THE EFFECT OF EDUCATION ON CROSS-NATIONAL DISPARITIES IN AIDS DEATH RATES*

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ABSTRACT

AIDS is now the fourth most important cause of death worldwide. Although it is spreading rapidly across the globe, the epidemic does not affect everyone equally. As of 2001, 90 percent of HIV infections have occurred in the developing world, and sub-Saharan Africa has suffered more than 80 percent of the world's AIDS-related deaths. The unequal distribution of AIDS deaths across the world suggests that macro, structural forces are at work. However, most of the sociological literature on AIDS focuses on individual behaviors and lifestyle changes. This study employs a macro, structural approach to the study of AIDS by predicting differences in AIDS death rates at the country-level using cross-national, empirical data and contemporary and lagged OLS panel models. Because of the well-established association between education and mortality, the analysis specifically focuses on secondary school enrollment as a key structural factor in reducing AIDS deaths. Results indicate that secondary school enrollment has the largest and most consistent effect on the AIDS death rate compared to any of the other structural variables, and these effects are estimated net of prevalence. Furthermore, secondary school enrollment mediates the effects of GDP, suggesting that education may be a more salient proximate cause of reduction in AIDS deaths. These findings provide convincing evidence that structural factors are important considerations for reducing AIDS deaths.

INTRODUCTION

AIDS is now the fourth most important cause of death worldwide (Neumayer 2004). Twenty-five million have already died from AIDS, and at least 40 million people are currently living with it (Lamptey, Johnson, and Khan 2006). It is also estimated that as many as 20 million more people will have died between 2000 and 2005 than would have in the absence of AIDS (Neumayer 2004). For this reason, HIV/AIDS has been referred to as the "most devastating health disaster in human history" (Lamptey, Johnson, and Khan 2006: 3).

Although it is spreading rapidly across the globe, the epidemic does not affect everyone equally. As of 2001, 90 percent of HIV infections have occurred in the developing world, and sub-Saharan Africa has suffered more than 80 percent of the world's AIDS-related deaths (Bancroft 2001). As many as 150,000 people die in Africa every month because of AIDS, and more Africans die of AIDS-related illnesses than any other cause (Lamptey, Johnson, and Khan 2006). These patterns have been a major cause of divergence in life expectancies between the developed and developing worlds (Goesling and Firebaugh 2004). In the absence of AIDS, countries with low life expectancies would continue to catch up to countries with high life expectancies. Instead, the global gap in life expectancy is widening according to some estimates (Neumayer 2004).

The inequality of the worldwide distribution of AIDS deaths should be of particular interest to sociologists because of the role of macro, structural forces that partially determine the impact of AIDS on society. Yet, this area that has not received much attention. Social scientists have examined HIV/AIDS and its impact on families (Macklin 1988; Urwin 1988; Thompson 2000; Wachter, Knodel, and VanLandingham 2002); caregiving (Pearlin et al. 1997; Turner et al. 1998; Leblanc and Wight 2000); reproductive behavior (Setel 1995; Chen et al. 2001; Grieser et al. 2001; Kirshenbaum et al. 2004); and gender inequality (Schoepf 1988; Scharf and Toole 1992;

Osmond et al. 1993; Albertyn 2003; Fawzi et al. 2004). In addition, a growing body of research has explored the social factors and inequalities that produce differences in exposure and vulnerability to HIV infection, and that influence risk behaviors related to alcohol and drug use and sexual patterns (Kaplan et al. 1987; Hunt 1989; Larson 1990; Philipson and Posner 1995; Zierler and Krieger 1997; Heffernan 2002; Ickovics et al. 2002). However, the prevailing research on AIDS typically focuses on *individual* behaviors and lifestyle changes. Very few studies examine the relationship between country-level *structural* factors and AIDS. Studies that do so have been speculative, small-scale, or geographically specific thus far, but many are beginning to recognize this gap in the research on AIDS (Kaplan et al. 1987; Farmer 1996; Sumartojo 2000; Parker 2001; Heffernan 2002).

The purpose of this study is to take a macro, structural approach to the study of AIDS by predicting differences in AIDS death rates at the country-level using cross-national, empirical data and multivariate statistical analysis. Specifically, I examine how several structural factors, including population growth, urbanization, economic development, debt burden, trade openness, democratization, health care, and particularly education, influence AIDS death rates. Although all of these variables have the potential to affect AIDS, secondary school enrollment is perhaps the most plausible and compelling structural factor in reducing AIDS deaths. This work extends the seminal research of McIntosh and Thomas (2004) which examines social determinants of HIV prevalence. The analyses reported here employs contemporary and lagged OLS panel models to estimate the relationship between structural factors and AIDS deaths at two points in time.

First, I review previous research on the links between structural factors and well-being and health, and develop hypotheses about how these factors might specifically relate to AIDS deaths. Second, I describe the sample, data sources, variable measurement, and estimation technique I use to predict cross-national differences in AIDS death rates. Results indicate that secondary school enrollment has the largest and most consistent effect on the AIDS death rate compared to any of the other structural variables, and these effects are estimated net of prevalence. Furthermore, secondary school enrollment mediates the effects of GDP, suggesting that education may be a more salient proximate cause of reduction in AIDS deaths. These findings provide convincing evidence that structural factors are important considerations for reducing AIDS deaths. After presenting the results, I suggest avenues for future research and discuss the policy implications of these findings.

STRUCTURAL DETERMINANTS OF AIDS DEATHS

An analysis of structural determinants assumes that there are forces larger than the individual that influence the risk of contracting and dying from AIDS. According to Sumartojo (2000), "HIV-related structural factors are defined as barriers to, or facilitators of, an individual's HIV-prevention behaviors. They directly or indirectly affect an individual's ability to avoid exposure to HIV" (3). This definition can be easily extended to include an individual's ability to avoid death due to AIDS as well. Structural factors are macro-level, population-wide characteristics of societies that constrain individual choice. Economic, political, institutional, and demographic factors are barriers to and facilitators of AIDS-related behaviors prior to and after infection, and thus influence the shape of the AIDS pandemic (Parker et al. 2000). An extensive body of research and empirical evidence suggests that the structural variables I examine here are important for health and well-being. I review this literature below and develop hypotheses about how this evidence might apply specifically to AIDS deaths.

Education

The general association between education and mortality is well-established (Lleras-Muney 2005; Crimmins and Saito 2001; Liu et al. 1998; Hummer et al. 1998; Elo and Preston 1996), although the mechanisms by which education reduces mortality are not as clear. Education is also an important predictor of population health and well-being in developing countries (Pritchett and Summers 1996; Brady et al. forthcoming). Furthermore, lower educational attainment has specifically been linked to higher HIV risk in several geographically specific studies in South Africa (Simbayi et al. 2005), Tanzania (Kapiga and Lugalla 2002), Zimbabwe (Gregson et al. 2004), and Colombia (Miguez-Burbano et al. 2000).

Schools may help to disseminate information about sexual and reproductive health matters, such that more people know how to protect themselves from sexually transmitted diseases. One study claims that those with higher levels of education tend to know more about HIV (Gregson et al. 2004). Some schools are beginning to introduce specific AIDS prevention curriculums (Gallant and Maticka-Tyndale 2004; Lugalla et al. 2004). In the Kagera region of Tanzania, for example, the government adopted a special policy in the early 1990s to allow that region to introduce a curriculum focused on AIDS prevention in schools. The curriculum focuses on the symptoms of AIDS, how it spreads, how to protect oneself from being infected, and how to provide care to AIDS patients (Lugalla et al. 2004). These efforts to educate school children about AIDS likely reduce the prevalence of HIV infection, and in turn, probably contribute to the reduction of AIDS death rates.

