

HIV/AIDS AND AGRARIAN LIVELIHOODS IN ZAMBIA: A TEST OF THE NEW VARIANT FAMINE HYPOTHESIS

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Main Points

1. Consistent with the New Variant Famine (NVF) hypothesis, the negative impact of drought on crop output and output per hectare is further exacerbated where HIV prevalence rates are relatively high, particularly in the low- and medium rainfall zones of the country (agro-ecological regions I and II).
2. HIV prevalence rates and AIDS-related mortality rates in Zambia are highest in the lowest rainfall and most drought-prone zone of the country (agro-ecological region I).
3. Only for districts in agro-ecological region I do we find evidence of a robust negative effect of HIV/AIDS on agrarian livelihood indicators. Relatively stable food production zones and/or areas with relatively low HIV prevalence rates appear to be less vulnerable to the adverse effects predicted by the NVF hypothesis, which suggests that HIV/AIDS exacerbates the effects of drought and other shocks on agrarian communities.
4. HIV/AIDS reduces the crop production gains associated with fertilizer subsidy increases in the highest rainfall areas.
5. Increases in the percentage of female-headed households in a district are related to declines in agricultural production indicators, but these effects do not appear to worsen when the HIV/AIDS epidemic is severe.
6. Only in districts whose borders encompass both agro-ecological regions II and III do we consistently find weak evidence that HIV/AIDS reduces the contribution of productive assets to crop output and output per unit of land as would be expected under the NVF hypothesis.

BACKGROUND: The ‘new variant famine’ (NVF) hypothesis has become an important part of the conventional wisdom surrounding the relationship between HIV/AIDS and food crises in southern Africa, and has begun to shape the HIV/AIDS mitigation and food security policies and programs of governments and development agencies (de Waal and Tumushabe, 2003). The NVF hypothesis suggests, *inter alia*, that HIV/AIDS is causing a decline in agrarian livelihoods and that the epidemic is making agrarian communities more vulnerable and less resilient to drought and other transitory shocks (de Waal and Whiteside, 2003; de Waal, 2004).

Although a growing body of literature suggests a decline in agricultural productivity and productive assets among HIV/AIDS-afflicted households compared to non-afflicted households (reviewed in Gillespie and Kadiyala, 2005; and Barnett and Whiteside, 2002), there remains a dearth of empirical evidence to

support the NVF hypothesis (de Waal, 2004), which emphasizes how AIDS compounds the effects of other shocks on agricultural household and community livelihoods. To date, no studies have been specifically designed to test the predictions of the NVF hypothesis (de Waal, 2007).

This study represents a first step towards testing the predictions of NVF. We estimate the impact of AIDS-related morbidity and mortality on indicators of agrarian livelihoods in Zambia. We focus specifically on the impact of HIV/AIDS and its interactions with drought and other shocks on district-level crop output, output per hectare, and area cultivated (henceforth referred to as ‘agrarian livelihood indicators’ or ‘agricultural production indicators’).

OBJECTIVES: The main objective of the study is to use nationally representative district level survey data in Zambia to empirically test

the NVF hypothesis. The study has three sub-objectives: (1) to understand the potential effects of current and past AIDS morbidity and mortality on current and future agrarian livelihood indicators; (2) to measure the extent to which HIV/AIDS may exacerbate the impacts of other factors affecting agricultural production, such as macroeconomic structural adjustment, drought, and agricultural sector policy changes; and (3) to determine whether these trends and impacts are consistent with the predictions of the NVF hypothesis. Through these objectives, the study aims to strengthen the empirical foundation of food security policies and programs responding to the HIV/AIDS crisis in southern Africa.

METHODS AND DATA: The NVF hypothesis is tested using data on agrarian livelihoods from the Zambia Post-Harvest Surveys (PHS) for agricultural years 1991/1992 to 2002/2003. The PHS is carried out by the Central Statistical Office (CSO) in conjunction with the Ministry of Agriculture and Cooperatives (MACO). The survey is designed to be nationally representative. Approximately 7,000 small and medium scale farming households are included in the PHS each year. The specific households interviewed are not the same from year to year, but they are drawn consistently from the same 52 districts. Hence, the study is based on a nationally representative longitudinal survey of 52 districts over a 12-year period.

