SADC countries i.e., Lesotho, Botswana, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. Although this study was able to establish common ground on how HIV and AIDS impact households' agriculture and food security it assessed this impact qualitatively, and often, following a chosen theme. The study was unable to put a quantitative measure to household vulnerability in the presence of HIV and AIDS, which FANRPAN believe is pivotal to effective intervention in the HIV and AIDS crisis. To be able to address vulnerability, we need to be able to measure it, so that we can identify areas of highest priority (Thomas, 2003).

In theory, it should be easy to see that a household with better material wealth should be better equipped to cope with HIV and AIDS, yet the level of coping depends on the quantity and quality of such wealth, level of knowledge about the disease; and other complex societal variables. As a follow up to the 2004 FANRPAN study, the Household Vulnerability Index (HVI) study will carry out an advanced analysis of previous and new data to develop a consistent and comparable methodology of quantifying vulnerability. This entails investigating the different *dimensions* through which households are prone to impacts. In theory, it is possible to quantify such vulnerability per household by applying appropriate weights and scales to each of the impact areas and deriving an index that makes it possible to compare households' vulnerability. Such an index could also be useful for comparing households, regions, and communities.

2. Objectives of this study

The study seeks to develop:

- a) A refined method for constructing a vulnerability index- the Household Vulnerability Index (HVI). The index will shed new light on the different degrees and levels of household vulnerability introduced by the HIV and AIDS pandemic on household agriculture and food security.
- b) A computerized statistical tool for computing HVI. The tool will be useful for vulnerability assessments in general as well as introduce the quantitative inclusion of the impact of the pandemic in vulnerability assessments.
- c) HVI for the study data will be a usable indicator for monitoring how assisted households graduate or deteriorate from one level of vulnerability to another. It will also shed light on what would be required to move households from acute vulnerability to coping levels.

The practical outputs of the study are that all the households sampled will be categorized into at least one of three levels of vulnerability based on the index: Coping level households (CLH); Acute level households (ALH) and Emergency level households (ELH). Then, based on the different vulnerability levels specific relief or development packages will be recommended to policy makers for assisting the affected households overcome both their internal and external vulnerability. A tracking system will then be recommended to monitor how supported households graduate or deteriorate from one level of vulnerability to another.

3. Study Approach

The study has been designed to be a truly regional collaboration. FANRPAN understands and appreciates the quality and quantity of research efforts by various stakeholders working on agriculture and food security in the SADC region. FANRPAN therefore seeks to tap into this expertise, and ensure that the result will not only be highly robust to the needs of the region, but usable by programme implementers working on issues of HIV and AIDS, poverty and food security.

FANRPAN has set up a regional reference group that is steering the development of the HVI. FANRPAN has invited a number of stakeholders to this group, including government departments of agriculture, health and social protection, academic institutions of higher learning, regional early warning systems, regional and international agriculture and natural resources research institutions, UN agencies Vulnerability Action Committees (VACs), and other policy makers including those beyond southern Africa that have an interest in the development of this tool. The process is facilitated by FANRPAN's regional secretariat based in Pretoria, South Africa. Participation in the study is coordinated through the project webpage on the FANRPAN website and via email.

4. Brief Literature Review

4.1 Vulnerability as a concept

FANRPAN steered the direction for the project early in the study by endeavoring to get a common understanding of the meaning of vulnerability. Though there are a number of definitions of vulnerability arising from different disciplines some common features emerge.

“Vulnerability encompasses the factors that lead to variation in the impact of disease between different communities and individuals”

Bates et al, 2004

“Vulnerability of a person is the prospect that a person has now of being poor in the future i.e., the prospect of becoming poor if currently not poor, or the prospect of continuing to be poor if currently poor.”

Christiaensen and Subbarao (2004)

“Vulnerability of rural households to HIV and AIDS is the capacity of households to cope with, resist and recover from HIV and AIDS infection.”

Oyekale, (2004)

“Vulnerability is a function of exposure to risk and inability to cope.”

World Food Programme (1999)

Using the WFP definition HIV and AIDS affected households are exposed to the risk of the impacts of the virus such as loss of productive assets, labour, wage income, etc and the ability of these households to cope is their capacity to physically survive the shock with their livelihood more or less intact by depending on their income and other assets such as labor, physical assets, productive assets, social capital, and other support systems and entitlements.

The above definitions show that vulnerability is a generally wide concept that describes the features of a social and economic entity that determine the severity of impact on rural households likely to be caused by excess morbidity and mortality (Barnett et al (2000).

4.2 HIV and AIDS, Household Vulnerability and Food Security

HIV and AIDS affects rural households most of whom depend on agriculture as a source of livelihood (Mano and Chipfupa, 2005). Mutangadura et al, (1999) and Shapouri and Rosen (2001) states that HIV and AIDS is a major threat to agriculture and food security because it reduces agricultural productivity and diminishes the availability of food through direct loss of family labour, reduction in time allocated to farming, sales of farm assets, cultivation of marginal land and marginalization of surviving widow from land ownership by customary land tenure system.

HIV and AIDS causes spending to rise particularly on medical care and funeral expenses (Bates et al, 2004). FANRPAN’s study on *Impact of HIV and AIDS on Agriculture and Food Security* conducted in seven SADC countries in 2004 also confirmed the above findings, and generally showed that food production and income declines in HIV and AIDS affected

households. The pandemic exposes rural households to poverty mainly through its effects on agricultural production and food security.

