AIDS AND VIOLENT CONFLICT:
The Indirect Effects of Disease on National Security

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Journalists, policy officials, and academics increasingly warn of the negative effects on national security of Acquired Immune Deficiency Syndrome (AIDS) and the human immunodeficiency virus (HIV) that causes it. Despite numerous warnings, however, the idea that HIV/AIDS threatens national security has not become conventional wisdom within the international relations discipline. We empirically test the link between HIV/AIDS and two aspects of national security, the severity of human rights abuses and civil conflict. Specifically, we examine the direct and indirect effects of adult HIV prevalence levels in 1999 and 2001 across 112 countries on the occurrence and intensity of state-imposed human rights violations and civil conflict. We find that as HIV prevalence levels increase, so too does the severity of human rights abuses and civil conflict. HIV/AIDS has no direct impact on such abuses and civil conflict; it influences national security indirectly through its impact on the social, political, and economic institutions of the state.

Journalists, policy officials and academics increasingly warn of the negative effects on national security of Acquired Immune Deficiency Syndrome (AIDS) and the human immunodeficiency virus (HIV) that causes it. In January 2000, the United Nations (UN) Security Council met to discuss the security implications of AIDS in Africa, marking the first time in the institution's history that it had addressed a health issue. That same month, the Central Intelligence Agency's National Intelligence Council (NIC) (2000) explored the implications of HIV/AIDS for U.S. security. Later, NIC (2002) turned its attention to the security consequences of "the next wave of HIV/AIDS."[1] These official pronouncements mirror the reports of private think tanks. In recent years, the International Institute for Strategic Studies (Elbe 2003), RAND (Brower and Chalk 2003), the Chemical and Biological Arms Control Institute and the Center for Strategic and International Studies (Ban 2002), the Council on Foreign Relations (Garrett 2005), and the International Crisis Group (2001) have published reports on infectious disease as a national security issue.

A small, but growing number of scholars (i.e., Fidler 2003; Ostergard 2002; Price-Smith 2002; Singer 2002) and journalists (e.g. Garrett 1999, 2000, 2005) join national and international officials and public health advocates in raising the alarm: HIV/AIDS threatens national security. The threat posed to human security—the welfare of individuals or people collectively (Paris 2001)—should be obvious to even the most casual observers of the pandemic. The recent turn to rhetoric linking HIV/AIDS and national security highlights a narrower set of consequences, the impact of the disease on the use of force (i.e., Fidler 2003; Ostergard 2002; Peterson 2002/3; Price-Smith 2002, 2003; Price-Smith and Daly 2004). HIV/AIDS, in other words, produces significant and lethal externalities for the hardest hit societies. In addition to the tens of millions of people who have or will succumb to HIV/AIDS, the pandemic, it is argued, will claim even more lives by exacerbating violent conflict (Cheek 2001; Fourie and Schönteich 2001; Price-Smith 2003).

[1] The second wave includes epidemics in Nigeria, Ethiopia, Russia, India, and China.

Despite numerous warnings, the idea that HIV/AIDS erodes political stability and enflames conflict is not conventional wisdom within the international relations discipline. The catastrophic consequences of HIV/AIDS experienced by a handful of sub-Saharan African states have not been replicated in other states, leading some students of the pandemic to question the accuracy and usefulness of casting the pandemic largely in security terms (Elbe 2006; Peterson 2002/3). The lack of attention to HIV/AIDS in the international relations literature and particularly the security journals suggests that claims about the dire threats posed by HIV/AIDS do not resonate with traditional approaches to national security.[2] More importantly, no one has systematically and empirically examined the relationship between HIV/AIDS and national security.

In this paper, we empirically test the argument that HIV/AIDS increases the likelihood and severity of violent conflict by contributing to the social, political, and economic breakdown of the state. Specifically, we examine the direct and indirect effects of adult HIV prevalence levels in 1999 and 2001 across 112 countries on the occurrence and intensity of state-imposed human rights violations and civil conflict. We find that as HIV prevalence levels[3] increase, so too do the occurrence and severity of violent conflict. But HIV/AIDS has no direct impact on conflict; it influences national security indirectly through its impact on a state's society, economy, and political institutions

I. The Problem

HIV/AIDS already has surpassed in absolute terms the most notorious epidemics of earlier generations, including the Black Death of the 14th century, the smallpox epidemics that ravaged the Americas in the 16th and 17th centuries, and the 1918 influenza epidemic that claimed

[2] For an early exception, see Rosen 1987.

[3] HIV prevalence level refers to the percentage of the population—in this case 15-49 year olds—infected with HIV and/or AIDS.

25 million lives.[4] To date, over 60 million people have been infected with HIV and/or died from AIDS. 2.5 million people were newly infected in 2006, and 2.1 million died (UNAIDS 2007, 1). More frightening than the statistics describing the pandemic is the fact that, no matter what breakthroughs medical science achieves in the coming years, we likely have witnessed only the proverbial tip of the AIDS iceberg, which is poised to claim hundreds of millions of lives in the coming decades. The HIV/AIDS pandemic, what one analyst calls "a viral holocaust" (Cheek 2001), constitutes a humanitarian and human security crisis of unimaginable proportions.

Many scholars and practitioners of international relations warn that the disease constitutes a national security threat. This is a narrower claim, that in some countries the devastation wrought by HIV/AIDS presents a physical threat to the preservation of the state—its territorial integrity, political institutions, and national sovereignty. The core of this claim is that the epidemic influences the occurrence and outcome of violent conflict.