Education may also reduce disease by increasing gender equality and contributing to the improvement of women's status (Caldwell 1986; Preston 1996; Frey and Field 2000; Nussbaum 2004; Wickrama and Lorenz 2002). This issue is particularly important in developing countries where women are disproportionately affected by AIDS (Ruger 2004). Gender inequality weakens women's abilities to negotiate safe sex encounters; thus, elevating the status of women can greatly reduce their exposure to sexually transmitted diseases (McIntosh and Thomas 2004). The expansion of schooling usually correlates with the expansion of female education and improvement in status. As women are educated, they are able to become employed, move outside the home, access the legal system, and most importantly for AIDS prevention, take charge of decisions affecting their reproductive and sexual health (Nussbaum 2004). For example, ratios of male to female literacy are positively associated with HIV prevalence (McIntosh and Thomas 2004).

In addition, education may be indicative of community capacity. Increased secondary school enrollments may reflect a community's ability to provide more resources for its population (Bradshaw 1993), which could improve health and reduce mortality. Plus, better educated populations may be more equipped to mount effective responses to the spread of HIV/AIDS (Gregson et al. 2001). For these reasons, education should have a negative effect on AIDS death rates.

Other Structural Factors

Other country-level, structural factors may also contribute to differences in AIDS death rates, including population growth, urbanization, economic growth, debt burden, trade openness, democratization, and health care. Population growth has the potential to affect well-being in several ways. Rapid population growth often results in an increase in young, lower-paid workers and an excess labor supply, which inflates the bottom of the income distribution and depresses wages (Alderson and Neilsen 1999). Population pressure can destabilize the food supply and a population's access to it (Jenkins and Scanlan 2001). Population growth can also increase the number of dependents who are not in the work force. In these ways, rapid growth puts a strain on a population's resources, which might increase AIDS death rates.

Urbanization improves well-being by providing increased access to clean water, educational, and healthcare facilities (Fosu 1989; El-Ghannam 2002; Cutler and Grant 2005). Urbanization may also improve well-being because it is associated with decreased fertility and increased education (Li and Ballweg 1992). Furthermore, urbanization is positively associated with manufacturing employment and negatively associated with agricultural employment. As industrialization comes about and the agricultural sector declines, well-being improves (Brady et al. forthcoming). Thus, urbanization may help to reduce AIDS death rates.

Economic growth improves well-being by increasing the food supply, infant survival and adult life expectancy (Firebaugh and Beck 1994; Pritchett and Summers 1996; Jenkins and Scanlan 2001). Firebaugh and Beck (1994) find large and robust effects of economic growth on national welfare in 62 least developed countries, which leads them to conclude that economic growth is of central importance to well-being. The "conventional wisdom of growth's benefits" (Brady et al. forthcoming) is demonstrated by the fact that many researchers use GDP as controls and find that it significantly affects well-being (Beckfield 2004; Bradshaw et al. 1993; Bradshaw and Huang 1991; Jenkins and Scanlan 2001; London and Williams 1990). As economic growth improves well-being, it should also contribute to reducing AIDS death rates.

Debt burden has become extremely problematic, particularly for least developed countries (Portes and Kincaid 1989). Bradshaw and colleagues (1993) find that, "Directly or indirectly, foreign debt and structural adjustment influence mortality, economic growth, immunization, health care, urbanization, and nutrition. These phenomena are integrally related to human survival and societal advancement" (651). Structural adjustment programs weaken governments' abilities to distribute resources and to alleviate poverty (Hoffman and Centeno 2003). Many researchers criticize structural adjustment programs and the corresponding domestic austerity measures that hamper well-being by allocating fewer resources for publicly provided social welfare and health maintenance programs (Bradshaw 1988; Bradshaw and Huang 1991; Bradshaw et al. 1993; Walton and Ragin 1990; Walton and Seddon 1994; Bradshaw and Wallace 1996; Przeworski and Vreeland 2000; Sachs 2005). Such programs are crucial in the face of spreading diseases like AIDS; thus, debt burden may exacerbate AIDS death rates.

Trade openness reflects economic globalization, border openness, and economic exchange. All of these things may increase susceptibility to AIDS because they contribute to transnational dissemination of diseases. Altman (1999) suggests that the rapid dispersion of HIV/AIDS across the world is closely tied to the "forces of 'development'" and to the "nature of a global economy" (563-564). Economic integration may have adverse health effects as it encourages migration and travel. Interaction with the world through trade, travel, and investment increases the risk of cross-border diffusion of infectious diseases (Bettcher, Yach, and Guindon 2000; Dollar 2001), and may therefore increase AIDS death rates.

Several studies show a positive relationship between democracy and improved physical quality of life (Wickrama and Mulford 1996; London and Williams 1990; Moon and Dixon 1985), needs fulfillment, and decreased income inequality (Crenshaw 1992; Sorensen 1991; Goldsmith 1986). Democracies keep governments responsible and accountable, and augment the capacity for people to express their claims and needs (Sen 1999). Democratization enhances social and economic development by allowing the people to press their government to make public investments in nutrition, education, and healthcare (Sorensen 1991; Goldsmith 1986). For these reasons, democratization may help to reduce AIDS death rates.

Finally, a country's health care system has a large impact on the general health of its population and on the prevention and treatment of disease. Many developing countries in particular are experiencing human resource shortfalls that hinder the capabilities of local clinics to administer health care. For example, it has been estimated that Africa needs approximately 1 million more health care workers to adequately care for its people (Garrett and Rosenstein 2005). The severe shortage of healthcare personnel jeopardizes treatment abilities and means that services will go undelivered (Rubenstein and Friedman 2004). In the face of shortages of health care workers and inadequate health infrastructure, many developing countries find it exceedingly difficult to make effective use of increased supplies of medicines and other resources for preventing and treating AIDS (Copson and Salaam 2005). Thus, more physicians in a country should contribute to reducing that country's AIDS death rate.

This body of literature demonstrates the connections between several structural variables and health, suggesting that they may also have an effect on the degree to which a country is affected by AIDS. In the analyses that follow, I present a series of models that explore the relationships between these variables and AIDS deaths.

METHODS AND MEASUREMENT

Sampling

The data set pools information from several archival sources: United Nations Common Database (UNCDB), World Bank World Development Indicators (WDI), Polity IV, Penn World Table, and James Vreeland's International Monetary Fund (IMF) data. The total sample is comprised of 130 countries with observations for two time points, 1990 and 2000. Countries are included if available data exists on the dependent variable, AIDS deaths, from the UNCDB.[1] This database provides a recent and previously unexamined source of information about AIDS death in select countries worldwide. The sample includes a variety of low to high income, least developed to highly developed, and indebted to affluent countries, with varying levels of AIDS

[1] Unfortunately, the UNCDB does not provide information on some countries that are pertinent to discussions of HIV/AIDS, such as India.

prevalence and death. Due to missing information on the independent variables, the sample is reduced to 115 countries in the first set of models, and to 106 countries in the second set of models. A list of countries in the total sample, as well as the countries excluded in each set of models, is provided in Appendix I.