Extend of this exposure i.e., how households are vulnerable to the impacts of HIV and AIDS depends on their socio-economic and political status. Households are bound to have varying degrees in resilience or their ability to cope and this has implications on the policy recommendations intended to mitigate the impact of the disease. As refuted by Bates et al (2004), vulnerability is too broad a concept to enable effective targeting of the most vulnerable especially when resources are scarce. In their guidelines for vulnerability mapping, WFP (1999) stressed the need for creating a vulnerability database that is useful to identify both chronic and transitory vulnerabilities i.e., groups that are permanently vulnerable and those that are temporarily vulnerable must be differentiated for appropriate policy action. This cements the need to develop an appropriate method of quantifying the levels of vulnerability of each household.

4.3. Coping Strategies in the face of HIV and AIDS

Rural households adapt various coping strategies to reduce or even reverse the impacts of HIV and AIDS on their livelihoods. Coping strategies that are pursued not only depend on but have a cumulative impact on, the assets upon which a household can draw and hence influence a household's future vulnerability (White and Robinson, 2000). These strategies can be short-term unsustainable or long-term sustainable coping strategies. Mani (2001), states that while the responses of the poor in coping with a shock such as HIV and AIDS provide valuable clues to policymakers, their effectiveness in reducing vulnerability must be carefully assessed. He went on to give some examples e.g. relying on child labor to ensure subsistence of the household would result in long-term decline of the child's potential as he or she may not attend school and may suffer from health problems. Without development of human capital the households will remain vulnerable in the long term. Also, the type of employment that the vulnerable gain access to during a crisis needs to be studied – for example, women entering prostitution to cope is not a desirable solution (Mani, 2001).

SAfAIDS (1999) identified three categories of household coping strategies i.e., strategies aimed at improving food security (reducing household consumption, sending children away to live with relatives, etc), raising and supplementing income in order to maintain household expenditure levels (selling assets, migrating to work, etc) and alleviating the loss of labour (putting extra hours, intra household labour reallocation, etc). Chen and Dunn (1996) further analyzed how households were coping with impacts of HIV and AIDS and came up a 'Household loss Management framework' which stated that coping strategies that are pursued not only depend on, but have a cumulative impact on the assets upon which a household can draw and hence influence a household's future vulnerability. The framework states that different coping strategies fall within three stages of loss management i.e., reversible mechanisms and disposal of self-insurance assets, disposal of productive assets and destitution. Fig 1 below illustrates the three stages of coping against impact of HIV and AIDS.

Stages of loss Management	Strategies
<p style="text-align: center;">I <i>Reversible mechanisms and disposal of self insurance assets</i></p>	<ul style="list-style-type: none"> • seeking wage labour or migrating to find paid work • switching to producing low-maintenance substance crops • liquidating savings accounts, selling jewellery, chicken, goats • calling on extended family or community obligations • borrowing from formal or informal credit sources • reducing consumption and decreasing spending (e.g. on education, health, etc)
<p style="text-align: center;">II <i>Disposal of productive assets</i></p>	<ul style="list-style-type: none"> • selling land, equipment, tools or animals used for farming • borrowing at exorbitant interest rates • further reduction in consumption, education and health • reducing amount of land farmed and types of crops produced
<p style="text-align: center;">III <i>Destitution</i></p>	<ul style="list-style-type: none"> • dependency on charity • breakdown of household • distress migration

Fig 1. Household loss Management (Source: Chen and Dunn, 1996)

4.4. Determinants of household vulnerability

A number of factors affect the ability of a household to cope in the presence of HIV and AIDS. Oyakele (2004) when analyzing household vulnerability to HIV and AIDS in 5 states in Nigeria found five factors that were significantly affecting household vulnerability. These factors were age of household head, primary occupation, household size, years of schooling, distance of public health clinics and farm income. In another study in rural Kenya, Christiaensen and Subbarao (2004) found out a number of important factors contributing to vulnerability. They found out that natural hazards (such as droughts), land holdings, fertilizer uses, access to non-farm sources of income, household size, dependency ratio and adult literacy were determinants.

Size of the household affects consumption and labor availability. The expected results are rather contradictory. Larger household sizes are expected to reduce average consumption per adult equivalent thereby increasing vulnerability but they could also result in greater flexibility and time savings in times of higher economic activity. The larger the dependency ratio the larger would be the household vulnerability to poverty (Christiaensen and Subbarao, 2004). The changing demographic structure of households as a result of loss of household members from death affects access to resources and so options in relation to coping strategies would change overtime. This makes these households more vulnerable (White and Robinson, 2000). For example the emergence of widow headed households and

double orphans means these have greater difficulty in accessing land and rely on their extended family and/or the wider community for sustenance.

Land holdings are expected to reduce vulnerability of households to food security as they provide opportunity for crop diversification provided that other inputs such as fertilizers and seeds are available and accessible. As stated by White and Robinson (2000), landless households who depend upon wage labour are likely to be one of the groups most vulnerable to the sickness and death of a prime age adult.

The availability of non-farm sources of income e.g. informal employment should reduce the vulnerability of rural households. In a study done by FEWS in 1995 in Kenya districts of Kitui and Makueni, the vulnerability of subsistence farmers was reduced by the high share of non-agricultural income in those districts (Omamo, 1998).