Using districts as a unit of observation, the study first examines the direct impacts of district-level HIV prevalence and AIDS-related mortality on the agrarian livelihood indicators (district-level crop output, output per hectare, and area cultivated) controlling for other factors, such as input and output prices, and rainfall, that are likely to affect agricultural production outcomes. Then we test the validity of the NVF hypothesis by examining how the impact of shocks such as drought, government fertilizer subsidies, communities' asset bases, and the percentage of households headed by females on agrarian livelihood indicators change when HIV prevalence or AIDS-related mortality rates vary.¹ We do these two pieces of analysis separately for each of four agrozones² in Zambia, as preliminary tests suggest that the effects of HIV/AIDS and other factors on agrarian livelihood indicators vary across agro-ecological regions in Zambia.

SUMMARY OF FINDINGS: This study highlights several findings:

First, HIV prevalence rates and AIDS-related mortality rates in Zambia are highest in the lowest rainfall and most drought-prone zone of the country (agro-ecological region I).

Second, only in agro-ecological region I do we consistently find evidence of a significant negative independent effect of HIV/AIDS on agrarian livelihoods at the district level (see Table 1). This region is characterized by the lowest mean annual rainfall levels and the highest mean HIV prevalence and AIDS-related mortality rates of the four agrozones. Holding other factors constant, the estimated effects of HIV/AIDS are negative in some of the other agrozones for several of the agricultural production indicators, but these effects are imprecisely measured. This finding of a weak relationship between HIV/AIDS and agricultural production at the district level is consistent with other community and aggregate level evidence from Zambia (e.g., Larson et al., 2004; Jayne et al., 2006; and Drinkwater et al., 2006).

Table 1. Effects of a one-percentage point increase in HIV prevalence on agrarian livelihood indicators in Agrozone 1

| Effects of 1% increase in HIV prevalence on: | HIV Prevalence is at ____ | |
|--|---------------------------|-------------------------|
| | Mean (17.3%) | 90th Percentile (25.0%) |
| Crop output | -11.3%** | -16.5%** |
| Output per capita | -7.3%+ | -7.0% |
| Output/ha | -1.0%** | -1.1%* |
| Output/ha per capita | 12.4%** | -5.5% |
| Area Cultivated | -3.8% | -4.3%+ |
| Area cultivated per capita | -2.3% | -2.4% |

Notes: +, *, and ** significant at 10%, 5% and 1% respectively.

Third, for the key NVF suggestion that HIV/AIDS exacerbates the impacts of drought on agrarian livelihoods, the results of this study lend some support to this prediction for agrozones 1, 2 and 3, particularly when the outcome variable is crop output or output per hectare (both in levels and per capita terms). In many cases, the negative impact of drought is at least doubled when HIV prevalence rates are relatively high (at the 90th percentile, which corresponds to 18% to 25%, depending on the particular agrozone) compared to when these rates are held at mean levels for the various agrozones (between 11.7% and 17.3%).

However, of the various alternative model specifications, results consistent with the NVF hypothesis are far from universal even within these agrozones. For example, the results are sensitive to the HIV/AIDS variable used. When district HIV prevalence rates are used in the models, results shown in Table 2 were obtained. But models using AIDS-related mortality rates produced mostly statistically insignificant effects on the various indicators of agrarian livelihoods.

Fourth, increases in fertilizer subsidies have a practically small, if any, positive effect on output and output/ha (in both levels and per capita terms). In all cases but one where there is a statistically significant, positive partial effect of fertilizer subsidies at mean HIV/AIDS levels, this effect is less positive in magnitude when evaluated at high HIV/AIDS levels. This is consistent with the predictions of the NVF hypothesis, but occurs mainly in agrozones 3 and 4, and only for a subset of the agricultural production indicators analyzed.

Fifth, there is little evidence to support the NVF prediction that HIV/AIDS affects the relationship between a rise in female headship (e.g., due to male head mortality or migration) and a decline in crop cultivation or output. Of

the 48 simulations done, the results of only 6 of them are consistent with the predictions of the NVF hypothesis as it relates to female headship shocks. While we find some evidence of negative impacts of female-household headship on agricultural production indicators (a result that is consistent with household-level studies that find a negative impact of prime-age male head of household deaths on agricultural production (Yamano and Jayne, 2004; Chapoto and Jayne, 2008) and widows' access to land (Chapoto et al., 2007; Mather et al, 2004)), the results do not suggest a differential impact of female household headship shocks depending on the severity of the HIV/AIDS epidemic.