Dependent Variable

The dependent variable is based on estimated AIDS deaths for ages 0 – 49 in 2001 and 2003.[2] These estimates are calculated by the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization (WHO), and are reported in the UNCDB (United Nations 2006). I calculate the *AIDS death rate* by first dividing the estimated AIDS deaths for each country in 2001 and 2003 by the country's total population in each corresponding year to obtain the ratio of AIDS deaths to population for the two years. Because the UNCDB only reports AIDS deaths for those years, I take the average of the two ratios in order to minimize possible measurement error for either year. I then multiply the averaged ratio by 100 in order to turn AIDS deaths into a percentage of population. Finally, I use the natural log of the AIDS death rate in all of the analyses that follow to correct for the skew of the variable.[3] Graphs depicting the distributions of the AIDS death rate and the natural log of the AIDS death rate are displayed in Appendix II. There is great variation in the dependent variable, ranging from very few deaths due to AIDS (.00039% of the population in Japan) to very high rates of AIDS deaths (1.85% of the population in Botswana). Although the distribution of AIDS deaths across all countries is highly skewed, the natural log of the AIDS death rate approximates a normal

[2] This figure may underestimate the total number of AIDS deaths in a population, since estimates are not calculated for ages 50 and older. However, this figure does capture that portion of the population that is most affected by AIDS and that derives the most benefit from education, the main independent variable of interest in this study.
[3] The skewness statistic of the AIDS death rate prior to transformation is 3.27, indicating that the distribution contains an asymmetric tail that extends to the right. However, the skewness statistic for the natural log of the AIDS death rate is .23, which is much closer to a normal distribution.

distribution. Thus, the AIDS death rate is the natural log of the average of AIDS deaths in 2001 and 2003 as a percentage of the population for each country.[4]

Independent Variables

Education is the main independent variable of interest in this study. Data on education were obtained from WDI, where education is measured as gross *secondary school enrollment* as a percentage of age appropriate children (World Bank 2006). According to the World Bank's website (2006), secondary education "completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers." Gross enrollment includes *total* enrollment, regardless of age, as a percentage of the age group that officially corresponds to the secondary level; therefore, the percentage can go above 100 percent (World Bank 2006).[5] In 2000, secondary school enrollment ranged from 5.53% in Tanzania to 158.76% in Australia.[6] This measure of education takes into account the fact that more children may be enrolled in school than those who are of the official school age.

I introduce several other variables into the models to control for country-level, structural effects other than education that might influence a country's AIDS death rate, including population growth, urbanization, economic development, debt burden, trade openness, democratization, physicians per 1,000, and prevalence. Information on population growth, urbanization, and economic development was acquired from WDI (World Bank 2006).

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[4] Values of the AIDS death rate prior to transformation range from .0004 to 1.85, and values of the natural log of the AIDS death rate range from -7.84 to .61. These values are negative because the natural log of a number less than 1 is negative.

[5] This is in contrast to net enrollment, which is the number of children of official school age who are enrolled in school as a percentage of the population of corresponding age (World Bank 2006). Gross enrollment includes age appropriate *and* age-inappropriate children who are enrolled. I estimate an additional model using net secondary school enrollment as the measure of education and results are very similar to the models using gross enrollment (see Appendix IV).

[6] Fourteen percent of the 115 countries used in the first set of models have secondary school enrollment rates that are above 100. I top-code secondary school enrollment at 100 percent in a separate model and results do not change. (See Appendix IV.)

Population growth is measured as an annual rate of change.[7] Economic development is measured as *real gross domestic product (GDP) per capita*, in purchasing power parity dollars. Measuring GDP in purchasing power parity dollars is preferable for the purposes of cross-national comparison (Firebaugh 1999). Urbanization is measured as an annual percent of *urban population growth*.[8]

Data on debt burden was taken from James Vreeland's (2003) research on the IMF. Debt burden is measured as a dummy variable indicating that a country is presently *under an IMF agreement*, with the omitted reference category as countries that are not under IMF agreements. Trade data was obtained from the Penn World Table, where *trade openness* is measured as exports plus imports as a percentage of GDP (Heston et al. 2006). Democratization is measured as the *democracy score*, taken from the Polity IV data set (Marshall et al. 2006). This variable is computed by combining scores for democracy (the general openness of political institutions) and autocracy (the general closedness of political institutions). The democracy score is an interval variable, ranging from -10 (high autocracy) to 10 (high democracy).[9] Number of *physicians per 1,000* people serves as a measure of the healthcare system (World Bank 2006).[10] *Prevalence* is

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[7]The total fertility rate is an alternative measure of population growth. This may be a better assessment of the strain that new births put on family and community resources. However, total fertility rate is too highly collinear with secondary school enrollment to include them both in the models (r= -.87).

[8] An alternative measure of urbanization would be urban population as a percent of the total population, but this measure is more highly collinear with secondary school enrollment and GDP than urban population growth. In additional analyses not shown here, I test this alternative measure of urbanization, and it does not have a significant effect on AIDS death rates. Moreover, urban population growth provides a better measure for examining the way that changes in urbanization may affect well-being.

[9] Freedom House also provides country-level ratings on political rights and civil liberties, but the Polity IV democracy score is a more general measure of the openness of a country's political regime.

[10] I also considered hospital beds per 1,000 people, health expenditure per capita, and percent of HIV-infected people receiving antiretroviral (ARV) drugs as measures of the healthcare system. Data on hospital beds in 2000 are very limited. Although number of hospital beds does have a significant negative effect on AIDS death rates, including this variable reduces the sample to only 70 cases. Health expenditure per capita is too highly collinear with GDP per capita to include them both in the same model (r= .92). Unfortunately, data on ARV use are only available for 2005 (World Health Organization 2006). Considering the fact that the rest of the independent variables are lagged, and that ARV use likely takes some time before its effects are manifest as well, it is implausible to use these data to predict AIDS deaths at an earlier time. Furthermore, number of physicians is more highly correlated

measured as a percentage of persons aged 15 and older infected with HIV/AIDS (United Nations 2006).[11] The UNCDB only provides information on prevalence for 1999, but this figure gives a good approximation of the extent of the disease in each country at the time that AIDS deaths are estimated 2 to 4 years later.

I also include dummy variables for two regions of the world that have been the most affected by AIDS deaths: Sub-Saharan Africa and Latin America.[12] Sub-Saharan African includes 37 countries from the sample, and Latin America includes 22 countries. Appendix I presents a list of the countries in each region. Appendix III provides descriptive statistics for all variables.

Estimation Technique

I use OLS regression techniques to predict AIDS death rates in all of the models. The analysis is divided into two complementary sections: contemporary panel models and lagged panel models. Both sets of panel models predict the value of the dependent variable based on independent variables measured at an earlier time. Such models are appropriate for testing structural effects that may take several years to fully manifest (Jenkins and Scanlan 2001). First, in the contemporary panel models, I regress the AIDS death rate on independent variables measured in 2000. Because the AIDS death rate is an average of values from 2001 and 2003, the contemporary panel models test the effects of the independent variables after only a short time lag. Then, I consider the fact that some structural effects may involve a more substantial time

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with AIDS death rates (r= -.66) than number of hospital beds (r= -.49), health expenditure per capita (r=- .49), or ARV use (r= -.42).

[11] This figure may actually underestimate prevalence since it does not account for persons under the age of 15. There is also a slight age mismatch between the UNCDB estimates of prevalence and AIDS death in each country. Although this is a limitation of the data, the estimates still provide a good approximation of the extent to which AIDS is affecting each country.