II. The Argument

We focus in this paper on the first of these relationships and develop a causal model of HIV/AIDS and civil conflict. Figure 1 illustrates our core argument that HIV/AIDS causes conflict by contributing to the breakdown of a state's society, economy, and political institutions.[5] The disease degrades what we call a country's *Social-economic-political (SEP) status*, the relative quality of the country's composite social conditions, economic circumstances, and political institutions. As HIV/AIDS erodes a country's *SEP status*, the propensity for civil conflict and human rights abuse increases. In short, our model posits that HIV/AIDS indirectly

[4] As a percentage of the population, the victims of some earlier epidemics still outnumber those from AIDS. Smallpox and other European diseases, for example, killed as many as 95 percent of North American Indians between 1492 and the late 1600s. (Joralemon 1982).

[5] In our research design we discuss the control variables and other mechanisms at work in our model.

affects conflict by eroding a state's society, economy, and political institutions.[6] The spread of HIV/AIDS does not itself cause intra-state conflict; rather it contributes to social, economic, and political instability, which in turn aggravates violent conflict.

A. The Social, Economic, and Political Effects of AIDS

The first stage of our model depicted in Figure 1 shows that HIV/AIDS affects a country's *SEP status*, its composite score on the quality of its social, economic, and political conditions. A wealth of recent research highlights the ruinous effects of HIV/AIDS on household, local, and national economies, as well as the social and political institutions of the state.

In many states, particularly in sub-Saharan Africa, HIV/AIDS is devastating all levels of the economy. The United Nations Development Programme (UNDP 2001) estimates that AIDS lowers the income of affected households by 80 percent, and food consumption drops 15-30 percent. HIV strikes people in their economically most productive years, ravaging local and national economies. By 2001, a UN Food and Agriculture Organization study estimated, AIDS had claimed 26 percent of the agricultural work force in the ten most affected African nations (ICG 2001, 11). AIDS lowers productivity and produces labor shortages in all economic sectors, but it disproportionately attacks the middle and professional classes—including teachers, scientists, technicians, and managers. In a high prevalence country like South Africa, according to Arndt and Lewis (2000), GDP will be 17 percent lower in 2010 with AIDS than it would have been without it. Even after accounting for AIDS-induced population decline, they argue, GDP in South Africa will be 8 percent lower in 2010 with AIDS than without it.

AIDS also threatens the social fabric of the hardest hit nations. It has become commonplace to note that AIDS is producing a generation of orphans: As many as 11 percent of children in some

[6] We model the reverse causal process between *HIV/AIDS* and *SEP-status* and control for other independent variables in our research design.

African states had lost one or both parents by 1997, compared with about 2 percent before the AIDS era. As the number of AIDS orphans grows, particularly in societies where criminal opportunities and weapons are readily available, so too will the level of violent crime and the potential for other forms of conflict. At least one-third of children orphaned by AIDS drop out of school (UNDP 2001, 9). At the same time, the disease depletes the supply of teachers. In South Africa, up to one-third of teachers are HIV positive. In Zambia, the number is 40 percent, and in Swaziland, 70 percent (ICG 2001, 16). A World Bank study of Malawi asserts that roughly 40 percent of education personnel in that country will die from AIDS (Cohen 1999a). In 2001, the International Crisis Group (2001, 16) estimated that Africa would lose 10 percent of its educators to AIDS by 2005, setting the continent back a century in education levels.

Finally, the HIV/AIDS pandemic undermines the ability of the state to govern. AIDS literally destroys political institutions by gutting them of their personnel. In September 2000, Zimbabwean President Robert Mugabe announced that AIDS had killed three of his cabinet ministers, as well as many traditional tribal chiefs (Pan African News 2000). Eighty-six percent of all employee deaths at the Kenya Revenue authority in 1998 and 75 percent of all police deaths in 1996-98 were AIDS-related (ICG 2001, 14-15). More than one-fourth of South African police forces are thought to be infected with HIV (Price-Smith 2003, 24), and the disease has brought the courts and local governments to a halt in some parts of sub-Saharan Africa (Cohen 1999b).

B. AIDS and Violent Conflict

Much of the existing research on AIDS and national security draws our attention to the myriad ways the pandemic strains the social, political, and economic resources of affected countries, but it usually only speculates about the effects of these stressors on violent conflict.[7] We draw on Colin Kahl's (2006) analysis of the causes of environmental conflict to propose two

[7] For works that explore the impact of violent conflict on public health generally and HIV/AIDS in particular, see Iqbal (2006) and Iqbal and Zorn (2008), respectively.

pathways by which state weakness caused by a stressor like HIV/AIDS makes countries susceptible to civil strife.

First, state failure or "bottom-up" conflicts occur when HIV/AIDS weakens the legitimacy, capacity, and cohesion of the state, providing or increasing incentives and opportunities for anti-state and inter-group actors to engage in violence (Kahl 2006; Price-Smith 2002). Competition over access to scarce anti-retroviral medications will intensify this effect. In most parts of sub-Saharan Africa today, treatment programs for HIV/AIDS are limited to urban areas. If access to life-saving treatments are based or perceived to be based on geography, skill, education, ethnicity, religion, political loyalty, or other factors, HIV/AIDS is far more likely to produce mass conflict (Cheek 2001).

Second, state exploitation produces "top-down" conflicts because disease creates opportunities and incentives for political elites to initiate violence (Kahl 2006). Challenges to regime capacity and legitimacy "can contribute to the eruption of violence, not just spontaneously, but in some cases as the result of exploitation by ethnic, religious or national elites to serve their narrow interests" (Fourie and Schönteich 2001). In such cases, elites may incite or initiate civil conflict, but they also will seek to crush political opposition or even engage in "planned genocides" (Price-Smith 2002, 124). State exploitation, in short, may produce both civil conflict and human rights abuses.