Asset holding capacity of a household affects its vulnerability. Households with less assets are more vulnerable to the impacts of HIV and AIDS as they are less resilient to shocks. Households resort to the sale of assets as a short-term measure of coping to avoid impact of HIV and AIDS (Webb and Mutangadura, 1999).

4.5 Quantifying/Measuring household vulnerability

A number of disciplines and studies have proposed numerous ways of measuring or quantifying vulnerability of rural households to different phenomena. Despite their differences in defining vulnerability and hence the variables selected and methodologies (Luers et al, 2003) they all agree that the development of measures of vulnerability is complicated by the lack of consensus on the exact meaning of the term, the complexity of the systems analyzed, and the fact that vulnerability is not a directly observable phenomenon (Luers, 2003; Mani, 2001; Pritchett et al, 2000; Downing et al., 2001). Yet without some ability to measure vulnerability, at least in a relative sense, it will be difficult to operationalize the concept (Luers et al, 2003) in assessing the impact of HIV and AIDS on African societies.

Oyekele (2004) used the fuzzy set approach to health risk vulnerability analysis, initially proposed by Costa (2002), to quantify the level of vulnerability to HIV and AIDS in 5 states in the Rainforest belt of Nigeria. The method takes a given population to be represented by vulnerable households and households that are not vulnerable. The vulnerability index proposed measured the degree of vulnerability of a given household as a weighting function of a given set of attributes. The weight attached to each attribute would represent the intensity of vulnerability of that attribute. The methodology used by Costa has its limitations in that it is static and would not be able to wholly capture the effects of adaptive capacity of the household overtime. Despite its shortfalls Costa's methodology can be applied on different phenomena such as ecosystems and social issues e.g. impacts of HIV and AIDS on rural livelihoods and provides a useful measure of vulnerability at a given point in time that can be used to inform intervention policies.

In another study in Rural Kenya, Christiaensen and Subbarao (2004) proposed an approach to measure vulnerability where vulnerability is seen as expected poverty, akin to the safety risk measures developed by Fishburn (1997). They took consumption as a measure of

wellbeing. A person's vulnerability was measured as the current probability of becoming poor, multiplied by the conditional expected poverty i.e., the product of the probability that a person's consumption falls below the poverty line times the probability-weighted function of relative consumption shortfall. Pritchett et al (2000) also tried to incorporate vulnerability analysis as a component of poverty analysis. Pritchett and his fellow researchers argued that though most poverty measures consider shortfalls in current income or consumption expenditures to determine the poverty line, these measures do not indicate the vulnerable among the population and therefore propose a "vulnerability to poverty line (VPL)" that is the level below which a household is vulnerable to poverty. The VPL is calculated by considering differences in vulnerability depending on gender of household head, educational level, urban versus rural, landed versus landless households, and sector of occupation.

In vulnerability assessment studies in Africa, the USAID Food Emergency Warning System (FEWS) use a set or composite of proxy indicators to quantify vulnerability to food insecurity. The FEWS program has used indices, calculated as averages or weighted averages of selected variables, to measure vulnerability (<http://www.fews.org/fewspub.html>). These studies focus on compiling data in different areas, such as crop risk (e.g. length and variability of growing season), income risk (e.g. income variability, average cash crop production) and coping strategies (e.g. staple food production, access to infrastructure). On the other hand Luers et al (2003) propose a new approach to measuring vulnerability. They argue that vulnerability assessments should shift away from attempting to quantify the vulnerability of a place and focus instead on assessing the vulnerability of selected variables of concern and to specific sets of stressors. Their methodology considered three issues i.e., sensitivity and threshold (sensitivity of system to different stressors, threshold of human being at which the system is said to be damaged), exposure (varying magnitudes and frequencies of disturbing forces, and adaptive capacity (extent to which a system can modify its circumstances to move to a less vulnerable condition). The inclusion of adaptive capacity to vulnerability quantification adds an important dimension to vulnerability assessment. Luers et al (2003) measured the existing vulnerability under current and future conditions and the minimum potential vulnerability as the existing vulnerability minus adaptive capacity:

4.6 Limitations of the Indicator Approach to quantifying vulnerability

The indicator approach, while valuable for monitoring trends and exploring conceptual frameworks, its application are limited by considerable subjectivity in the selection of variables and their relative weights, by the availability of data at various scales, and by the difficulty of testing or validating the different metrics (Luers et al, 2003). This approach which has been used for assessing vulnerability by most researchers lacks a component of dynamism i.e. it does not put a quantitative measure on the adaptive capacity of a system to shocks such as HIV and AIDS. Nevertheless this study will use a modified indicator approach to quantify the vulnerability of households to impact of HIV and AIDS. Our study approach is not affected by the above limitations as it measures vulnerability to regionally chosen dimensions of HIV and AIDS impact. It also incorporates a component of adaptive capacity in coming up with household vulnerabilities that should influence policy decisions.

5.0 Study Methodology

Vulnerability to HIV and AIDS impact is viewed as determined by the exposure of households to HIV and AIDS and the ability to cope with the impacts of the disease (WFP, 1999). Households exposed to HIV and AIDS will suffer in at least one of the following areas, i.e., decline in agricultural productivity, reduced participation in the market, reduced number and quality of livestock, increase in mobility of household members, an increased environmental degradation, decline in household food consumption, erosion of household productive asset base and increased dependency ratios among others.