Sixth, only in agrozone 3 do we consistently find evidence that HIV/AIDS reduces the contribution of productive assets to crop output and output per unit of land as would be expected under the NVF hypothesis. In mean household terms, the productive asset base in agrozone 3 is lower than the other three agrozones. Perhaps because communities in agrozone 3 have fewer productive assets to begin with, those few assets are more important for their agricultural production but are also more vulnerable to being liquidated as HIV/AIDS puts more stress on the community.

Table 2. Effects of a one percentage point increase in negative rainfall shocks (drought) on select agrarian livelihood indicators for Agrozones 1 and 2

| Effect of a one-percentage point increase in the negative rainfall shock on: | Agrozone 1 | | Agrozone 2 | |
|--|--------------------------------|--|--------------------------------|--|
| | HIV Prevalence at mean (17.3%) | HV Prevalence at 90 th Percentile (25.0%) | HIV Prevalence at mean (17.3%) | HV Prevalence at 90 th Percentile (25.0%) |
| Output | -1.4%* | -2.7%** | -1.6%* | -0.40% |
| Output per capita | -1.00% | -2.1%* | -2.0%* | -3.8%+ |
| Output/ha | -0.2%** | -0.3%** | -0.2%** | -0.4%** |
| Output/ha per capita | -2.4%** | -4.3%** | -2.7%** | -7.2%** |

Notes: +, *, and ** significant at 10%, 5% and 1% respectively.

POLICY IMPLICATIONS: None of these findings lend unequivocal support to the NVF hypothesis in Zambia. There is strong evidence that in low rainfall areas, HIV/AIDS exacerbates the effects of drought on crop output and output per hectare. The evidence is much weaker that HIV/AIDS exacerbates the impact of other shocks on agricultural output (such as reductions in fertilizer subsidies, a rise in the percentage of households that are female headed, and a

reduction in productive farm assets). Furthermore, results vary by agrozone, by the agricultural production outcome analyzed, and by the HIV/AIDS measure used. Thus, as is the case with household level analyses, it is important not to lump all highly affected districts (or agrozones) into one category and overgeneralize as to the effects of HIV/AIDS (and its interaction with other shocks) on rural agrarian communities.

The findings of this study suggest that efforts to target assistance toward communities that are drought-prone (have low annual rainfall) or have a weak productive asset base and are also highly AIDS-affected may be an important aspect of both food security and HIV/AIDS mitigation strategies. Efforts to improve social protection and safety nets in communities whose asset bases have been eroded may also be an effective way to mitigate the impacts of the epidemic.

The finding of no robust negative effect of HIV/AIDS on district level agricultural production except in the lowest rainfall areas suggests that some agrarian communities may be more resilient in the face of HIV/AIDS than earlier predicted. Nevertheless, it is likely to remain important for governments, donors and NGOs to continue to invest in AIDS prevention and mitigation in order to reduce rural poverty, and to invest in rural development, broadly defined, to bolster resilient livelihood strategies in all HIV/AIDS affected agrarian communities.

Endnotes:

¹Because the impacts of HIV/AIDS are likely to accumulate over time, our regression analysis employs a flexible lag structure on HIV prevalence rates and AIDS-related mortality rates (an Almon lag structure). This modeling approach allows for current crop output and other indicators of rural livelihoods to be affected by HIV prevalence rates up to 8 years earlier.

²Zambia is divided into three agroecological regions (AERs): AER I covers the southern border of the country and receives less than 800 mm of rainfall per year; AER II covers western and central Zambia and receives 800 to 1,000 mm of rainfall; and AER III covers the northern part of the country and receives in excess of 1,000 mm of rainfall per annum. Some districts' borders encompass parts of both AERs II and III so we define four "agrozone" categories and assign districts to each of them: districts in AER I are assigned to agrozone 1; districts in AER II only are assigned to agrozone 2; districts whose borders encompass parts of AERs II and III are assigned to agrozone 3; and districts in AER III only are assigned to agrozone 4.

*This *Policy Synthesis* is a condensed from an updated version of FSRP Working Paper 30 by the same name. The full working paper in PDF form may be downloaded from: www.aec.msu.edu/agecon/fs2/zambia/index.htm.

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