Recent literature on HIV/AIDS and national security is littered with implicit and explicit hypotheses about the relationship between the pandemic and the outbreak or intensification of violent conflict. To date, however, the arguments discussed above are relatively underdeveloped and the evidence for them is largely anecdotal. There has been no systematic attempt to test empirically the argument that HIV/AIDS increases conflict by contributing to state failure and/ or state exploitation.[8] In the model developed below, we fill this gap by examining the indirect effects of HIV/AIDS on conflict.

[8] Note that Price-Smith and Daly 2004 examine the link between HIV/AIDS and conflict in a case study.

III. Research Design

Our argument posits that *HIV/AIDS* erodes a country's *SEP status*, but it is logically possible, indeed likely, that the causal arrow points in the opposite direction: *SEP status* influences *HIV prevalence levels*. Our model also includes other factors that affect the degradation of *SEP status* and the severity of conflict. We leave open the possibility for reverse causation between *HIV/AIDS* and *SEP status* and add control variables to the core model.

Reverse Causality?

Since the epidemic's earliest days, students and practitioners have recognized the role poverty plays in the spread of HIV/AIDS ("AIDS" 1994). Poverty undermines public health in general and contributes to the quick and extensive spread of HIV/AIDS in particular by limiting access to health care, creating malnutrition, and compelling women to enter the commercial sex trade (Barnett and Whiteside 1999; Parker 2002; Poku 2002; Whiteside 2001). Lack of democratic institutions, including respect for women's rights and free speech, facilitate the spread of the disease (Fourie and Schonteich 2001). Countries with weak educational systems and those in which students drop out at young ages create few opportunities for effective HIV education. Wealthier, more democratic, and more educated countries are better able to respond to the epidemic, because they provide more universal access to better health care, afford fewer incentives to engage in commercial sex work, provide more extensive HIV/AIDS education, and enjoy greater legitimacy for their policies than poorer, less democratic, and less educated countries.

To model such reverse causality econometrically, we include a variable in our model that affects *HIV prevalence*, but not *SEP status*. *Religious fractionalization* has not been shown to affect wealth, democracy, and education, but religion has long been thought to be correlated with HIV/AIDS prevalence. Empirical studies suggest that the relationship is a complex one. Some

studies (i.e., Abebe et al 2000; Drain et al 2004) suggest that Muslims are less likely to become HIV-infected, while others (Lawoyin and Aderwole 2004) claim that Christians have a lower risk of infection. Still other students of AIDS claim that religious affiliation and religiosity, rather than the specific religion of subjects, explains lower prevalence levels (Hasnain et al 2005), the perception of risk of infection (Largarde et al 2000; Prohaska et al 1990), and knowledge of AIDS (Takyi 2003). We argue that in countries where one religion dominates and sets the moral (and sometimes legal) code for a nation, HIV prevalence levels should be lower. The greater the degree of religious fractionalization, in contrast, the higher the HIV prevalence level should be (See Figure 1).

Control Variables

Figure 1 also adds control variables to the core model. Industrialization and capitalist development increases civil society, urbanization, and education, and improves communication and transportation (Rueschemeyer, Stephens, and Stephens 1992). It produces modern values and democratic institutions, which provide the rule of law, civil liberties, and freedoms to a state's citizens (Przeworski and Limongi 1997). Thus, agricultural output should decrease a country's *SEP status*, while manufacturing output and urban population should increase a country's *SEP status*.

The literature on civil war and human rights abuses provides our security control variables. Influential students of civil war argue that economic development and growth, education, and democracy help explain why men rebel (Collier and Hoeffler 1998; Elbadawi and Sambanis 2002. These models also suggest two additional explanatory variables: population increases civil war onset, while social cohesion (low ethnic fractionalization) decreases the risk of social conflict.[9]

[9] Balch-Lindsay and Enterline (1999) find no statistically significant relationship between ethnic fractionalization and civil war, although they use a different measure than Elbadawi and Sambanis (2002).

Existing studies of state terror and human rights abuses make similar findings. Poe and Tate (1994) and Henderson (1991) argue that democracy should dampen human rights violations due to the rule of law, open participatory channels with which to influence government decisions, and associated freedoms. Henderson (1991) argues, moreover, that repression increases as a country's population increases for two reasons. First, the occurrence of terror should increase as the opportunity increases; more people mean more opportunity. Second, large populations put more stress on the government in terms of policy choices (e.g. natural resources, welfare, etc.). Such a government often resorts to terrorizing the population to maintain control. Finally, economic development should decrease repression because the poorest countries tend to be the ones with the most social and political tensions, which lead the state to employ intimidation tactics to scare people into compliance.

Data

We systematically test the argument that HIV/AIDS indirectly causes conflict by eroding a state's social, economic, and political conditions with aggregate data for 112 countries over two years, 1999 and 2001. We append a list of countries included in our estimation sample, which includes all countries for which we have data for at least one of our two years (1999 or 2001). Given our unbalanced panel, we can say more about spatial variation than temporal variation. We want to be clear that we are testing whether higher HIV levels indirectly yield higher levels of civil conflict and human rights abuses in a given country-year. We do not test whether higher HIV prevalence levels *cause* the onset of civil conflict or human rights abuses.

The first stage of our argument claims that HIV/AIDS erodes a state's *SEP status*. To test this argument, we identify measures that capture each of the component parts—society, economy, and political institutions—and combine them in a way that reflects a country's overall *SEP status*. *SEP status*, in other words, is a composite measure of a country's social conditions, economic prosperity, and political institutions.