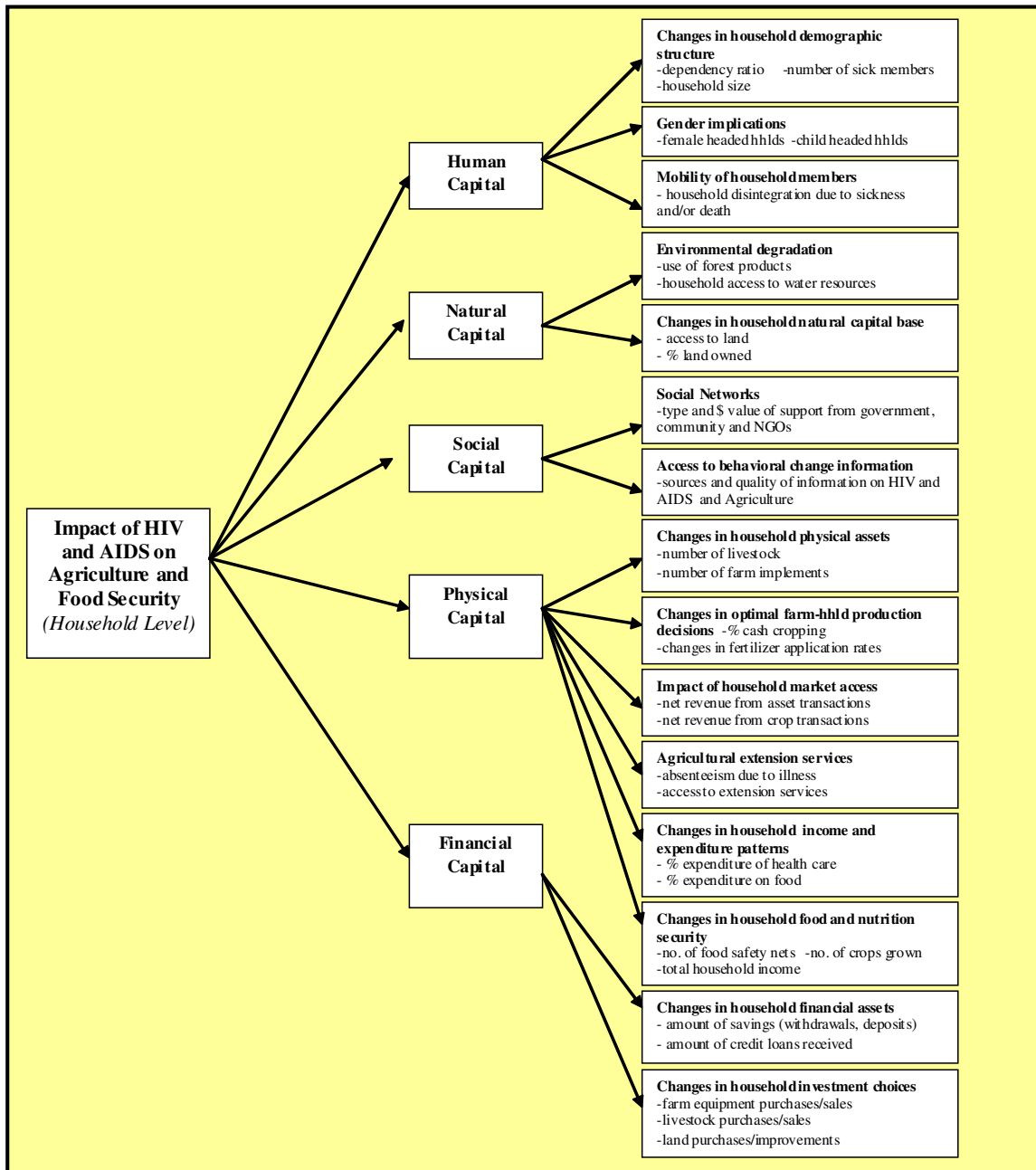
These possible impact areas show that the HIV and AIDS problem in most African communities is really a livelihoods problem issue. A household livelihood comprises the capabilities, assets and activities required for a means of living.

5.1 Conceptual framework

The study has adopted the sustainable livelihoods framework in analyzing how households are affected by HIV and AIDS and their ability to cope with such shocks. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base. Thus the more assets a household has, the lesser its vulnerability. A household livelihood generally has five assets, i.e., human, physical, financial, social and natural capitals. Household vulnerability evolves from the impact of HIV and AIDS impacts on one or all of these assets. Fig 1 shows the five livelihood assets and how they are affected by HIV and AIDS.

- *Human capital*- HIV and AIDS impacts on household demographic structure ie size and composition, and the mobility of household members.
- *Natural capital*- Household vulnerability increases environmental degradation and access to natural capital.
- *Physical capital*- This includes changes in household physical assets, access to extension services and changes in optimal farm household production.
- *Financial capital*- HIV and AIDS evoke changes in household financial assets, investment choices, household income and expenditure and market access.
- *Social capital*- The pandemic affects family social networks in terms of support, and inter and intra-relationships from government, community and other relatives.

Fig 1: Conceptualizing Household Vulnerability to Impact of HIV and AIDS



The ability of households to cope with the above impacts greatly depends on their asset ownership (Moser, 1998). The ability of a household to cope is defined by WFP as the capacity to physically survive the shock with their livelihood more or less intact by depending on their income and other assets such as labor, physical assets, productive assets, social capital, and other support systems and entitlements (Fig 2).