[12] The dummy variable for Latin America includes Caribbean countries as well, because the World Bank classifies Latin America and the Caribbean as one region. However, I refer to this region simply as "Latin America" throughout for the sake of simplicity.

lag in the second set of models. In the lagged panel models, I regress the AIDS death rate on independent variables measured in 1990 to provide a more sizeable time interval between the independent variables and the dependent variable.[13]

In the analyses that follow, I present 6 contemporary and 6 lagged panel models. The first model estimates the baseline controls: population growth, urban population growth, GDP, a dummy variable indicating that a country is under an IMF agreement, trade openness, and the democracy score. I then add physicians per 1,000 in model 2 to examine the effect of the healthcare system. I investigate the effects of education by adding secondary school enrollment in model 3. In model 4, I add prevalence in order to determine how much of the effects of the independent variables are operating through prevalence. In model 5, I add region dummy variables for Sub-Saharan Africa and Latin America. Finally, I test the interaction between secondary school enrollment and the regions in model 6, to see if education has a different effect in the two areas that are most affected by AIDS. I report unstandardized and standardized coefficients in order to examine both the significance and the magnitude of the effects.[14]

An assumption of OLS regression is that the error term has a constant variance, which will be true if observations are drawn from similar distributions. Heteroskedasticity, a violation of this assumption, often occurs in data sets with a large range between the highest and lowest values of the variables because the distribution of the error term does not have a constant variance (Studenmund 2001). Because I analyze both least developed, poor countries and highly

[13] I also considered using semi-difference models to examine how changes in the independent variables over time (t-1 vs. t) affect the AIDS death rate (at time t). The advantage of difference models is that they control for unobserved, stable characteristics which are difficult to quantify, but may have a substantial effect on the outcome under study (Firebaugh and Beck 1994). Difference variables are constructed by subtracting the 1990 values from the 2000 values. The dependent variable is then regressed on the difference variables. I ran several models using this approach, but none of the coefficients were significant. (Results available upon request.) This suggests that changes in the independent variables from 1990 to 2000 do not predict AIDS death rates.

[14] The italicized coefficients for the dichotomous variables are semi-standardized in Tables 1 and 2. They are calculated by dividing the unstandardized coefficient by the standard deviation of the dependent variable.

developed, affluent countries, there is substantial heterogeneity between the lowest and highest values of the variables. For example, GDP per capita ranges from $517 to $57,792. I correct for this source of bias by using the HC3 estimator, which is recommended for samples of less than 250 cases (Long and Ervin 2000; Davidson and MacKinnon 1993).

RESULTS

Figures 1 and 2 show the relationships between AIDS death rates and secondary school enrollment in 2000 and 1990 respectively. This relationship will be tested empirically in the regression models that follow.

[INSERT FIGURES 1 AND 2 HERE]

Contemporary Panel Models

The estimated regression coefficients of the contemporary panel models are presented in Table 1. The first model shows that GDP has a significant, negative effect on the AIDS death rate. For each standard deviation increase in GDP, the AIDS death rate is estimated to decrease by .49 standard deviations. However, this substantial effect is attenuated by number of physicians in model 2. Although it remains negative and significant at the .01 level, the beta coefficient for GDP is reduced to .31. Number of physicians also has a significant, negative effect on the AIDS death rate. One standard deviation increase in number of physicians reduces the AIDS death rate by approximately .52 standard deviations. This suggests that part of the way in which GDP reduces AIDS death rates is by financing better healthcare systems.

[INSERT TABLE 1 HERE]

I introduce education into model 3. Education has a significant negative effect on the AIDS death rate ($p<.01$). Net of the other independent variables, one standard deviation increase in secondary school enrollment reduces the AIDS death rate by approximately .53 standard deviations, which is the largest effect in model 3. Inclusion of education reduces the significance level and the beta coefficient of number of physicians ($p<.05$ and $b=.37$ in model 3). Moreover, the education effect is about 1 ½ times larger in magnitude than the effect of physicians. Note also that GDP no longer significantly affects AIDS death rates, and it remains insignificant throughout the subsequent contemporary panel models. Thus, another mechanism by which GDP may reduce AIDS deaths is by improving the educational system.

Model 4 adds prevalence, the largest predictor of the AIDS death rate in this model. For one standard deviation increase in prevalence, the AIDS death rate decreases by approximately .55 standard deviations. Prevalence also *partially* mediates the effects of education on the AIDS death rate. Although it is still significant at the .01 level, the magnitude of the education effect is reduced from .53 to .40. However, secondary school enrollment still has a strong direct effect on AIDS deaths. Education may reduce AIDS deaths through HIV prevention to some extent, but it also has a robust impact on AIDS deaths apart from its effect through prevalence. Prevalence also mediates the effect of number of physicians, which is no longer significant in this model.

Model 5 shows that the dummy variables for region have considerable effects on the AIDS death rate. Sub-Saharan Africa and Latin America have a significant, positive effect ($p<.01$), and these effects are larger than the effects of other variables in the model. Countries in Sub-Saharan Africa have AIDS death rates that are 1.00 standard deviations higher than the rest of the sample; countries in Latin America have AIDS death rates that are about .68 standard deviations higher. Because these two regions have the highest prevalence and AIDS death rates in the sample, it is not surprising that they are positively significant. However, the magnitude of their effects is remarkable. Even holding prevalence constant, AIDS death rates in these two regions are still considerably higher than AIDS death rates in the rest of the sample.

In analyses not shown, I test the effects of other regions, as well. I estimate a model that includes the baseline controls, secondary school enrollment, and these two regions, along with additional dummy variables for the Middle East and North Africa, East and South Asia and the Pacific, and Europe and Central Asia, with high income countries as the omitted reference category (World Bank 2006). Prevalence, secondary school enrollment, and trade openness are the only independent variables that have an effect on the AIDS death rate. None of the region variables are significant in this model (N=115, R^2=.86). The R^2 for this model is not much larger than the R^2 for model 5, and it is the same as the R^2 for model 6. In addition, likelihood ratio tests reveal that the model with added region dummies does not significantly improve model fit over the model without the additional region dummies ($p<.17$). This suggests that the reduced model is preferred over the model with extra region dummies.

Prevalence remains significant in model 5, although its magnitude is reduced from model 4. Still, it has the largest effect after the region variables. Secondary school enrollment has the next largest effect. Secondary school enrollment significantly reduces AIDS death rates in model 5, although the magnitude of the effect is smaller than in model 4 (beta= -.40 in model 4, but beta= -.26 in model 5). With the inclusion of the regions, population growth becomes significant at the .05 level for the first time. Contrary to expectation, population growth is negatively associated with the AIDS death rates. With one standard deviation increase in population growth, AIDS death rates are estimated to decrease by about .17 standard deviations. In addition, trade openness is now positive and significant. One standard deviation increase in trade openness increases the AIDS death rate by about .14 standard deviations. Compared to population growth and trade openness, the effect of education is still larger and more significant ($p<.01$ for secondary school enrollment, $p<.05$ for trade openness and population growth).

Model 6 shows the interaction effects between education and region. The main effect of Sub-Saharan Africa remains strong, but the interaction effect is not significant. In contrast, the main effect of Latin America remains strong, and the interaction effect is negative and significant. This suggests that secondary school enrollment has an even more ameliorative effect on AIDS death rates in Latin America than it does in the rest of the sample. The rest of the independent variables behave similarly to model 5. Prevalence (+), secondary school enrollment (-), population growth (-), and trade openness (+) are still significant (listed in order of descending magnitude, after the region dummy variables, which continue to have the biggest effects). The magnitudes of each of these variables do not change substantially from model 5 to model 6. A comparison of R^2 across the set of contemporary panel models suggests that model 6 is the preferred model.

Prevalence, the region dummies, and secondary school enrollment are the only variables that remain significant across all models in which they are included. Population growth and trade openness are only significant in models that include the regional effects. GDP significantly reduces AIDS death rates in the baseline control model, but this effect is partially mediated by number of physicians, and then further mediated by education. Prevalence mediates the effects of number of physicians and education, although education continues to have a robust direct effect on the AIDS death rate. In fact, secondary school enrollment has the largest and most consistent effect on the AIDS death rate compared to any of the other structural variables in this set of models. For example, Australia had a remarkable secondary school enrollment rate of 158.76% in 2000 and a correspondingly low AIDS death rate of -6.89, one of the lowest in the sample. Conversely, only 6% of Tanzania's children were enrolled in secondary school in 2000, and the AIDS death rate of that country is -0.85, one of the highest in the sample. Although these are just two examples, these countries represent the general pattern of high secondary school enrollments and corresponding low AIDS death rates, and vice versa.