To measure a state's economy we use *Gross Domestic Product* (GDP) data available from the 2004 World Bank Development Indicators database. To proxy a state's societal status, we utilize S*econdary education enrollment* (percent net) from the same World Bank database. Finally, we use *Democracy* (e.g. democracy score – autocracy score) from the Polity IV project to capture the nature of a state's political institutions We then create a composite measure[10] from the three component variables using principle components analysis, a common factor analysis method. Using the Kaiser (1960) criterion, we only retain factors that extract at least as much as the equivalent of one original variable (i.e., an eigenvalue = 1.0). With these data, we retain only the first factor.

To internally validate our new measure, we correlated our component variables and our new composite indicator, *SEP status.* Each component variable is positively associated with the other components and with the new composite measure To demonstrate external construct validity, we also correlated our composite and component variables with *HIV prevalence* levels. The results provided preliminary evidence that *HIV prevalence* is statistically significant and negatively associated with each of the component variables as well as *SEP status*. The results of the validation checks are available in our online Appendix and can be verified using our replication dataset.

Information on HIV/AIDS prevalence levels come from the United Nations Joint Programme on AIDS and represent the most consistent and reliable data available. They measure the percentage of 15-49 year olds within each country infected with HIV and/ or AIDS (UNAIDS 2004, 189-92). The consistent negative correlation among our component measures and *HIV prevalence* and between our composite measure and *HIV prevalence* demonstrates that our

[10] We created a composite measure because the variables are correlated with one another, and any multi-equation analyses would need to take into account the endogenous relationships among the three variables. Identifying such a model to estimate it without bias and inefficiency is problematic. For robustness checks, we ran separate regressions for each component variable controlling for the others as well as for our modernization variables. In each equation, the *HIV prevalence* coefficient was negative and statistically significant.

measure is externally valid. In other words, it produces the kind of relationship with *HIV prevalence* that we expect and is consistent with the correlation coefficients we observe among *HIV prevalence* and each of our component variables. Given that our composite measure performs well on our tests for internal and external construct validity, we feel it captures our concept of socio-economic-political status well. In the first stage of our model, we control for the effects of modernization on a country's *SEP status* while testing our key HIV/AIDS hypothesis. We capture the industrialization process using the "manufacturing, value added (% of GDP)" variable from the World Bank Development Indicators database. We expect that *Manufacturing output* will have a positive and statistically significant impact on *SEP status*. In contrast, agrarian economies should be lower on the *SEP status* index. We capture this concept by measuring *Agricultural output* obtained from the same World Bank database. Finally, to capture urbanization associated with modernization, we use the *Urban population* variable from the Correlates of War dataset. We expect the estimated coefficient on *Urban population* to be positive and statistically significant.

To address the possibility of reciprocal causation between *HIV* and *SEP status*, we model the potential effect of *SEP status* on *HIV* by including *Religious fractionalization* as a variable that should affect *HIV* but not *SEP status*. This variable is analogous to the *Ethnic fractionalization* measure discussed above, although it measures the degree of religious, rather than ethnic, fractionalization. It comes from Fearon & Laitin's (2003) dataset, is constructed using information from the CIA Factbook and other sources, and ranges from 0 to 1.[11]

In the second stage of our model, we analyze the effects of *SEP status* on a core element of national security, the occurrence and severity of violent conflict within a society. In particular, we examine the effects of *SEP status* on the presence and intensity of civil conflict and human rights abuses. The *Civil conflict* variable comes from the Armed Conflict Dataset (Type3). It is an ordinal ranking of the intensity of armed conflict ranging from 0 (no internal conflict) to 1

[11] The correlation between the two fractionalization indexes in our estimation sample is only .24.

(minor internal armed conflict) to 2 (intermediate internal armed conflict) to 3 (internal war).[12] We measure *Human rights abuses* with Gibney and Dalton's (1996) Political Terror Scale (PTS). The PTS variable is a standards-based measure of the intensity and scope of violations coded on a 5-point scale.[13] Higher values are associated with greater levels of violation. The data are content-analyzed from two text sources: Amnesty International annual reports and the U.S. Department of State's annual reports on human rights. We report the findings using the State Department Indicator and note that the effects are consistent with the Amnesty International variable.

We use the Sambanis (2001) and other civil war models as a baseline specification for our analyses. We capture democracy, economic development, and education in our *SEP status* variable. We then add *Population* and *Ethnic fractionalization* as control variables. We report results using the population size variable from the COW project's capabilities dataset, and like Elbadawi and Sambanis (2002) and Sambanis (2004), we take the natural log. We use Taylor and Hudson's (1972) ethno-linguistic fractionalization indicator from Laitin and Fearon's (2003) replication dataset also used by Sambanis' (2004) and others. This measure ranges from 0 to 1, where higher values represent high fractionalization and lower values represent ethnically dominated societies.[14] Some studies find non-monotonic relationships between ethnic fractionalization and civil war onset and duration, so we include a squared term to test for nonlinearity. Certainly, there are other variables that affect the presence of civil conflict, but we

[12] See Strand, Håvard, Wilhelmsen, Gleditsch, and Mikael Eriksson (2004).

[13] 1= a country where rights are respected (political imprisonment, torture, and extra-judicial execution are extremely rare); 2 = a state that employ a limited use of political imprisonment, but largely avoid torture, and rarely resort to political killing; 3 = a country that routinely uses political imprisonment and extra-judicial execution occurs, but it is not endemic; 4 = a country where political imprisonment, torture, and extra-judicial killings are routine, but are only employed against those active in politics; 5 = a country where the entire population is at risk to political imprisonment, torture, and extra-judicial execution as the state regularly employs all of these tactics as a means of rule.

