Using Population Policies and Non-Governmental Organizations to Explain HIV/AIDS Outcomes in Sub-Saharan Africa

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There exists no consistent explanation for why some countries are successful in combating HIV/AIDS and others are not (de Waal 2006). We need an explanation in order to design effective policies and programs to improve reproductive health. This paper combines short case studies (Senegal, Nigeria, and Malawi) with analysis of quantitative, country-level data to determine how strategies used in sub-Saharan African countries in the 1980s and 1990s to slow population growth impacted later success in reducing the prevalence of HIV/AIDS. Specifically, I test the model that countries with strong efforts to reduce population growth were left with 1) reproductive health care infrastructure, 2) non-governmental organizations (NGOs), and 3) practice convincing people to alter intimate behaviors that then translated into effective HIV interventions. This paper thus considers the organizational and institutional context, set by population policies and NGOs working on both family planning and HIV/AIDS, for reproductive health outcomes.

INTRODUCTION

There exists no consistent explanation for why some countries are successful in combating HIV/AIDS and others are not (de Waal 2006). We need an explanation in order to design effective policies and programs to improve reproductive health, as well as to identify efficient allocations of scarce government and donor funds. The analysis below seeks to determine the factors that have allowed some countries to successfully combat HIV/AIDS, while other countries have struggled. Specifically, I test the hypothesis that strategies used in sub-Saharan African countries in the 1980s and 1990s to slow population growth impacted later success in reducing the prevalence of HIV/AIDS. In so doing, I emphasize the importance of macro contextual factors, including governmental policy and non-governmental organizations (NGOs), in determining reproductive health outcomes.

The inability of most sub-Saharan African countries to slow the spread of HIV/AIDS has perplexed academics and policymakers. Using a case study approach, many blame a lack of political will and the weak capacity of African governments. But some weak countries, like Uganda, have enacted positive change, while some of the richest, most capable governments, like Botswana and South Africa, have been relatively ineffective in reducing HIV rates. The case study methodology fails to take advantage of the variation in factors that might drive differential outcomes in HIV prevention across Africa, including those institutional and organizational factors related to earlier efforts to slow population growth. Previously-used methodological approaches therefore produce insufficient evidence for use in designing health-related interventions. To circumvent these issues, I use a two-tiered approach to determine the impact of the timing and strength of efforts used to slow population growth on the success of HIV/AIDS interventions. In this paper, I first present brief case studies of three countries chosen to vary in terms of the strength and timing of their efforts to slow population growth: Senegal (strong), Nigeria (moderate), and Malawi (weak). I then analyze data on all sub-Saharan

African countries to test for a statistically significant association between the strategies used to address population growth in the 1980s and 1990s and HIV prevalence in the 2000s.