Lagged Panel Models

The lagged panel models presented in Table 2 show slightly different outcomes, although the three largest effects remain the same across all models: regions, prevalence, and secondary school enrollment (in descending order of magnitude). These models differ from the ones presented above in that I regress the AIDS death rate on a set of independent variables measured in 1990 to provide a more substantial time lag for the structural effects to become fully discernible.[15] In model 1, GDP has a significant, negative effect on the AIDS death rate. For a standard deviation increase in GDP, the AIDS death rate is expected to decline by .27 standard deviations.

[INSERT TABLE 2 HERE]

When number of physicians is added in model 2, the effect of GDP is reduced to insignificance. Number of physicians has a negative effect, but it is only marginally significant at the .10 level. While GDP is certainly important, it seems to work through number of physicians to reduce AIDS deaths. Secondary school enrollment, however, has a strong negative effect on the AIDS death rate ($p<.01$) in model 3. One standard deviation increase in secondary school enrollment in 1990 reduces the AIDS death rate by approximately .66 standard deviations. This is the only significant effect in model 3, as number of physicians becomes non-significant.

In model 4, prevalence has a significant, positive effect as expected. For each standard deviation increase in prevalence, the AIDS death rate is expected to increase by .64 standard deviations. Although the effect of education is slightly reduced in magnitude with the addition

[15] With the exception of prevalence, which is measured in 1999 throughout. Again, this is because 1999 is the only year that data on prevalence are available from the UNCDB.

of prevalence into the model, it remains significant at the .01 level. One standard deviation increase in secondary school enrollment reduces the AIDS death rate by approximately .53 standard deviations. Thus, education continues to have a strong direct effect on AIDS deaths, net of prevalence.

Model 5 shows that the dummy variables for Sub-Saharan Africa and Latin America have the anticipated positive effects on the AIDS death rate.[16] Sub-Saharan African countries are estimated to have AIDS death rates that are .97 standard deviations higher than the rest of the sample, and Latin American countries are estimated to have rates that are .52 standard deviations higher. The addition of the region variables reduces the magnitude of prevalence and secondary school enrollment, but both coefficients remain significant and sizable. The beta coefficient for prevalence declines from .62 to .43, and the beta for education declines from .52 to .33.

Model 6 includes the interactions between the regions and secondary school enrollment in 1990. As in the contemporary models, the interaction effect for Latin America is negative and significant; the interaction for Sub-Saharan Africa is not significant. Secondary school enrollment in 1990 has an even more ameliorative effect on AIDS death rates in Latin America than for other countries in the sample. The main effects of Sub-Saharan Africa and Latin America are still the largest in the model, followed by prevalence and secondary school enrollment. The main effect of education remains significant and negative at the .05 level, and prevalence remains positive and significant at the .01 level. For one standard deviation increase in secondary school enrollment in 1990, the AIDS death rate is expected to decline by .28

[16] Once again, in analyses not shown, I estimate a model that includes the standard controls, secondary school enrollment, and these two regions, along with additional dummy variables for the Middle East and North Africa, East and South Asia and the Pacific, and Europe and Central Asia, with high income countries as the omitted reference category (World Bank 2006). Prevalence is significant at the .01 level, and secondary school enrollment is significant at the .05 level (N=110, R^2=.85). The R^2 for this model is not much larger than the R^2 for model 6. A likelihood ratio test suggests that the model with added region dummies does significantly improve model fit over the model without the additional region dummies (p<.05).

standard deviations. None of the other independent variables have significant effects. R^2 is .84 for model 6, making it the preferred lagged panel model.

Prevalence, the region variables, and secondary school enrollment are the only variables that remain significant across all lagged panel models in which they are included. GDP is mediated by number of physicians. However, number of physicians becomes non-significant when education is added to the model. Compared to the other structural variables, secondary school enrollment in 1990 has the largest and most consistent effect on the AIDS death rate. Several countries provide useful examples of the relationship between education levels in 1990 and subsequent AIDS death rates 11 to 13 years later. The Netherlands had a secondary school enrollment rate of 119.51% in 1990; its corresponding AIDS death rate is -7.39. In Mozambique, however, only 6.94% of children were enrolled in secondary school in 1990, and its subsequent AIDS death rate is -0.57. The Netherlands has one of the highest secondary school enrollment rates and one of the lowest AIDS death rates in the sample; Mozambique is the opposite.

Comparing Tables 1 and 2, model fit is almost identical. The magnitude of the secondary school enrollment coefficient in model 4 in 1990 (b= -.66) is a bit larger than the corresponding coefficient in 2000 (b= -.53), and the 1990 coefficients remain slightly largely in subsequent models. Perhaps secondary school enrollment in 1990 has slightly larger effects on AIDS death rates because the ameliorative effects of education develop slowly over time, but enrollment in 2000 still has substantial influence. Even controlling for all of the other independent variables, the education effect is quite robust. Education remains significant across all models, contemporary and lagged. It consistently has the largest effect on the AIDS death rate, after prevalence and the region variables, when they are included.

I provide several alternative operationalizations of education in Appendix IV, and results are comparable. I present the unstandardized coefficients, standardized beta coefficients, and standard errors for each indicator of education, as well as the R^2 and N for each model.[17] For the most part, these alternatives support the conclusions reached above regarding the robustness of the education effect on the AIDS death rate. Education continues to have a significantly negative effect on the AIDS death rate in most of its varied forms in the sensitivity analyses.

DISCUSSION

Although the impact of AIDS is increasing dramatically in a global context, we know relatively little about how macro, structural forces influence AIDS death rates. We do know that AIDS experiences are not created equally; that is, more people are dying of AIDS in certain areas of the world than they are in others. The unequal distribution of AIDS deaths across the world suggests that structural stratification processes are at work. Several scholars have called for research that explicates the influence of structural factors on this epidemic, yet sociologists, to date, have responded in limited ways to this call. For the most part, their research agendas focus on the social determinants of individual risk behaviors and lifestyle change. This study contributes to the existing sociological literature on AIDS by presenting a macro, structural approach to explaining disparities in AIDS death rates. I provide an empirical investigation of the reasons that some countries might have more AIDS death than others by using cross-national data sources and panel models that estimate the effects of independent variables measured at two time points. The analysis reveals several important findings that are important for developing a macro, structural perspective on forces related to the inequalities of AIDS deaths worldwide.

Results indicate that secondary school enrollment is a consistent and robust predictor of the AIDS death rate, along with prevalence, Sub-Saharan Africa, and Latin America. The percentage of the population that is infected with HIV/AIDS obviously influences the number of

[17] I regress the AIDS death rate on the contemporary values of the standard set of controls in each model, along with one alternative indicator of education at a time. More details are available upon request.

people that die from it; thus, the strong effect of prevalence is to be expected. Because Sub-Saharan Africa and Latin America have been the most affected by AIDS, it is no surprise that these regions have such significantly positive effects on the AIDS death rate. Besides these variables, secondary school enrollment has the largest effect on the AIDS death rate. In fact, it is the only structural variable that remains significant across all contemporary and lagged models. The models presented here suggest that education has clear and consequential implications for the impact of AIDS, as higher school enrollments translate into fewer AIDS deaths at the country level.

Results further indicate that physicians per 1,000 and secondary school enrollment mediate the relationship between GDP and the AIDS death rate. This is not to deny the importance of GDP, because higher GDP is associated with more physicians and higher rates of school enrollment. Although GDP may not directly reduce AIDS death rates, it may improve well-being indirectly as it contributes to the expansion of schooling and the healthcare system. Because of its robust effects, education seems to be a more salient proximate cause of reduction in AIDS deaths, while GDP is more distal.