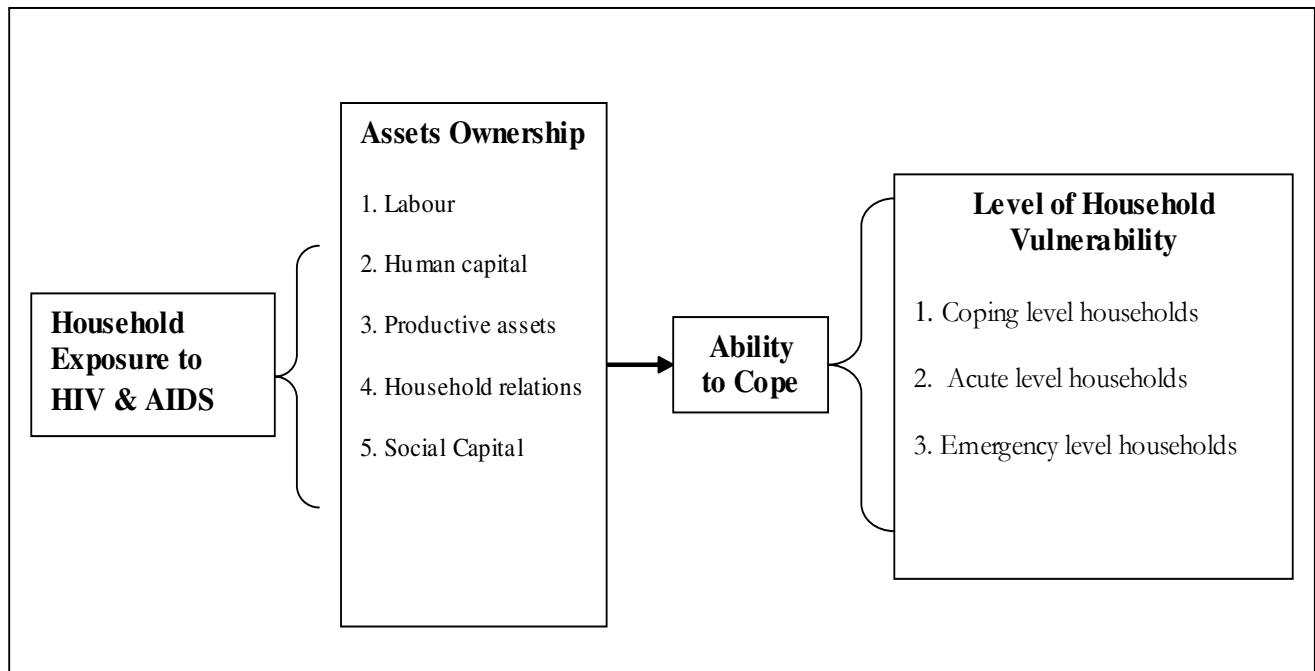


Fig 2: Relationship between Impact of HIV and AIDS and Household Vulnerability. Adapted from WFP (VAM) (Available at http://www.wfp.it/vam_documents/va/va99/html) and Moser (1998)

Depending on the asset ownership and the subsequent coping strategies, vulnerability is expected to differ across households. Households fall into three different levels of vulnerability i.e.:

- *Coping level households* - a household in a vulnerable situation but still able to cope
- *Acute level households* - a household that has been hit so hard that it badly needs assistance to the degree of an acute health care unit in a hospital. With some rapid-response type of assistance the family may be resuscitated
- *Emergency level household* - the equivalent of an intensive care situation (almost a point of no return) but could be resuscitated only with the best possible expertise.

5.2 Empirical Approach and Data

5.2.1 Empirical Approach

Two major types of analytical tools are currently being used in this analysis. These are multivariate regression analysis¹ and household vulnerability index analysis. These two levels of analysis complement each other. Whilst the multivariate regression analysis serve to determine the extent, nature and magnitude/severity of the impact, the HVI picks up and attaches a score on extent, nature and magnitude or severity of the impact and calculates a compounded index to describe the level of vulnerability of the household.

The HVI have been calculated largely following the methodology developed in the last study. The index is being used to establish different levels of vulnerability that the impact of HIV and AIDS on agriculture and food security has introduced in the households studied. The different Household Vulnerability Indices (HVI) reflects different degrees of vulnerability. Three levels of vulnerability are of particular importance for policy purposes:

- 1) Vulnerability level 1 = Coping level Households (CLH)
- 2) Vulnerability level 2 = Acute level households (ALH)
- 3) Vulnerability level 3 = Emergency level Households (ELH)
- 4) Vulnerability level 0 = non-vulnerable households

From the resulting indices it is possible determine the percentage of households falling under each category from the study sample. It is also possible to determine the level of vulnerability of a specific household from any selected questionnaire. Using the HVI it is possible to put more weight to factors that are important in each country e.g. livestock in Botswana, seasonal agriculture in Zimbabwe, etc..

The theory proposed for the construction of the household vulnerability index (HVI) takes on from the work originally proposed by Costa². The quest for the exercise, as was the case in the work by Costa, is to quantify the multi-dimension aspects of the impacts of a health problem on a household. Our specific quest is to assess at the household level, the impact of HIV and AIDS on agriculture. The Fussy Set approach has been used to analyze the data. The following definitions help clarify how the approach will be used:

- One can state that for the population N made up of n households i.e. $(N = \{hh_1, hh_2, hh_3, \dots, hh_n\})$, V is a subset of v households that have some degree of vulnerability to HIV and AIDS- hence impacted by the epidemic. Thus $v \leq n$ and $v=0$ implies that there are no vulnerable households, and $v=n$ implies that all households are vulnerable.