Figure 1. Conceptual Model

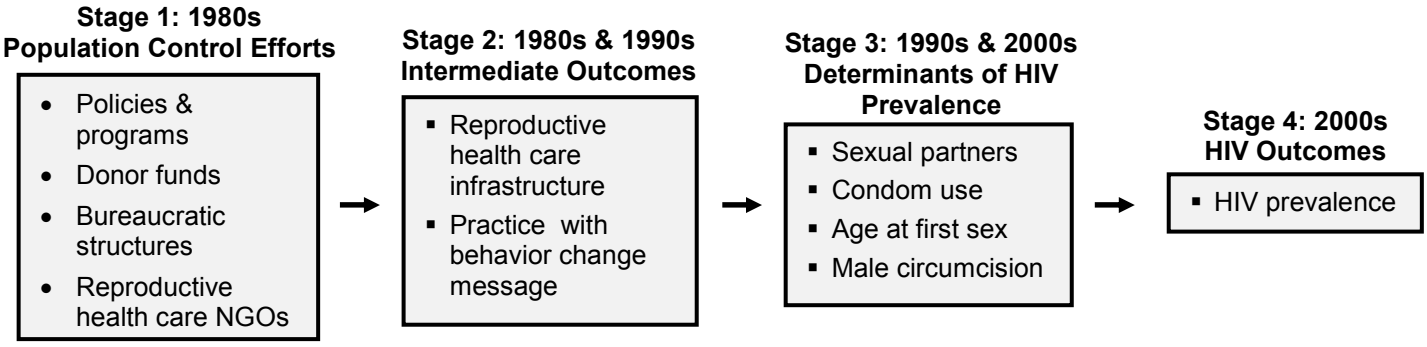

Figure 1 shows the model I test which posits, in short, that countries with stronger population control efforts were left with the resources and infrastructure necessary to mount more effective HIV/AIDS interventions. Stage 1 refers to governmental and social efforts to reduce population growth, which included national population policies and programs designed to limit fertility, acquisition of donor funds for family planning, administrative and bureaucratic structures for providing contraceptive services and supplies, and the creation of local NGOs in the reproductive health care field. These efforts, which began as early as the 1960s in some countries, predated HIV/AIDS, which was not widely diagnosed until the mid-1980s. The degree to which governments and societies engaged in such efforts influenced Stage 2 of the model, a set of intermediate outcomes that resulted from population control efforts—domestication of techniques for behavior change (Cleland and Watkins 2006), governmental experience with donors, governmental and NGO familiarity with social mobilization efforts to induce behavior change, and even family planning technologies (e.g., condoms)—that could then be translated in to HIV-reduction efforts. These efforts, or lack thereof, in conjunction with factors ranging from culture to political economy to the status of women, then impacted the

physical determinants of HIV prevalence, as shown in Stage 3, ultimately driving the overall level of HIV in a country in Stage 4.

BACKGROUND ON THE SUCCESS OF HIV/AIDS INTERVENTIONS

The key mechanisms through which reductions in HIV/AIDS have been, and can be, realized are decreases in the number of overall and concurrent sexual partners, increases in condom use, increases in the age at first sex, and prevalence of male circumcision (Barnett and Whiteside 2006; Bongaarts et al. 2008; Caldwell 2000; Cohen 2008; Green et al. 2009; Gregson et al. 2006; Hayes and Weiss 2006; Low-Beer & Stoneburner 2004; Potts et al. 2008; UNAIDS 2008; Wilson and de Beyer 2008). Existing scholarship has identified two main factors that operate through these mechanisms to determine country-level success in addressing HIV/AIDS: (1) political leadership and commitment, and (2) government coordination with NGOs and other civil society organizations.

Political commitment and leadership should help reduce HIV prevalence because they galvanize action around HIV/AIDS, organize those efforts, and provide legitimacy to messages promoting behavior change (e.g., Boone and Batsell 2001; ECA 2004; Gow 2002; Kalipeni and Mbugua 2005; Moran 2004; Parkhurst and Lush 2004; Putzel 2004; UN 2003a; WHO 2000). There remains, however, no convincing, cross-national study that shows that political commitment leads to reductions in prevalence of HIV, although factors such as lack of ethnic fragmentation (Lieberman 2007) and press freedom, income equality, and high HIV prevalence (Bor 2007) lead to high levels of political commitment, and countries with “good” leadership provide better care to their HIV-positive citizens (Nattrass 2008).

The second prominent factor associated with successful reductions in HIV prevalence is government interaction with civil society, broadly understood to include NGOs, community-based organizations, religious organizations, labor unions, and other social groups (e.g., Boone and Batsell 2001; ECA 2004; Kalipeni and Mbugua 2005; Moran 2004; Parkhurst and Lush 2004; Putzel 2004; UN 2003a; WHO 2000). Coordination with such groups provides the

conduits through which messages about prevention are spread, as well as increases the perceived legitimacy of messages that cover sensitive issues relating to sex, morality, and religion.

The most-frequently studied AIDS success stories are Uganda and Senegal. In Uganda, HIV prevalence declined from approximately 20% to 10% in the 1990s (Low-Beer & Stoneburner 2004). The mechanisms for Uganda's decline were a decrease in number of sexual partners and an increase in condom usage (Green et al. 2006; Low-Beer & Stoneburner 2004). The drivers for these changes included political leadership on the part of the country's charismatic president, Yoweri Museveni, a decentralized government which allowed for local experimentation and personalization of responses to HIV/AIDS, and active incorporation of different social groups in prevention efforts (Allen and Heald 2004; Barnett and Whiteside 2006; Eboko 2005; Green et al. 2006; Parkhurst and Lush 2004; Patterson 2006).