Furthermore, prevalence mediates the relationship between physicians per 1,000 and the AIDS death rate. This suggests that physicians help reduce the number of AIDS deaths in a country through their efforts to reduce the pervasiveness of HIV infection. Prevalence also partially mediates the relationship between secondary school enrollment and the AIDS death rate, but secondary school enrollment still continues to have a strong, direct effect on the AIDS death rate net of prevalence. Thus, one of the indirect mechanisms by which education helps to reduce AIDS death rates is by reducing prevalence. Because the prevalence of HIV infections and the number of deaths due to AIDS are highly correlated, a reduction in prevalence will contribute to a reduction in deaths.

There are several possible pathways through which education may affect AIDS prevalence and death. Increased school enrollment may help to disseminate information about sexual and reproductive health matters, such that more people know how to protect themselves from disease. There are other pathways through which education may be producing a strong effect on AIDS death rates as well. Increased secondary school enrollments may contribute to increased gender equality and improved women's status. Increased equality and status help women gain autonomy over their sexual and reproductive health and protect themselves from disease. Secondary school enrollment may also be indicative of a community's ability to provide more services to its population, improving health and preventing death. Further research should continue to investigate these causal mechanisms.

Future research should also continue to explore the relationship between other structural factors and AIDS prevalence and death. Multi-level models that link individual and population data could provide even more explanatory power in teasing out the relationships among individual variables, structural variables, and AIDS prevalence and death. Hierarchical lineal modeling (HLM) allows the researcher to estimate both individual-level (level 1) *and* country-level (level 2) effects on the dependent variable. The advantage of this technique is that the net effects of one level can be estimated while controlling for variation in the other level (Raudenbush and Bryk 2002). This technique permits tests of variability in regression coefficients across levels of analysis, and should therefore be able to answer questions such as whether individual-level effects are conditional on country-level effects (Huffman and Cohen 2004). Such models provide promising avenues for future research as data sources on AIDS continue to yield new and improved information.

This study has several limitations. First, data on AIDS deaths is only available from the UNCDB for 130 countries and two years. These numbers are likely to be underreported due to lack of diagnosis, the mis-attribution of cause of death, or under-reporting because of the stigmatization of the disease. Second, data on drug availability by country are also not available. Approximately 30% of the world's population does not have regular access to essential medicines. This figure rises to 50% in some of the poorest parts of Africa and Asia (WHO 2004). Existing drug treatments allow many people with AIDS to lead relatively normal lives by controlling opportunistic infections and by increasing longevity and quality of life, but the costs for such drugs are prohibitive for many others. Unfortunately, cross-national data about medication use are not available for the years examined here.

Despite its limitations, this study provides convincing evidence that structural factors are important considerations for reducing AIDS deaths. Much research focuses on the proximate causes of AIDS incidence, prevalence, or death. It is time to examine more distal causes in order to attack the root of the problem. Without a structural explanation, we are limited to individual explanations such as risky behavior or condom use to explain disparities in AIDS-related health outcomes. However, individual explanations are not sufficient when disparities in health outcomes are patterned according to population-level indicators of income and education, or when AIDS is concentrated in certain regions of the world.

Without a structural explanation of AIDS inequality, we also return to individual policy solutions to ameliorate the problem. Individual solutions are not sufficient, yet they are most commonly employed to fight AIDS. For instance, PEPFAR (the President's Emergency Plan for AIDS Relief) targets individual treatment and prevention campaigns to combat AIDS worldwide by means of the ABC model (abstain, be faithful, and correct and consistent use of condoms). One-third of prevention and education funds are required to be spent on abstinence programs, and country teams are told to emphasize different components of the ABC model to different target populations (GAO 2006). Condom provision and promotion are only directed to those who practice high-risk behaviors (prostitutes, sexually active couples in which one partner is known to have HIV, and drug users). Condoms are not mentioned as a strategy for helping young, unmarried people.

As a result of its parameters and stipulations, PEPFAR has been very controversial. It has been criticized for its lack of breadth and its restrictive policies regarding abstinence and condom promotion. Many claim that these policies constrain PEPFAR's effectiveness by undermining programs that have proven to be effective. The program is focused on individual behavior change and on providing different solutions to different populations. However, changing the structural conditions that accelerate or impede the dissemination of disease would help protect a lot more people than programs aimed at specific interventions for specific groups of people. Policies that aim to change structural conditions help change the environment for everyone, decreasing the risk for everyone. This may be more effective than policies that attempt to intervene at an individual level, particularly when those interventions are controversial, biased, and limited to certain groups.

References

Albertyn, Catherine. "Contesting Democracy: HIV/AIDS and the Achievement of Gender Equality in South Africa." *Feminist Studies* 29: 595-615.

Alderson, Arthur S. and Francois Nielsen. 1999. "Income Inequality, Development, and Dependence: A Reconsideration." *American Sociological Review* 64: 606-631.

Altman, Dennis. 1999. "Globalization, Political Economy, and HIV/AIDS." *Theory and Society* 28(4): 559-584.

Beckfield, Jason. 2004. "Does Income Inequality Harm Health? New Cross-National Evidence." *Journal of Health and Social Behavior* 45:231-48.

Bettcher, Douglas W., Derek Yach, and G. Emmanuael Guindon. 2000. "Global Trade and Health: Key Linkages and Future Challenges." *Bulletin of the World Health Organization* 78(4): 521-534.

Bradshaw, York W. 1993. "State Limitations, Self-Help Secondary Schooling, and Development in Kenya." *Social Forces* 1993: 347-378.

Bradshaw, York W., Rita Noonan, Laura Gash, and Claudia Buchmann Sershen. 1993. "Borrowing Against the Future: Children and Third World Indebtedness." *Social Forces* 71: 629-656.

Bradshaw, York, and Jie Huang. 1991. "Intensifying Global Dependency: Foreign Debt, Structural Adjustment, and Third World Underdevelopment." *Sociological Quarterly* 32: 321-342.

Brady, David, Yunus Kaya, and Jason Beckfield. Forthcoming. "Reassessing the Effect of Economic Growth on Well-Being in Less Developed Countries, 1980-2003." *Studies in Comparative International Development.*

Caldwell, John C. 1986. "Routes to Low Mortality in Poor Countries." *Population and Development Review* 12: 178-220.

Chen, James L., Kathryn A. Phillips, David E. Kanouse, Rebecca L. Collins, and Angela Miu. 2001. "Fertility Desires and Intentions of HIV-Positive Men and Women." *Family Planning Perspectives* 33: 144-152+165.

Copson, Raymond W. and Tiaji Salaam. 2005. "The Global Fund to Fight AIDS, Tuberculosis, and Malaria: Background and Current Issues." *CRS Report for Congress.* Retrieved from http://ncseonline.org/nle/crsreports/05mar/RL31712.pdf

Crenshaw, Edward M. 1992. "Cross-National Determinants of Income Inequality." *Social Forces* 71: 339-63.

Crimmins, Eileen M. and Yasuhiko Saito. 2001. "Trends in Healthy Life Expectancy in the United States, 1970-1990: Gender, Racial, and Educational Differences." *Social Science and Medicine* 52: 1629-1641.

Cutler, David and Grant Miller. 2005. "The Role of Public Health Improvements in Health Advances: The Twentieth Century United States." *Demography* 42: 1-22.

Davidson, Russell and James G. MacKinnon. 1993. *Estimation and Inference in Econometrics* New York: Oxford University Press.

Dollar, David. 2001. "Is Globalization Good for Your Health?" Bulletin of the World Health Organization 79(9): 827-833.