¹ This methodology will be used as a control measure to check the sensibility of calculated HVIs.

² Costa, M. (2002). A Multidimensional Approach to the Measurement of Poverty: An Integrated Research Infrastructure in the Socio-Economic Sciences IRISS Working Paper Series No. 2002-05; and Costa, M. (2003). A Comparison Between One-dimensional and Multidimensional Approaches to the Measurement of Poverty An Integrated Research Infrastructure in the Socio-Economic Sciences IRISS Working Paper Series No. 2003-02.

- One can also break down the vulnerability X into m specific dimensions of impact, and give a corresponding weight $(w_i, i=1, \dots, m)$ to each dimension. The weights can be predetermined, or developed using an appropriate function.
- The vulnerability of any given household $hh_i, i=1 \dots n$ to the j th $j=1, \dots, m$ dimension of impact can be expressed as X_{ij} , and set to take values between 0 and 1 such that 0=no impact and 1 full impact. A specific formula for calculating X_{ij} is discussed later. Thus each X_{ij} denotes the degree of vulnerability of household i to the j th dimension of impact, and $X_{ij}w_j$ will be the corresponding weighted vulnerability.
- The sum of the weighted vulnerabilities across all dimensions will give the particular household's total vulnerability V_{hh_i} to HIV and AIDS, that is:

$$\sum_{j=1}^m X_{ij}w_j / \sum_{j=1}^m w_j = V_{hh_i}$$

- It is also possible to sum down the dimensions and calculate the particular dimension's contribution to vulnerability to HIV and AIDS.
- For the study, the sum of the weights has been conveniently set to $\sum_{j=1}^m w_j = 100$.

The weights have been preset using detailed literature review.

The Household vulnerability index is calculated by applying the theory discussed above to the data collected by the household questionnaires, observing a number of steps:

1. Selecting appropriate dimensions of impact.
2. Selecting variables from collected data to describe these dimensions.
3. Setting the goal posts for each variable: maximum and minimum values.
4. Developing a matrix of weights for the dimensions. Each variable is given an appropriate weight within its cluster using the predetermined weights. Please note that the sum of weights is divided by 100 to ensure that the weighting remains between 0 and 1.
5. Next we calculate the individual variable indices as a number between 0 and 100 by using:

$\frac{\text{Actual value} - \text{minimum value}}{\text{Maximum value} - \text{minimum value}} \times 100$

6. The Household Vulnerability Index (HVI) is then computed for the total mark using the formula:

$\text{Household Vulnerability Index (HVI)} = \text{average value of individual indices.}$
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5.2.2 Data and variables

Data for the study is largely being drawn from that collected in the last study. (Table 2 in A1). FANRPAN identified 15 impact areas that can be tracked to assess household vulnerability to impacts of HIV and AIDS (Table 3 A1). The model is being developed using existing data and a survey conducted in Zimbabwe to simulate application of the model in a real life setting. For the Zimbabwe survey, cluster sampling was used to identify a geographic region where the field-testing was conducted. The data collected is being used to shape the final HVI model and propose practical methods for applying the technique in southern Africa.

6.0 Preliminary Results

6.1 Multivariate Regression Analysis

This was conducted on the regional data from the 2004 study. Two regression models were constructed. These models aimed at determining factors significantly affecting productivity and food security of HIV and AIDS affected households.

Productivity is defined in the regression model as returns to land put under crop production. Farmers within the same geographic space realize pronounced differences in maize yield due to farmer level factors such as level of management, input use, gender, degree of impact of HIV and AIDS related illness. Results from the analysis (Table 4 in A2) show that factors such as education of the household head, agricultural inputs (seed and fertilizer), number of crops and access to a social club emerge as significant in explaining differences in productivity across households. Household head's level of education affects management practices put on the farm. Input application rates affects efficiency in production. Higher input application rates are expected to increase productivity. Crop diversification negatively affects productivity. The more crop diversified a household is, the more the demand on scarce resources. Households that had access to at least one social club such as community projects, marketing clubs, etc, had higher productivity. This is because such households could easily have access to inputs and new technology on the market. They could also gain from the knowledge acquired through interaction with other farmers or professionals who visit the communities.

Due to the inadequacy of data from the 2004 study, food security could only be partially defined in the regression model as household intake of cereals as a ratio of total cereal requirements. Results from the analysis (Table 5 in A2) show that the worsening impact of HIV related sickness significantly affects the availability of family labour and hence food security. The presents of HIV and AIDS related sickness in a household also puts a strain on the scarce financial resources available to the household. With increased sickness in the home demand for health care increases thus diverting funds that could have otherwise been used to buy more food and/or acquire inputs to use in production. This culminates into reduced food security. Other variables that significantly explained variations in food security across households include asset/wealth index, cultivated land, maize yield/ha, gender of household head and total number of cattle. Male headed households tend to be more food

secure compared to female headed households. This is because most male heads are useful in earning income from formal and informal employment that will be used to supplement family food reserves if the need arises. Male heads tend to be more mobile than female heads, who have to stay at home taking care of the children. This increases chances of male heads being able to secure employment elsewhere away from home where they are increased opportunities of earning higher wages.