In Senegal, HIV prevalence has remained at approximately 1% since the 1980s (Barnett and Whiteside 2006). The mechanisms for this lack of increase in prevalence include low numbers of multiple concurrent sexual partners, a less virulent form of the virus (HIV-2), an increase in the age at marriage and first sex, and almost universal male circumcision (c.f. Moran 2004; Putzel 2006). These outcomes resulted from early government acknowledgement of HIV, effective management of sexually-transmitted infections among sex workers, and active incorporation of social groups, particularly religiously-oriented ones, in distributing HIV-prevention messages (Barnett and Whiteside 2006; Eboko 2005; Iliffe 2006; Meda et al. 1999; Patterson 2005; Pisani 2000; Putzel 2004, 2006).

The emphasis of the literature on political commitment, and on the cases of Senegal and Uganda, poses three challenges to determining the causes of variation in country-level success addressing HIV/AIDS. First, political commitment is a difficult variable to measure (Daly 2001; Moran 2004; Putzel 2006; UN 2003a) and may not actually translate into action once countries have learned that displays of political commitment are necessary to garner and maintain

international support (Eboko 2005; Patterson 2005). Second, the cases of Senegal and Uganda do not generalize well. In Uganda, the timing of the decline in HIV prevalence indicates that behavior change most likely occurred *prior* to intervention by Museveni and international donors, and so is most likely not the result of policy (Ainsworth and Teokul 2000; de Waal 2006; Low-Beer & Stoneburner 2004). In Senegal, there is no way to know whether the epidemic would have actually grown out of control in the absence of the government actions taken, particularly given the relative protection provided to the population by the less virulent form of HIV and near-universal male circumcision. The uniqueness of the Ugandan and Senegalese cases points to the need to examine multiple cases in a multivariate framework.

The third challenge to determining the causes of variation in country-level success addressing HIV/AIDS is that although the literature has identified government engagement with civil society as key to fighting HIV/AIDS, no systematic research has incorporated measurements of the strength of civil society. The analysis below addresses all three challenges to the existing literature by testing a new hypothesis about the legacy of population interventions, employing a multi-country analysis, and incorporating systematic measures of the structure of civil society. These contextual factors are highly likely to drive reproductive health outcomes.

DATA AND METHODS

The objective of the analysis is to determine how government and social efforts in the 1980s and 1990s to slow population growth impacted sub-Saharan African countries' HIV prevalence in the 2000s. These efforts included population policies, reproductive health care NGOs, and acquisition of funding from outside donors. Below, I present results from (a) case studies based on the secondary literature as well as my own fieldwork in Senegal, Nigeria, and Malawi, and (b) regression analysis of unique data for all sub-Saharan African countries encompassing the past 30 years.

Case Studies

I have selected three case study countries to vary on the independent variable: the timing and strength of country-level efforts to slow population growth described above. Senegal represents the earliest and strongest efforts, Nigeria the moderate category, and Malawi the latest and weakest efforts. My description of these case studies is based primarily on the secondary literature, but also comes from analysis of government documents, and interviews with population and HIV/AIDS experts in each country[1].

Quantitative Analysis

In order to conduct the quantitative analysis I have built a unique data set with country-level data for all sub-Saharan African countries covering the past 30 years. Data on adult HIV prevalence (the percent of adults 15-49 infected) come from UNAIDS for the years 2001, 2003, 2005, and 2007 (UNAIDS 2006, 2008). Countries can be successful at combating HIV either by decreasing a high level of prevalence, or by maintaining a low level of prevalence. I therefore model success at combating HIV/AIDS in three ways: 1) as a percent change in adult HIV prevalence between 2001 and 2007, 2) as a percent change in the adult HIV prevalence between pairs of years, and 3) as the level of adult HIV prevalence in a given year. Unfortunately, systematic, reliable data from before 2001 are not available, and it not clear that the data for 2003 and 2005 are fully reliable (which is why I focus on the first analysis, despite its smaller sample size). Given that prevalence lags incidence, it would be ideal to also measure incidence rates (Bongaarts et al. 2008; de Waal 2006; Grulich and Kaldor 2002), but such data are hard to gather and do not exist consistently across sub-Saharan African countries[2]. I do not use the AIDS Program Effort Index (USAID et al. 2003) as it measures country-level *effort* to address AIDS, not the impact of such efforts, and exists for only half (23) of sub-Saharan countries for only one year.