El-Ghannam, Ashraf Ragab. 2002. "The Determinants of Social Well-being, Economic Development, and Development Index in the Third World Countries." *Perspectives on Global Development and Technology* 1: 51-69.

Elo, Irma T. and Samuel H. Preston. 1996. "Educational Differences in Mortality: United States, 1979-85." *Social Science and Medicine* 42: 47-57.

Farmer, Paul. 1996. "Social Inequalities and Emerging Infectious Diseases." *Emerging Infectious Diseases* 2: 259-269.

Fawzi, M.C. Smith, W. Lambert, J.M. Singler, Y. Tanagho, F. Leandre, P. Nevil, D. Bertrand, M.S. Claude, J. Bertrand, M. Louissaint, L. Jeannis, J.S. Mukherjee, S. Goldie, J.J. Salazar, and P.E. Farmer. 2005. "Factors Associated with Forced Sex Among Women Accessing Health Services in Rural Haiti: Implications for the Prevention of HIV Infection and Other Sexually Transmitted Diseases." *Social Science & Medicine* 60: 679-689.

Firebaugh, Glenn and Brian Goesling. 2004. "Accounting for the Recent Decline in Global Income Inequality." *American Journal of Sociology* 110: 283-312.

Firebaugh, Glenn and Frank D. Beck. 1994. "Does Economic Growth Benefit the Masses? Growth, Dependence, and Welfare in the Third World." *American Sociological Review* 59: 631-653.

Firebaugh, Glenn. 1999. "Empirics of World Income Inequality." *American Journal of Sociology* 104: 1597-1630.

Fosu, Gabriel B. 1989. "Access to Health Care in Urban Areas of Developing Societies." *Journal of Health and Social Behavior* 30: 398-411.

Frey, R. Scott and Cralyn Field. 2000. "The Determinants of Infant Mortality in the Less Developed Countries: A Cross-National Test of Five Theories" *Social Indicators Research* 52: 215-234.

Gallant, Melanie and Eleanor Maticka-Tyndale. 2004. "School-based HIV Prevention Programmes for African Youth." *Social Science & Medicine* 58: 1337-1351.

Garrett, Laurie and Scott Rosenstein. 2005. "Missed Opportunities: Governance of Global Infectious Diseases." *Harvard International Review* 27: 64-69.

Goesling, Brian and Glenn Firebaugh. 2004. "The Trend in International Health Inequality." *Population and Development Review* 30: 131-146.

Goldsmith, Arthur. 1986. "Democracy, Political Stability, and Economic Growth in Developing Countries." *Comparative Political Studies* 18: 517-531.

Government Accountability Office. 2006. "Spending Requirement Presents Challenges for Allocating Prevention Funding Under the President's Emergency Plan for AIDS Relief." *Report to Congressional Committees*. Retrieved from http://www.gao.gov/new.items/d06395.pdf

Gregson, Simon, Heather Waddell, and Stephen Chandiwana. 2001. "School Education and HIV Control in Sub-Saharan Africa: From Discord to Harmony?" *Journal of International Development* 13: 467-485.

Gregson, Simon, Nicola Terceira, Phyllis Mushati, Constance Nyamukapa, and Catherine Campbell. 2004. "Community Group Participation: Can it Help Young Women to Avoid HIV? An Exploratory Study of Social Capital and School Education in Rural Zimbabwe." *Social Science & Medicine* 58: 2119-2132.

Grieser, Mira, Joel Gittelsohn, Anita V. Shankar, Todd Koppenhaver, Thomas K. Legrand, Ravai Marindo, Webster M. Mahvu, and Kenneth Hill. 2001. "Reproductive Decision Making and the HIV/AIDS Epidemic in Zimbabwe." *Journal of Southern African Studies* 27: 225-243.

Heffernan, Catherine. 2002. "HIV, Sexually Transmitted Infections and Social Inequalities: When the Transmission is More Social than Sexual." *International Journal of Sociology and Social Policy* 22: 159-176.

Heston, Alan, Robert Summers, and Bettina Aten. 2006. *Penn World Table*. Version 6.2. Philadelphia: University of Pennsylvania, Center for International Comparisons of Production, Income and Prices. Retrieved from http://pwt.econ.upenn.edu/php_site/pwt_index.php

Hoffman, Kelly and Miguel Angel Centeno. 2003. “The Lopsided Continent: Inequality in Latin America.” *Annual Review of Sociology* 29: 363-390.

Huffman, Matt L., and Philip N. Cohen. 2004. "Racial Wage Inequality: Job Segregation and Devaluation across U.S. Labor Markets." *American Journal of Sociology* 109:902-936.

Hummer, Robert A., Richard G. Rogers, and Isaac W. Eberstein. 1998. “Sociodemographic Differentials in Adult Mortality: A Review of Analytic Approaches.” *Population and Development Review* 24: 553-578.

Hunt, Charles. 1989. “Migrant Labor and Sexually Transmitted Diesease: AIDS in Africa.” *Journal of Health and Social Behavior* 30: 353-373.

Ickovics, Jeannette R., Susan E. Beren, Elena L. Grigorenko, Allison C. Morrill, Jennifer A. Druley, and Judith Rodin. 2002. “Pathways of Risk: Race, Social Class, Stress, and Coping as Factors Predicting Heterosexual Risk Behaviors for HIV Among Women.” *AIDS and Behavior* 6: 339-350.

Jenkins, J. Craig and Stephen J. Scanlan. 2001. “Food Security in Less Developed Countries, 1970 to 1990.” *American Sociological Review* 66: 718-744.

Kapiga, S.H. and J.L.P. Lugalla. 2002. “Sexual Behaviour Patterns and Condom Use in Tanzania: Results from the 1996 Demographic and Health Survey.” *AIDS Care* 14: 455-469.

Kaplan, Howard B., Robert J. Johnson, Carol A. Bailey, and William Simon. 1987. “The Sociological Study of AIDS: A Critical Review of the Literature and Suggested Research Agenda.” *Journal of Health and Social Behavior* 28: 140-157.

Kirshenbaum, Sheri B., A. Elizabeth Hurky, Jacqueline Correale, Rise B. Goldstein, Mallory O. Johnson, Mary Jane Rotheram-Borus, and Anke A. Ehrhardt. 2004. “’Throwing the Dice’: Pregnancy Decision-Making among HIV-Positive Women in Four U.S. Cities.” *Perspectives on Sexual and Reproductive Health* 36: 106-113.

Lamptey, Peter R., Jami L. Johnson, and Marya Khan. 2006. “The global challenge of HIV and AIDS.” *Population Bulletin* 61 (1).

Larson, Anne. 1990. “The Social Epidemiology of Africa’s AIDS Epidemic.” *African Affairs* 89: 5-25.

Leblanc, Allen J. and Richard G. Wight. 2000. “Reciprocity and Depression in AIDS Caregiving.” *Sociological Perspectives* 43: 631-649.

Li, Li and John Ballweg. 1992. “Development, Urbanization and Fertility in China.” *Sociology and Social Research* 76: 111-117.

Liu, Xian, Albert I. Hermalin, and Yi-Li Chuang. 1998. “The Effect of Education on Mortality Among Older Taiwanese and Its Pathways.” *Journals of Gerontology* 53B: 71-82.

Lleras-Muney, Adriana. 2005. “The Relationship Between Education and Adult Mortality in the United States.” *Review of Economic Studies* 72: 189-221.

London, Bruce and Kirk Williams. 1990. “National Politics, International Dependency, and Basic Needs Provision.” *Social Forces* 69: 565-584.

Long, J. Scott and Laurie H. Ervin. 2000. “Using Heteroskedasticity Consistent Standard Errors in the Linear Regression Model.” *The American Statistician* 54: 217-224.