[14] Specifically, the indicator measures the probability that two randomly selected individuals belong to different ethnolinguistic groups (Taylor & Hudson 1972).

contend that the model includes the main controls needed to assess the indirect effects of HIV/AIDS on civil conflict. Since too many variables in a regression can be dangerous and mask causal relationships (Ray 2003, 2005; Achen 2002), we include only the core variables found to influence civil conflict. As a result, our model specification is very similar to Sambanis' (2001) "Core Economic Theory of Civil War Onset" model.[15] The primary contribution of our research, beyond confirming his (2001) findings, is to provide empirical evidence of the indirect effect of HIV/AIDS on conflict.

For the human rights abuse models, our measure of *SEP status* accounts for democracy and economic development in the Poe and Tate (1994) model as well as a country's societal characteristics (e.g., education levels). We also control for social tensions by adding *Ethnic fractionalization* to the mix. Finally, we include *Population* size (logged) in the model.[16] The descriptive statistics for each variable appear in Table 1.

Estimation

We estimate a different system of equations for each dependent variables, *Human rights abuses* and *Civil conflict intensity*. Each system is nonrecursive and Ordinary Least Squares (OLS) is inconsistent because one or more of the explanatory variables is correlated with the error term (Gujarati 1995, 642). Because our model is over identified, the three-stage least squares (3SLS) estimator is the appropriate choice. Since it is shown to perform best on such systems (Cragg 1967), we report three-stage least squares estimates for each system.[17]

[15] See regression 3.3 in Table 3 of that article. He also includes "Cold War" as a control variable, but it is statistically insignificant.

[16] Poe and Tate (1994) also control for British cultural influence, Leftist government, military control, economic growth, population change, and previous civil and international war experience. The only consistent statistically significant findings across different democracy measures, however, are the previous civil and international conflict measures. For this reason, we also include those measures in some of our model specifications.

[17] See Greene (2000, 681-84 and 692-693) for more information on identifying equations and the differences between and utility of both two-stage least squares (2SLS) and 3SLS routines. Because our

IV. Results

Table 2 reports our 3SLS regression estimates for our first system of equations: *SEP status*, *HIV prevalence*, and *Human rights abuses*, while Table 3 reports our 3SLS results for our second system of equations: *SEP status*, *HIV prevalence*, and *Civil conflict intensity*. We calculate the direct, indirect, and total effects for variables of interest in Table 4. Graphs portraying the indirect effect of our key variable, *HIV prevalence levels*, on both *Human rights abuses* and *Civil conflict intensity* appear in Figure 2.

Overall, the structural equation models demonstrate that HIV/AIDS has a significant indirect, positive effect on violent conflict. *HIV prevalence* is negatively correlated with *SEP status*, which has a negative effect on *Human rights abuses* and *Civil conflict intensity*. Therefore, as HIVAIDS prevalence levels increase, the propensity for and severity of human rights abuses and civil violent conflict increase. These findings hold even in the presence of reciprocal causation between *SEP stat*us and *HIV prevalence levels*. In fact, the feedback loop amplifies the indirect effect of *HIV prevalence levels* on both security variables.

The results for Equation 1 in both Tables 2 and 3 indicate that controlling for the effects of modernization, states with high *HIV prevalence levels* experience breakdown in socio-economic-political conditions. *HIV prevalence levels* have a statistically significant, negative effect on *SEP status*, controlling for variation in *Manufacturing*, *Agriculture*, and *Urban population*. These results hold when modeling the reciprocal causal relationship between *HIV prevalence* and *SEP status*. The results for Equation 2 in Tables 2and 3 show that *SEP status* has a negative and statistically significant effect on *HIV prevalence*, controlling for *Religious fractionalization*. The paths from *SEP status* to *HIV prevalence* are equal to

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model is overidentified, the 3SLS estimator is the most appropriate choice. However, as a robustness check, we estimate our system using both 2SLS and 3SLS estimators. The results are consistent across estimators, yet the 3SLS estimates differ slightly in magnitude. Cragg (1967) shows that the 3SLS estimator performs better than the 2SLS estimator on such systems and so we report the 3SLS estimates.

-1.67 and -1.80 respectively, revealing a strong negative effect. The impact of *Religious fractionalization* is positive and significant in both systems of equations. Consistent with our hypothesis, the results show that the more heterogeneous a state's religious environment is, the higher the HIV prevalence level. In other words, the more dominated a society is by one religion, the lower its HIV prevalence level.

The results for Equation 3 in Tables 2 and 3 show that *SEP status* is negatively associated with *Human rights abuses* and *Civil conflict intensity*.[18] Controlling for *Ethnic fractionalization* and total *Population*, the results confirm that as the social, political, and economic climate of a state erodes, both the severity of human rights abuses and the intensity of civil conflict increases. The logged value of *Total population* is significant in both models, but ethnic fractionalization is only significant in the human rights model. While Poe and Tate (1994) show that population matters, the *Ethnic fractionalization* finding reported here is new and its robustness should be examined in future studies.