[1] For the sake of brevity, I do not present a full analysis of the interview and archival data. Some of this analysis can be found in Sullivan (2007), while the rest is part of a book project on the topic in which I am currently engaged.

[2] In future analyses, I hope to experiment by using prevalence among those aged 15-24 (who have just become sexually active) as a proxy for incidence and look at the change between 2001 and 2007.

Variables that capture the strength and timing of countries' efforts to slow population growth include the following:

- Date and existence of population policy. From my previous work (Sullivan 2007), obtained from population policies themselves and the United Nations Population Fund (2003). Two thirds of African countries have such policies, and their texts indicate them to be comparable. In particular, the policies focus primarily on slowing the population's growth rate via reductions in the number of children born per woman.
- Date of founding of IPPF affiliate. Based on publications from the International Planned Parenthood Federation (IPPF), I have the date of founding of each country's IPPF affiliate (Sullivan 2007). Although some of these organizations were directly set up by IPPF, others were in existence already and then affiliated with the IPPF later. All but one country (Somalia) has an affiliate organization, founded between 1932 (South Africa) and 1999 (Malawi).

Given that there are factors other than those related to population-related interventions likely to influence HIV prevalence, I include two HIV-related controls:

- An indicator for whether a country has an NGO that focuses specifically on HIV/AIDS. These data come from a United Nations directory of NGOs (UN 2003b) and from two directories of organizations for people living with HIV/AIDS published by the United States Agency for International Development (USAID 2002, 2004).
- A measure of the proportion of those HIV-positive individuals in 2006[3] in need of antiretroviral coverage who were receiving it (UNAIDS and WHO 2009). Better provision of antiretroviral therapy is, ironically, likely to make HIV prevalence higher because it reduces mortality, and thus increases the number of HIV-positive individuals.

Time-variant measures to be included as controls in the regression include:

[3] Ideally, I would include this measure for all years. I have not, as of yet, been able to locate the data for more than this one year.

- Degree of government control, proxied by type of government (autocracy, transitional, or democracy), from Freedom House (2009)
- Economic well being, proxied by gross domestic product per capita, from the World Development Indicators (World Bank 2008)
- Stability, proxied by the occurrence of war, from the International Peace Research Institute armed conflict data set (Harbom and Wallensteen 2009)

Time-invariant measures to be included as controls in the regression include:

- State capacity, proxied by ethnic fractionalization (cf. Easterly and Levine 1997; Lieberman 2007), taken from Alesina et al. (2003). Ranges between 0 (all individuals from same ethnic/lingual group) and 1 (all individuals from different ethnic/lingual groups).
- Structure of institutions, proxied by former colonial power, from Bratton and Van de Walle (1997)

I start off by presenting univariate and bivariate statistics. I then present the results from three regressions, each using a variant of the data set. I conducted all analyses with SAS and SPSS. The first analysis looks at change in prevalence over time, between 2001 and 2007. I picked this time frame both because it capture the long duration that one would expect would be required of institutions and organizations to change reproductive health behavior, but also because of some concern about the quality of the sequencing of the data for 2001, 2003, 2005, and 2007[4]. The dependent variable is thus the change in HIV prevalence between 2001 and 2006. The time-varying variables are an average of the period 2001 to 2006. The data set theoretically has 47 observations, but missing data and the need to exclude Mauritius and

[4] The prevalence rates for 2003 and 2005 do not seem to "fit" well with those from 2001 and 2007. Given that the 2001 and 2007 figures were published together by UNAIDS (2008), but the 2003 and 2005 figures are from a different publication (UNAIDS 2006), it may be that the figures for the intervening years are in need of revision.

Senegal because of their being outliers on the dependent variable cuts the sample size down to 37. The analysis consists of an ordinary-least squares regression.