6.2 Household Vulnerability Index Analysis

The results from the HVI analysis show that of the 30 sampled households 27% were at the coping level whilst the majority, approximately 70%, was at the acute level. Only one household, i.e., 3% of the sample was at the emergency level (Table 1)

Table 1 Categorization of households according to their vulnerability

Level of vulnerability	Criteria	No of households	% households
Coping Level Households	$(0 < H < 0.25)$	8	27
Acute Level Households	$(0.25 \leq H < 0.75)$	21	70
Emergency Level Households	above 0.75	1	3

Although households are affected in almost every aspect of their lives by HIV and AIDS, there is variability in the impact on each household asset.

Coping level households- for the sampled households results show that these are affected by the pandemic in lesser critical areas as far as agricultural production and food security are concerned. Much of the vulnerability of these households is arising from the effects of the pandemic on social capital and to a lesser extent financial capital. Little or no vulnerability is emanating from the physical, natural and human capital aspects of the households. Furthermore it is also shown that within the social capital of these households vulnerability is emanating from the impact of the pandemic on household access to social support services. Mitigation efforts for such households should be aimed at improving social support networks that will assist the households in building beneficial social relations within the community.

Acute level households- results show that vulnerability in these households is coming from almost every aspect of their livelihoods although the most significantly affected household asset varies across households. Generally for all the households falling in this group financial, physical and human capitals are affected the most by the pandemic although the extent of the impact can be manageable with targeted response packages. Results also show that within the broader dimensions of impact, vulnerability is also emanating from different impact areas. For example tracking the human capital component of these acute level households it is shown that much vulnerability is coming from the impact of HIV and AIDS

on household demographic structure more than it is from the impact on mobility of household members. This means that response packages that deal more with addressing issues of labour availability and power relations within a household are critical in assisting such households.

Emergency level households- Although this household is vulnerable in all the livelihoods aspects of its life, the degree to which the livelihood assets are affected is very high almost 100% effect. A considerable amount of effort is required to resuscitate this household because it requires assistance in almost every aspect of its livelihood.

7.0 Conclusion

After identifying the impacts that HIV and AIDS are having on rural livelihoods, the preliminary analysis has shown that it is possible to go a step further and classify households according to their level of vulnerability. This is important as it informs policies on the specific response packages that are required to help such households fight the impacts of HIV and AIDS. Furthermore the HVI makes it possible to trace the origins of vulnerability in any given household or cluster of households. Vulnerability can be tracked to individual impact areas that are affected by the pandemic and so shape intervention programmes in target communities.

It is possible to come with more categories of vulnerability which will help in developing more appropriate or refined response packages for intervention programmes.

References

Amy L. Luersa,b,*, David B. Lobella,c, Leonard S. Sklard, C. Lee Addamsa, Pamela A. Matsona,b, A method for quantifying vulnerability, applied to the agricultural System of the Yaqui Valley, Mexico, *Global Environmental Change* 13 (2003) 255–267

World Food Programme (WFP), “An Overview of Vulnerability Analysis and Mapping (VAM),” (http://www.wfp.it/vam_documents/va/va99/html/overcontents.htm).

WFP, “WFP Vulnerability Mapping Guidelines (draft January 1996),” (Available at http://www.wfp.it/vam_documents/va/va96/html/mapguide.htm).

Devyani Mani, 2001, vulnerability analysis and asset management, United Nations Centre for Regional Development (UNCRD) [<http://www.uncrd.or.jp>].

Lant Pritchett, Asep Suryahadi, and Sudarno Sumarto, “Quantifying Vulnerability to Poverty: A Proposed Measure, Applied to Indonesia,” (Policy Research Working Paper 2437) (Washington: The World Bank, 2000).

Shapouri S and Rosen S (2000), Vulnerability to HIV AND AIDS in Sub-Saharan Africa, Food Security Assessments/GFA, Economic Research Services, USDA

Downing, T.E., Butterfield, R., Cohen, S., Huq, S., Moss, R., Rahman, A., Sokona, Y., Stephen, L., 2001. Climate Change Vulnerability: Linking Impacts and Adaptation. University of Oxford, Oxford.

Moser C, 1998, "The Asset Vulnerability Framework: Reassessing Poverty Reduction Strategies", World Development

USAID Famine Early Warning System Various publications, Available online: <http://www.fews.org/fewspub.html>.

Thomas T.S., 2003, A Macro-Level Methodology for Measuring Vulnerability to Poverty, with a Focus on MENA Countries: Presentation for the Fourth Annual Global Development Conference, Globalization and Equity, Cairo, Egypt: Jan 21 2003

Moss, R.H., Malone, E.L., Brenkert, A.L., 2002, Vulnerability to climate change: a quantitative approach. Prepared for the US Department of Energy. Available online: <http://www.globalchange.umd.edu/cgi-bin/Details.pl?sref=PNNL-13765>.