To examine how HIV/AIDS indirectly affects a state's security, the main purpose of our study, we calculated the indirect effect of *HIV prevalence levels* on both *human rights abuses* and *Civil conflict intensity*. As Tables 2 and 3 illustrate, as a state's *HIV prevalence levels* increase, the state's *SEP status* decreases. This decrease in *SEP status* indirectly causes an increase in *HIV levels*. Thus, *HIV* exerts an indirect effect on itself. The same thing can be said for *SEP status*. As *SEP status* decreases, *HIV* increases and causes a decrease in *SEP status*. In sum, the feedback loop augments the total and indirect effects of the exogenous and endogenous variables. When the product of the two estimated endogenous coefficients is positive, the feeback loop amplifies total and indirect effects . When the product is negative, the feeback loop dampens total and indirect effects. Since the products in both of our estimated systems are positive (.184 and .180), the effects will be amplified.

[18] We also performed a series of robustness checks Which we discuss in our online Appendix.

In each system of equations, the total effect of *HIV* on *SEP status* and *SEP status* on *HIV* can be expressed as an infinite series because the variables continuously feedback on one another (Fox 1980, 17). These series converge, however, if the absolute value of the product of the two estimated endogenous coefficients is less than one. If not, the system is unstable. Both of our systems are stable, as the product of the coefficients on *HIV* and *SEP status* for each system is less than one. For stable systems, one uses a series of mathematically derived formulas outlined in Fox (1980, 14-19) to calculate the total and indirect loop-enhanced effects in a nonrecursive system. Those calculated effects appear in Table 4.

The loop-enhanced indirect effect of HIV/AIDS on security indicates that as HIV/AIDS levels increase, the severity of human rights abuses increases by .094 units and the intensity of civil conflict increases by .05 units. We plot these effects across different values of HIV prevalence levels in Figure 2. Specifically, Figure 2A shows that as *HIV prevalence levels* increase from 0% to 19%, *Human rights abuses* increase from level 1 to level 2 on a 5-point scale, holding all other variables constant. As *HIV prevalence levels* increase from 19% to 38%, *Human rights abuses* increase from level 2 to level 3 on a 5-point scale, holding all other variables constant. Similarly, Figure 2B, shows that *as HIV prevalence levels* increase from 0% to 19%, *Civil conflict intensity* increases from just above 0 to 1 on a 0 to 3 scale, holding all other variables constant. As *HIV prevalence levels* increase from 19% to 38%, *Civil conflict intensity* increases from level 1 to about level 2 on a 0 to 3 scale, holding all other variables constant. It appears that HIV/AIDS, while having substantively significant impacts on both variables, has a larger impact on human rights abuses. Nonetheless, both models reveal that changes across *HIV prevalence levels* generate fairly large fluctuations in human rights abuses and civil conflict intensity.

We briefly examine the effects of other variables on security. Table 6 shows that a one unit increase in *SEP status* leads to a 1.598 decrease on the human rights abuse index (holding all other variables constant). This is the total effect of *SEP status*, including the loop-enhanced effect

that *SEP status* has on itself through *HIV prevalence* and the direct effect that it has on *Human rights abuses*. This same effect is equal to almost -1 in the civil conflict model. These findings are consistent with other results from previous studies that a state's social, political, and economic environment has a strong impact on the severity of human rights abuses and the intensity of civil conflict. In terms of the indirect effect of *Religious fractionalization* on security, Table 4 shows that a one unit increase in *Religious fractionalization* (i.e., moving from a completely homogeneous religious society (0) to a completely heterogeneous society (1)), leads to a .372 increase on the *Human rights abuse* index and a .192 increase on the *Civil conflict intensity* scale, holding all other variables constant. This is consistent with our hypothesis that the more religiously fractionalized a state, the greater the *HIV prevalence level*. The greater the state's *HIV prevalence level*, the smaller the state's *SEP status* should be, and thus, the more conflict it should experience. The modernization variables also perform as expected. *Manufacturing* and *Urban population* indirectly decrease our conflict variables, and our *Agriculture* variable increases conflict. The results imply that modernization indirectly decreases conflict by strengthening political institutions, the economy, and the educational system.

We have demonstrated the indirect effect of HIV/AIDS on security, but the question remains whether HIV/AIDS directly affects the intensity of human rights abuses and violent civil conflictWe ran an OLS regression (reported in our Online Appendix), which revealed that *HIV prevalence* does not have a direct effect on our security measures. Specifically, the results fail to provide evidence of a statistically significant correlation of *HIV prevalence levels* with *Human rights abuses* and *Civil conflict*. Note, however, that *SEP status* retains its significant, strong negative correlation with *Human rights abuses* and *Civil conflict* when *HIV prevalence* is included in the model. Our previous results suggest that part of the variance in *SEP status* can be attributed to the variance in *HIV prevalence levels*. The results further support our argument about the indirect effects of HIV/AIDS on violent conflict.

V. Conclusion

AIDS kills as surely as war. Ten times as many Africans die today from AIDS as lose their lives in war (UNAIDS 2000). That HIV/AIDS also kills by making violent conflict more likely and more intense only heightens the disease's catastrophic consequences. It also moves the study of HIV/AIDS from the "low politics" of public health and economic development to the "high politics" of national security. Public officials, journalists, public health advocates, and scholars increasingly recognize the link between HIV/AIDS and national security, but the relationship has been under-researched and, arguably, poorly understood.

Our research provides systematic and compelling evidence that HIV/AIDS affects the use of force, at the same time that it illuminates the causal links between the two variables. HIV/AIDS has an indirect, positive effect on violent conflict by contributing to the breakdown of the social, economic, and political conditions within a state. Our analyses provide evidence of the indirect effects of HIV/AIDS on conflict, controlling for external factors and modeling the potential for reverse causality between *HIV prevalence* and *SEP status*. Despite the grim news on AIDS, the pandemic's impact on conflict is indirect. HIV/AIDS has no direct influence on the outbreak or intensity of violent conflict. Rather, it affects this aspect of national security indirectly through its influence on the social, political, and economic conditions within a state. We do not claim that HIV/AIDS is exclusively or even largely a security threat. The pandemic remains largely a humanitarian and economic crisis, albeit one of epic proportions. Its security dimensions, while present and significant, are dwarfed by the other costs of the disease.