The second analysis uses data organized into country-years, with three observations for each country. The dependent variable is the change in HIV prevalence over pairs of years (2001-2003, 2003-2005, and 2005-2007). The time-varying variables are an average of the two years preceding (so 2001-2002 for the 2001-2003 period, and so forth). This data set theoretically has 141 observations (47 countries times three years per country), but only 118 in reality. The analysis consists of an ordinary-least squares regression, with errors clustered on country because of the multiple observations per country.

The final analysis looks simply at level of HIV prevalence over time, so there are four observations for each country and the data are again organized in to country years. The dependent variable level of HIV prevalence in each of four years (2001, 2003, 2005, and 2007). The time-varying variables are an average of the two years preceding each year (so 1999-2000 for 2001, and so forth). This data set theoretically has 188 observations (47 countries times four years per country), but only 147 in reality. The analysis consists of an ordinary-least squares regression, which errors clustered on country because of the multiple observations per country.

RESULTS: CASE STUDIES

A brief analysis of the literature, my own fieldwork, and other primary sources for Senegal and Nigeria (Sullivan 2007), and for Malawi (cf. Chimbwete et al. 2005, Kaler 2004) provide support for the hypothesis that the strength and timing of country-level population interventions determined later success in addressing HIV/AIDS.

In previous research (Sullivan 2007), I explained why Senegal and Nigeria, two countries with populations that favored large families, had both been willing to adopt national population policies to limit fertility in 1988, making them the first African nations to pass such legislation in twenty years. Both Senegal and Nigeria had population “problems” of similar magnitudes in the late 1980s: they had comparably high fertility rates—6.5 and 6.7 children per woman,

respectively—and similarly high population growth rates—2.8% and 2.9% per year, respectively (World Bank 2008). Senegal and Nigeria also both had relatively early efforts to slow population growth, but Senegal's efforts were stronger. Specifically, although both countries adopted population policies to reduce population growth in 1988, Senegal had *twice* as many local NGOs as Nigeria working in reproductive health, despite having a population less than a tenth the size of Nigeria's (Robinson 2008). Similarly, the Senegalese government spent approximately twice as much per capita as the Nigerian government on family planning in the mid-1990s (Janowitz et al. 1999), and Senegal was a popular recipient of donor funding for population activities (Foley 2007). Finally, there was minimal resistance to the population policy in Senegal, but great resistance on the part of women's and religious groups in Nigeria (Dixon-Mueller 1993; Osuide 1988; Robinson 2009).

Malawi's response to population growth, however, can only be described at weak. Hastings Kamuzu Banda, who was president from 1964 to 1994, did not see population growth as a problem and went so far as to ban family planning in the 1960s (Chimbwete et al. 2005). As donor interest in family planning increased in the 1980s, the Malawian government remained unwilling to fully endorse family planning, and so implemented a policy in 1982 with a goal to increase the number of years between births (ibid.). It was not until Banda was pushed out of power in 1994 that the government adopted a national population policy (ibid.), and the affiliate of the International Planned Parenthood Federation was not founded until 1999 (Sullivan 2007).

Differences in the degree of effort put towards reducing population growth have impacted HIV outcomes in all three countries: strong success on the part of Senegal, but only moderate success in Nigeria, and very high HIV prevalence in Malawi. Senegal's success at keeping HIV prevalence near 1% is described in the background section above and resulted from both political commitment and governmental outreach to NGOs. Fieldwork in Senegal indicated that this outreach to civil society organizations, particularly religious ones, began with efforts to promote family planning, and most likely spilled over in to HIV prevention efforts. In

Nigeria, however, the National AIDS Control Program established in 1987 faltered soon after its inception as donors were not particularly willing to support the policies of an oil-rich, military dictatorship, the dictatorship itself was not interested in HIV prevention, and the country experienced massive political instability during the 1990s (Alubo 2002; Boone and Batsell 2001; Folayan 2004; Iliffe 2006; Smith 2004). As a result, the prevalence rate ultimately reached 3%, which translated in to 2.6 million people living with HIV/AIDS in 2007 (UNAIDS 2008) and a continued potential for rapid increases in prevalence. Had the Nigerian government more deftly navigated population growth reduction efforts, rather than provoking overt resistance, it might have laid the groundwork for more effective HIV prevention efforts.