Joint United Nations Programme on HIV AND AIDS, '**Report on the global HIV AND AIDS epidemic**'. Geneva: UNAIDS, June 2000. (http://www.unaids.org/epidemic_update/report/Epi_report.htm)

Bates et al, 2004, Vulnerability to malaria, tuberculosis and HIV AND AIDS infection and disease. Part 1: Determinants operating at individual and household level, The Lancet infectious Diseases Vol 4, May 2004

Christiaensen L. J and Subbarao K, 2004, Toward and understanding of Household Vulnerability in Rural Kenya, World Bank Policy Research Working Paper 3326, June 2004

Oyekale A.S., 2004, Rural Households' Vulnerability to HIV AND AIDS and Economic Efficiency in the Rainforest Belt of Nigeria, University of Ibadan, Ibadan, Nigeria

Barnett T, Whiteside A, and Decosas J, 2000, The Jaipur paradigm: A conceptual framework for understanding social susceptibility and vulnerability to HIV. S Afr Med J 2000; 90: 1098-101

Mano R and U. Chipfupa, 2005, *Empirical Assessment of the Impact of HIV AND AIDS on Agricultural Performance and Food Security of Rural Families*, Paper presented to the Regional Workshop on HIV AND AIDS and Agriculture: Implications for Food Security In West and Central Africa; 18-20 July 2005, Cotonou, Benin

Shapouri S and S. Rosen, 2001, I in Food Security: Toll on Agriculture from HIV AND AIDS in Sub-Saharan Africa, Agricultural Information Bulletin Number 965-9, United Nations Department of Agriculture

White, J. and E. Robinson, 2000, HIV AND AIDS and Rural Livelihoods in Sub-Saharan Africa. Natural Resources Institute, University of Greenwich.

Chen and Dunn, 1996, Household Economic Portfolios, USAID AIMS Microenterprise Impact Project, USAID

Mutangadura G, and D Webb, 1999, Mortality and Morbidity on Households in Kafue District, Zambia,” SAfAIDS, Harare

Omamo, S. W, 1998, Transport Cost and Smallholder Cropping Choices: An Application to Siaya District Kenya, American Journal of Agricultural Economics,80-1, p.116-123

Costa, 2002, A Multidimensional Approach to the Measurement of Poverty: An Integrated Research Infrastructure in the Socio-Economic Sciences IRISS Working Paper Series No. 2002-05

Fishburn P, 1997, Mean Risk Analysis with Risk Associated with Below-Target Returns. American Economic Review 67 (2): 116-126.

<http://ideas.repec.org/s/fao/wpaper.html>

Appendix 1

Table 2: Summary of Country Level Databases

Item	Botswana	Lesotho	Namibia	South Africa	Swaziland	Zambia	Zimbabwe
Database Platform	SPSS11	SPSS11	SPSS7	Excel	SPSS11	SPSS11	SPSS11
Sample size	157	210	144	48	847	203	320
Number of Variables tracked	138	899	1422	110	184	671	1265
Number of Variables Included in regional database**	31	68	58	122	78	34	138

** The regional database has a total of 158 Variables

Table 3: Impact areas and variables to be used to measure household vulnerability

	Impact Areas	Indicators
1	Optimal farm-household production decisions	% cash cropping Changes in input use (especially fertilizer)
2	Changes in household demographic structure and labour availability	household size dependency ratio No sick members
3	Changes in household productive physical capital assets	farm implements number livestock number
4	Sustainability of household food and nutrition security (<i>food accessibility and utilization</i>)	Number of meals per day Regular household income Household nutrition diversity Number of regular food sources
5	Impact on household Market Access	Net revenue from asset transactions Net revenue from crop transaction distance from nearest market place
6	Agricultural extension services	Access to extension services generally Absenteeism from extension meetings
7	Changes in household income and expenditure patterns	% expenditure on health care % expenditure on food
8	Changes in household productive financial capital assets	Savings withdrawals and deposits Amount of credits received
9	Impact on household investment choices	Farm equipment purchases and sales Livestock purchases and sales Land purchases/improvements
10	Access to behavioral change information	Sources and quality of information on HIV and AIDS Sources and quality of information on agriculture
11	Changes in household productive natural capital assets	Access to land % land owned
12	Mobility of household members	Household disintegration due to HIV and AIDS
13	Gender implications	female-headed households child-headed households
14	Support networks	Number and type of support from government, NGOs and local community Remittances from relatives Number of social networks
15	Environmental degradation	Use of forest products Household access to water resources

Appendix 2

Table 4. Factors Affecting Variability in Productivity

	Linear (OLS)
Dependent Variable	Maize yield
(Constant)	39.5 (0.22)
Region	0.06 (1.03)
Gender	-0.04 (-0.74)
Level of education	.088 (1.7*)
Number of cattle owned	0.02 (0.37)
Weighted index of the sick	-0.07 (-1.24)
Maize seed/ha	0.21 (3.7***)
N/ha of maize	0.24 (4.3***)
Number of crops grown	-0.21 (-3.9***)
Status of household	0 (-0.008)
Family labor	0.05 (0.89)
Social club	0.16 (2.99**)
Type of land	0.01 (0.2)
R	0.50
R Square	0.25
Adjusted R Squared	0.22
Durbin Watson	1.86

*significant at 10%, **significant at 5%, ***significant at 1%

*NB In brackets are t values

Table 5. Factors Affecting Variability in Food Security

	Translog
Dependent variable	Log food security
(Constant)	-8.7 (-1.2)
Region variable	-0.1 (-.852)
Asset/wealth index	0.62 (2.4**)
Total Nitrogen	0.08 (0.56)
Cultivated land	0.460 (3.5**)
Maize yield/ha	0.53 (3.7***)
Education	0.15 (1.3)
Weighted index of the sick	-0.36 (-2.4**)
Number of orphans	0.04 (0.3)
Family labour	0.16 (1.3)
Gender	0.29 (2.1**)
Number of crops grown	0.15 (0.94)
Number of cattle	0.5 (2.0*)
R	0.81
R Square	0.66

*significant at 10%, **significant at 5%, ***significant at 1%

*NB In brackets are t values