Our work suggests several avenues for future research. First, our research design does not allow us to test the two causal mechanisms—"bottom-up" and "top-down" conflict—against each other. Our findings suggest that HIV/AIDS may contribute to both, since th former is more likely to produce civil conflict and the latter to generate human rights abuses, but we do not pit the explanations against each other. Second, there is a need to explore the impact of HIV/AIDS on other aspects of security. The most obvious omission in this paper is the possible link

between the pandemic and international conflict. Since there are so few cases of international conflict in any given year, however, analyzing this link will require data on prevalence levels over a much longer time period. These data are not yet available, Third, HIV/AIDS affects the occurrence and intensity of violent conflict, but it also is the product of that conflict; war spreads HIV (Elbe 2002). Future research should model the effect of the pursuit of national security, particularly through war, on HIV/AIDS prevalence.

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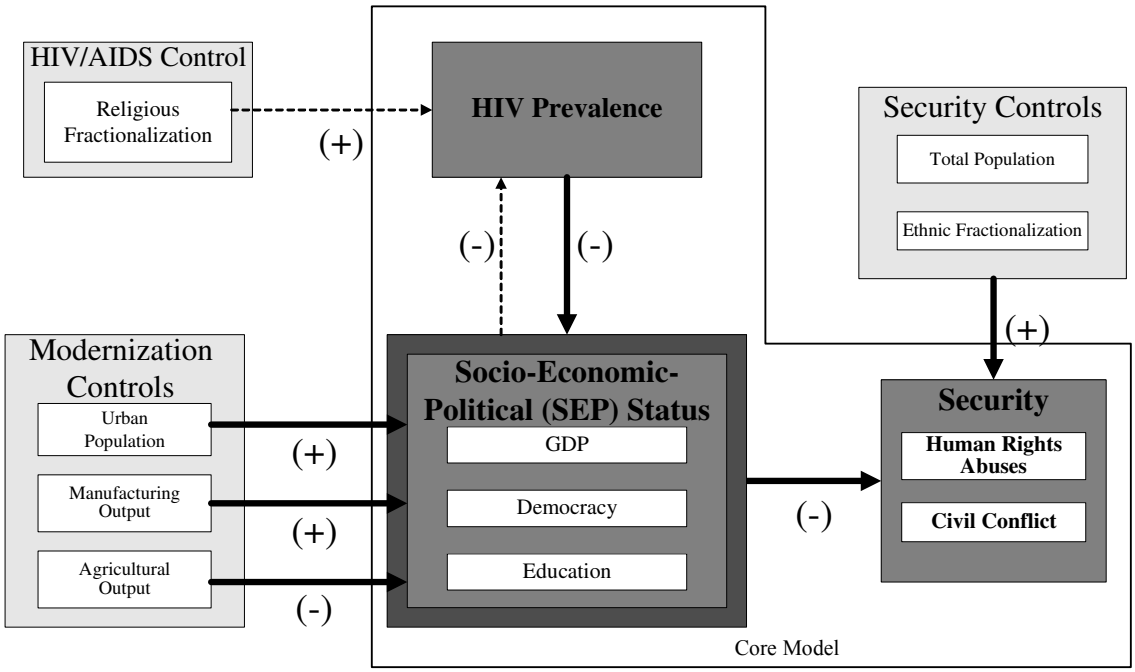