Malawi's initial response to HIV/AIDS was mixed. Despite being a medical doctor, President Banda had minimal interest in HIV/AIDS (Patterson 2006). Nonetheless, the Ministry of Health started the National AIDS Control Programme in 1987 (Putzel 2004), but it was ultimately quite ineffective (Patterson 2006). AIDS was declared a national emergency in 1999, but this still did not provoke much local interest, and the removal of the National AIDS Control Programme from Ministry of Health in 2001, in order to comply with World Bank guidelines, decimated the Ministry and further hampered efforts to address HIV (Putzel 2004). Surface efforts to address HIV/AIDS continued: a national AIDS policy followed in 2004, and that same year, HIV became a campaign issue for the first time (Patterson 2006). In terms of the relationship between responses to population growth and HIV/AIDS, the experiences in Malawi and Nigeria are quite similar. There was lots of suspicion about population control, and the fact that the government began to care about population growth at the same time as HIV/AIDS was leading to increased mortality made its efforts in relationship to HIV all the more suspect (Kaler 2004).

RESULTS: UNIVARIATE AND BIVARIATE ANALYSIS

Table 1 shows descriptive statistics for all variables included in the analysis.

Table 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.
HIV Prevalence (% 15-49 HIV+)				
2001	6.2	7.5	0.1	26.5
2003	7.0	7.8	0.1	32.4
2005	6.9	7.7	0.1	33.4
2007	5.7	6.8	0.1	26.1
Change 2001-03	0.3	0.8	-1.0	4.0
Change 2003-05	0.0	0.0	-0.2	0.1
Change 2005-07	-0.2	0.3	-1.0	0.3
Change 2001-07	0.1	0.8	-0.4	4.7
Population Interventions				
Year of population policy	1992	7	1967	1999
Population policy indicator	0.68	0.47	0	1
Founding year of IPPF affiliate	1978	15	1932	1999
IPPF affiliate founded before 1980	0.53	0.50	0	1
HIV-Related Controls				
Explicit HIV/AIDS NGO indicator	0.62	0.49	0	10
Antiretroviral coverage (proportion of those in need), 2006	0.26	0.20	0.01	0.95
Time-Varying Controls (average 2001-2006)				
Democracy indicator	0.19	0.39	0	1
GDP per capita (2000 US$)	870	1271	86	5491
War indicator	0.43	0.49	0	1
Time-Invariant Controls				
Ethnic fractionalization	0.67	0.22	0.00	0.93
Former colonial power Great Britain	0.36	0.48	0	1
Former colonial power France	0.36	0.48	0	1

Sources: See text above

Table 1 shows that across all countries there was an 11% increase in HIV prevalence between 2001 and 2007. This mean masks a great deal of variation, and indeed, there was a 3.5% *decrease* in HIV prevalence when two extreme outliers (Senegal and Mauritius) are removed from the calculation. Two thirds of countries have national population policies, and the average year of signing was 1992. The average year of founding for countries' IPPF affiliates was 1972, and 53% of affiliates were founded before 1980. Approximately 60% of countries have an explicit HIV/AIDS NGO, and on average, in 2006 only 26% of those in need of antiretroviral therapy were receiving it. Only 19% of countries were democracies during the time period in question, the average GDP per capita was $870, and 43% of countries experienced some sort

of war or conflict. Most African countries are extremely ethnolinguistically diverse, and there is an even split between former British and former French colonies.

As the first piece of bivariate comparisons, Table 2 shows the components of a composite measure of country-level governmental and social efforts to slow population growth based on the date of the country's population policy, the date of the founding of its IPPF affiliate, and the proportion of its family planning NGOs that date from before 1990 (Sullivan 2007; UN2003b). Countries are divided in to three groups based on each of the component measures, as shown in Table 2.

Table 2. Key Components of Composite Measure of Efforts to Slow Population Growth

	(1) Strong	*(2) Moderate*	*(3) Weak*
Population Policy Date*	Before 1994	After 1994	No policy
IPPF Affiliate Founding Date*	Before 1973	1973-1988	1989 or later, or not at all
Percentage of Family Planning NGOs Founded Prior to 1990**	50% or more	1-49%	0%

Sources: * Sullivan 2007; ** UN 2003b.

Countries are assigned the modal score for the three components to create an overall measure of the extent of governmental and social efforts to slow population growth. Where no mode exists (i.e., a country scored in different categories for all three components), countries are assigned to the moderate group. This composite measure is beneficial for two reasons. First, it captures a country's efforts to slow population growth in an objective way, without having to poll experts in country, and second, it exists for all but one country (Equatorial Guinea). The measure thus improves on previous measures, such as Ross and Stover's (2001) family planning program effort index, which is based on polling of experts, and is missing for 10 countries in Africa. Importantly, comparison with Ross and Stover's measure indicates rough correspondence: countries in the strong group have the highest (strongest) average family planning effort score, followed by countries in the moderate group, and then countries in the weak group. Like Ross and Stover's index, this classification scheme is based on the extent of a country's *efforts* to slow population growth, not the impact of those efforts on fertility.

This classification of countries into strong, moderate, and weak efforts to reduce population growth is salient for both population and HIV-related outcomes. Countries in the strong group experienced on average a 21% decline in their total fertility rate between 1987 and 2002, while countries in the weak group experienced only a 15% decline (World Bank 2008). Relative to the 3.5% decline in HIV experienced by all African countries between 2001 and 2007 (UNAIDS 2008, and excluding Mauritius and Senegal), countries in the strong and moderate groups experienced an approximate 4.5% decline in HIV prevalence, while countries in the weak group experienced almost no decline in HIV prevalence (see Table 3). Countries in the strong group also experienced the greatest absolute declines in HIV prevalence, followed by countries in the moderate group, and then countries in the weak group.

Table 3. Population Reduction Efforts and Changes in HIV/AIDS Prevalence, 2001-2007

	Country-Level Effort to Slow Population Growth		
	Strong	*Moderate*	*Weak*
Average Percent Change in HIV Prevalence*	-4.46	-4.82	-0.10
Average Absolute Change in HIV Prevalence	-0.86	-0.41	-0.12

Prevalence is the percentage of the population aged 15-49 with HIV/AIDS (UNAIDS 2008).
* Senegal and Mauritius removed from the percent change calculation due to extreme percent changes that resulted from minor changes to low prevalence rates.

The results from the case studies and the bivariate results are consistent with the hypothesis that country-level population interventions determined later success in addressing HIV/AIDS. I now turn to testing the hypothesis in a multivariate framework.

MULTIVARIATE RESULTS

Table 4 presents the results of the three multivariate analyses described above, each predicting a different way of measuring HIV prevalence. The first model predicts change in HIV prevalence between 2001 and 2007, the second predicts change in HIV prevalence between pairs of years (2001-2003, 2003-2005, and 2005-2007), and the third predicts level of HIV. Due to a lack of correlation with the dependent variable (results not shown), former colonial power was dropped from the final analysis. In all of these models, a decrease in the dependent variable (HIV prevalence) is a *good* thing, so negative coefficients indicate a positive outcome:

either greater declines in HIV prevalence, or lower HIV prevalence, associated with that covariate.

Table 4. Results of Multivariate Analyses Predicting Change in, and Level of, HIV Prevalence, Sub-Saharan African Countries, 2001-2007

	Dependent Variable		
Covariates	**(1) Change in HIV 2001-2007**	**(2) Change in HIV over pairs of years**	**(3) Level of HIV**
Intercept	0.05	-0.02	4.81
Population Interventions			
Population policy indicator	0.07	0.16	-2.74†
IPPF affiliate founded before 1980	-0.12†	0.04	1.53
HIV-Related Controls			
Explicit HIV/AIDS NGO indicator	-0.16*	-0.18†	1.31
Antiretroviral coverage, 2006	-0.38†	-0.28	5.54
Time-Varying Controls			
Democracy indicator	0.07	-0.03	-1.81
GDP per capita (2000 US$)	0.00	0.00	-0.00
War indicator	-0.09	0.08	-2.14
Time-Invariant Controls			
Ethnic fractionalization	0.19	0.14	2.17
N	37	118	147
R^2	39.4%	4.9%	4.3%