Figure 1 The Causal Model with Controls & Reciprocal Causation

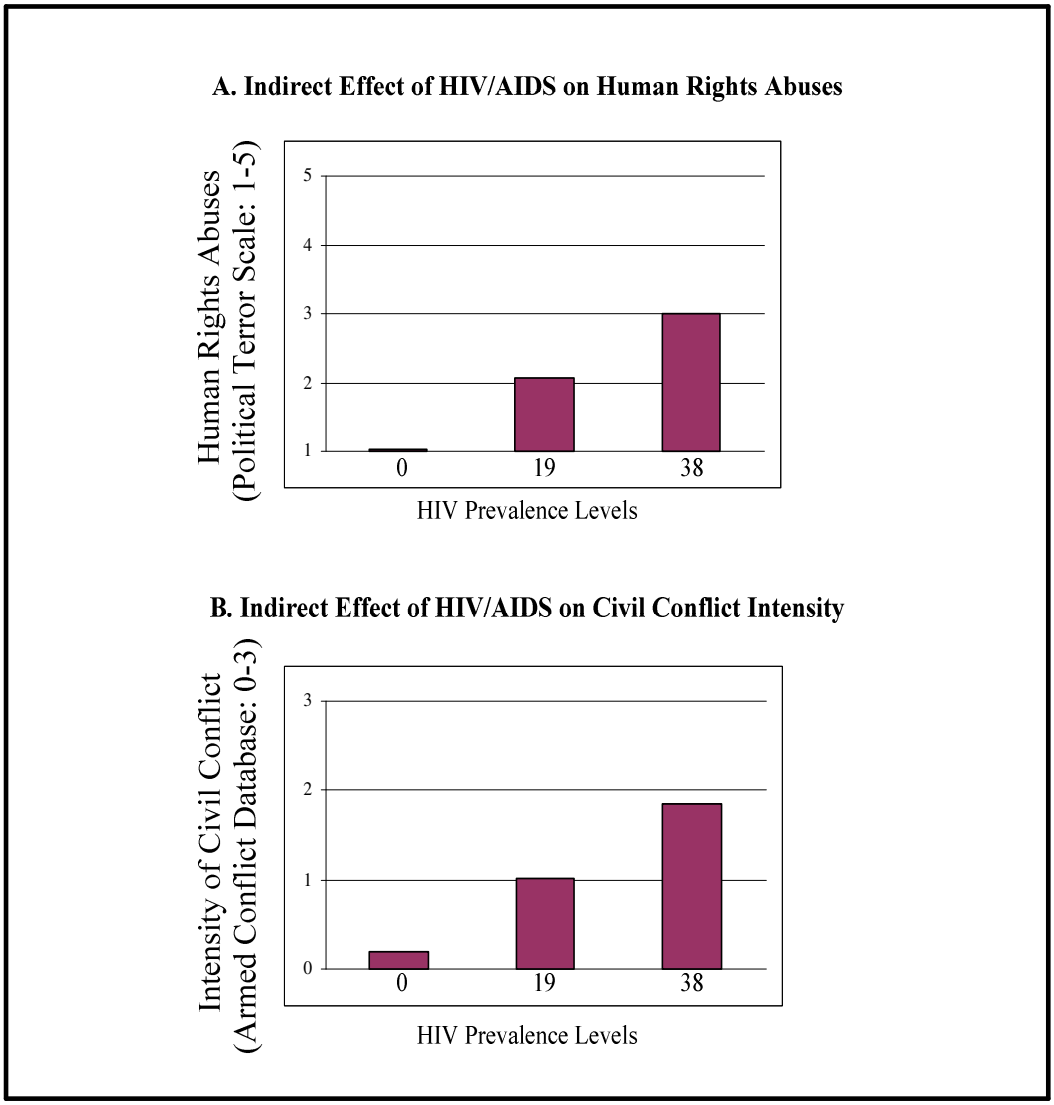

Figure 2 Indirect Effects of HIV/AIDS on Security

Table 1
Descriptive Statistics for Estimation Sample

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value
HIV Prevalence Level	2.57	5.94	0	38.20
Agriculture (value added)	17.23	13.85	.13	60.55
Manufacturing (value added)	15.70	7.77	3.05	57.00
Urban Population	11,519.56	29,896.76	0	240,091
Socio-Economic-Political Status	.11	.91	-2.05	4.08
Ethnic Fractionalization	.48	.20	0	1
Religious Fractionalization	.36	.22	0	.78
Population (logged)	9.28	1.56	3.64	14.06
Scaled Human Rights Abuses (PTS)	2.54	1.07	1	5
Scaled Civil Armed Conflict	.29	.80	0	3

Table 2
Simultaneous Equation Three Stage Least Squares Regression Estimates: PTS

Variable	Equation 1 SEP Status (GDP-Democracy-Education)	Equation 2 HIV Prevalence	Equation 3 Human Rights Abuses (1-5)
HIV Prevalence Level	-0.107*** (0.034)	-	-
Manufacturing (value added)	0.009* (0.007)	-	-
Agriculture (value added)	-0.028*** (0.005)	-	-
Urban Population	4.29×10^{-06}** (2.4×10^{-06})	-	-
SEP Status	-	-1.667** (.942)	-.721*** (.179)
Religious Fractionalization	-	3.969** (2.17)	-
Ethnic Fractionalization	-	-	.499* (.353)
Total Population (logged)	-	-	.395*** (.056)
Constant	0.735*** (.195)	1.756** (.948)	-1.238*** (.513)
F-statistic	16.12***	4.49***	27.00***
N	160	160	160

Statistical significance (one-tailed test): *** < .01, ** < .05, *<.10

Table 3
Simultaneous Equation Three Stage Least Squares Regression Estimates: Civil Conflict

Variable	Equation 1 SEP Status (GDP-Democracy-Education)	Equation 2 HIV Prevalence	Equation 3 Intensity of Civil Conflict (0-3)
HIV Prevalence Level	-0.100*** (0.037)	-	-
Manufacturing (value added)	0.010* (0.007)	-	-
Agriculture (value added)	-0.026*** (0.005)	-	-
Urban Population	5.29×10^{-06}** (2.4×10^{-06})	-	-
SEP Status	-	-1.802** (.915)	-.406*** (.168)
Religious Fractionalization	-	3.872** (2.16)	-
Ethnic Fractionalization	-	-	.007 (.341)
Total Population (logged)	-	-	.237*** (.052)
Constant	0.682*** (.208)	1.808** (.943)	-1.829*** (.470)
F-statistic	15.91***	4.67***	8.81***
N	161	161	161

Statistical significance (one-tailed test): *** < .01, ** < .05, *<.10

Table 4
Loop-Enhanced Effects on Human Rights Abuses & Civil Conflict Intensity [a]

	Human Rights Abuses (PTS Scale)			*Civil Conflict*		
Variable	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect
HIV Prevalence	-	.094	.094	-	.050	.050
SEP Status	-.721	-.877	-1.598	-.406	-.500	-.906
Religious Fractionalization	-	.372	.372	-	.192	.192
Urban Population	-	-6.720×10^{-07}	-6.720×10^{-07}	-	-4.715×10^{-07}	-4.715×10^{-07}
Value Added: Manufacturing	-	-.001	-.001	-	-8.912×10^{-04}	-8.912×10^{-04}
Value Added: Agriculture	-	.004	.004	-	.002	.002

[a] Effects are calculated using the formulas in Fox (1980).