Note: Significance indicated by † p < 0.10 level; * p < 0.05 level; ** p < 0.01 level, *** p < 0.001 level

The first model fits the best of all three models, although due to the small sample size, there are no highly significant covariates. Countries with an "early" IPPF affiliate (founded before 1980) experienced greater declines in HIV prevalence, as did those with an explicit HIV/AIDS NGO. Countries with better antiretroviral coverage also experienced greater declines in HIV prevalence, which may be an indicator that countries that mount effective prevention measures are also better at mounting effective care efforts. Although not significant, the sign on the ethnic fractionalization variable is as expected: increases in ethnic diversity are associated with smaller declines in HIV, which parallels findings in the literature that high ethnic diversity is associated with inefficient allocation of public goods (cf. Easterly and Levine 1997).

The only coefficient which is significant in the second model, predicting change in HIV prevalence over shorter time spans of two years, is again the HIV/AIDS NGO indicator. Countries with an explicit HIV/AIDS NGO experienced greater declines in HIV prevalence than

those without such an NGO. Again, although not significant, the sign on the ethnic fractionalization variable is positive, as would be expected.

The third model considers level of HIV prevalence, and the only variable which is significant is the population policy indicator. Countries with national population policies had lower levels of HIV. None of the other variables are significant, although the sign on ethnic fractionalization is still positive. We also see the positive sign on antiretroviral coverage, which probably does not reflect antiretroviral provision driving HIV rates higher, but instead indicates that those countries most severely impacted by HIV have worked harder (and received more international assistance) to provide antiretroviral therapy to their citizens. Finally, the democracy and war indicators, although not significant, are in the expected direction – democracies, and conflict-free countries, have lower HIV prevalence.

In sum, the multivariate results provide some support for the hypothesis that population-related interventions have positively impacted HIV outcomes in sub-Saharan African countries. Specifically, we see a significant relationship between the founding date of a country's IPPF affiliate and the change in HIV prevalence between 2001 and 2007, and a big effect of whether a country has a population policy and level of HIV prevalence. Intriguingly, and not directly related to the hypothesis tested in this paper, having an explicit HIV/AIDS NGO is significantly related with changes in HIV prevalence both over the whole period, and over shorter spans of time. The observed association these NGOs with better HIV outcomes points to the importance of civil society organizations in driving the reproductive health context.

CONCLUSIONS

The above analysis provides support for the argument that country-level responses to rapid population growth determined the effectiveness of countries' responses to HIV/AIDS, and in turn the quality of reproductive health for their citizens. The qualitative analysis of Senegal, Nigeria, and Malawi supports this conclusion, and provides more details on the causal mechanisms at play. Specifically, it seems that the lack of resistance to population policy and family planning in

Senegal may have helped the government's efforts to address HIV/AIDS. In Nigeria and Malawi, however, suspicions about condoms and outside efforts to change sexual behaviors that dated from the time before HIV/AIDS hampered what government efforts there were to reduce HIV.

The quantitative analysis of all sub-Saharan African countries also provides support for the argument that those countries with the strongest responses to population growth experienced the best HIV-related outcomes. Specifically, in the bivariate context, countries with either strong or moderate responses to population growth (with "strength" based on characteristics of their population policy and reproductive health care NGOs) experienced much greater declines in HIV prevalence between 2001 and 2007 than did those countries with weak responses. In the multivariate context, having had an IPPF affiliate for longer is also associated with better HIV-related outcomes, as is having an explicit HIV/AIDS NGO. Having a population policy is associated with overall lower levels of HIV. Together, these findings point to the importance of policies and organizations determining the context surrounding reproductive health outcomes.

In conclusion, this analysis provides support for the hypothesis that early efforts at slowing population growth, particularly those that were not met with resistance, had an impact on later efforts to reduce HIV prevalence. By focusing on macro factors, including population policy and both family planning and HIV/AIDS NGOs, this analysis makes an important contribution to the literature, which has focused primarily on individual-level determinants of reproductive health outcomes.

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