Lugalla, Joe, Maria Emmelin, Aldin Mutembei, Mwiru Sima, Gideon Kwesigabo, Japhet Killewo, and Lars Dahlgren. 2004. “Social, Cultural and Sexual Behavioral Determinants

of Observed Decline in HIV Infection Trends: Lessons From the Kagera Region, Tanzania." *Social Science & Medicine* 59: 185-198.
Macklin, Eleanor D. 1988. "AIDS: Implications for Families." *Family Relations* 37: 141-149.
Marshall, Monty G., et al. 2006. *Polity IV Dataset*. Version p4v2003. College Park: University of Maryland, Center for International Development and Conflict Management. Retrieved from http://www.cidcm.umd.edu/polity/data/polreg.htm
McIntosh, William Alex and John K. Thomas. 2004. "Economic and Other Societal Determinants of the Prevalence of HIV: A Test of Competing Hypotheses." *Sociological Quarterly* 45: 303-324.
Miguez-Burbano, Maria J., Ivan Angarita, James M. Schultz, Gail Shor-Posner, Winslow Klaskala, Jose Luis Duque, Hong Lai, Beatriz Londono, and Marianna K. Baum. 2000. "HIV-Related High Risk Sexual Behaviors and Practices Among Women in Bogota, Colombia." *Women & Health* 30: 109-119.
Moon, Bruce E. and William J. Dixon. 1985. "Politics, the State, and Basic Human Needs." *American Journal of Political Science* 29: 661-694.
Neumayer, Eric. 2004. "HIV/AIDS and Cross-national Convergence in Life Expectancy." *Population and Development Review* 30 (4): 727-742.
Nussbaum, Martha. 2004. "Women's Education: A Global Challenge." *Signs* 29(2): 325-355.
Osmond, Marie Withers, K.G. Wambach, Dianne F. Harrison, Joseph Byers, Philippa Levine, Allen Imershein, and David M. Quadagno. 1993. "The Multiple Jeopardy of Race, Class, and Gender for AIDS Risk among Women." *Gender and Society* 7: 99-120.
Parker, Richard G., Delia Easton, and Charles H. Klein. 2000. "Structural Barriers and Facilitators in HIV Prevention: A Review of International Research." *AIDS* 14: 22-32.
Parker, Richard. 2001. "Sexuality, Culture, and Power in HIV/AIDS Research." *Annual Review of Anthropology* 30: 163-179.
Pearlin, Leonard I., Carol Aneshensel, and Allen J. Leblanc. 1997. "The Forms and Mechanisms of Stress Proliferation: The Case of AIDS Caregivers." *Journal of Health and Social Behavior* 38: 223-236.
Philipson, Tomas and Richard A. Posner. 1995. "The Microeconomics of the AIDS Epidemic in Africa." *Population and Development Review* 21: 835-848.
Portes, Alejandro and A. Douglas Kincaid. 1989. "Sociology and Development in the 1990s: Critical Challenges and Empirical Trends." *Sociological Forum* 4: 479-503.
Portes, Alejandro and Kelly Hoffman. 2003. "Latin American Class Structures: Their Composition and Change during the Neoliberal Era." *Latin American Research Review* 38: 41-82.
Preston, Samuel H. 1996. "Population Studies of Mortality." *Population Studies* 50: 525-536.
Pritchett, Lant and Lawrence H. Summers. 1996. "Wealthier is Healthier." *The Journal of Human Resources* 31: 841-868.
Przeworski, Adam and James Raymon Vreeland. 2000. "The Effect of IMF Programs on Economic Growth." *Journal of Development Economics* 62: 385-421.
Raudenbush, Stephen W., and Anthony S. Bryk. 2002. *Hierarchical Linear Models: Applications and Data Analysis Methods.* 2nd edition. Thousand Oaks, CA: Sage Publications.
Rubenstein, Leonard S. and Eric A. Friedman. 2004. "Human Rights and the President's AIDS Initiative." *Human Rights Magazine*. Retrieved from http://www.abanet.org/irr/hr/fall04/initiative.htm

Ruger, Jennifer Prah. 2004. “Combating HIV/AIDS in Developing Countries.” *British Medical Journal* 329: 121-122.
Sachs, Jeffrey D. 2005. “Can Extreme Poverty Be Eliminated?” *Scientific American* August 22.
Scharf, Emily and Sue Toole. 1992. “HIV and the Invisibility of Women: Is There a Need to Redefine AIDS?” *Feminist Review* 41: 64-67.
Schoepf, Brooke Grundfest. 1988. “Women, AIDS, and Economic Crisis in Central Africa.” *Canadian Journal of African Studies* 22: 625-644.
Sen, Amartya. 1999. “Democracy as a Universal Value.” *Journal of Democracy* 10(3): 3-17.
Setel, Philip. 1995. “The Effects of HIV and AIDS on Fertility in East and Central Africa.” *Health Transition Review* 5: 179-189.
Simbayi, Leickness C., Seth C. Kalichman, Sean Jooste, Charsey Cherry, Sakhumzi Mfecane, and Demetria Cain. 2005. “Risk Factors for HIV-AIDS Among Youth in Cape Town, South Africa.” *AIDS and Behavior* 9: 53-61.
Sorensen, Georg. 1991. *Democracy, Dictatorship and Development*. London: Macmillan.
Studenmund, A.H. 2001. *Using Econometrics: A Practical Guide* Boston: Addison Wesley Longman.
Sumartojo, Esther. 2000. “Structural Factors in HIV Prevention: Concepts, Examples, and Implications for Research.” *AIDS* 14: 3-10.
Thompson, Elizabeth A. 2000. “Mothers’ Experiences of an Adult Child’s HIV/AIDS Diagnosis: Maternal Responses to and Resolutions of Accountability for AIDS.” *Family Relations* 49: 155-164.
Turner, Heather A., Leonard I. Pearlin, and Joseph T. Mullan. 1998. “Sources and Determinants of Social Support for Caregivers of Persons with AIDS.” *Journal of Health and Social Behavior* 39: 137-151.
United Nations. 2006. *United Nations Common Database*. Retrieved from http://unstats.un.org/unsd/cdb/cdb_advanced_data_extract.asp
Urwin, Charlene A. 1988. “AIDS in Children: A Family Concern.” *Family Relations* 37: 154-159.
Vreeland, James Raymond. 2003. *The IMF and Economic Development*. Cambridge: Cambridge University Press. Retrieved from http://pantheon.yale.edu/~jrv9/DATA_PAGE.html
Wachter, Kenneth W., John E. Knodel, and Mark VanLandingham. 2002. “AIDS and the Elderly of Thailand: Projecting Familial Impacts.” *Demography* 39 (1): 25-41.
Walton, John, and Charles Ragin. 1990. “Global and National Sources of Political Protest: Third World Responses to the Debt Crisis.” *American Sociological Review* 55: 876-890.
Wickrama, K.A.S. and Frederick O. Lorenz. 2002. “Women’s Status, Fertility Decline, and Women’s Health in Developing Countries: Direct and Indirect Influences of Social Status on Health.” *Rural Sociology* 67: 255-277.
World Bank. 2006. *World Development Indicators Online*. Retrieved from http://devdata.worldbank.org/dataonline/
World Health Organization. 2004. “Equitable Access to Essential Medicines: A Framework for Collective Action.” *WHO Policy Perspectives on Medicines*.
World Health Organization. 2006. *WHO Statistical Information System*. Retrieved from http://www.who.int/whosis/database/core/core_select.cfm
Zierler, Sally and Nancy Krieger. 1997. “Reframing Women’s Risk: Social Inequalities and HIV Infection.” *Annual Review of Public Health* 18: 401-436.

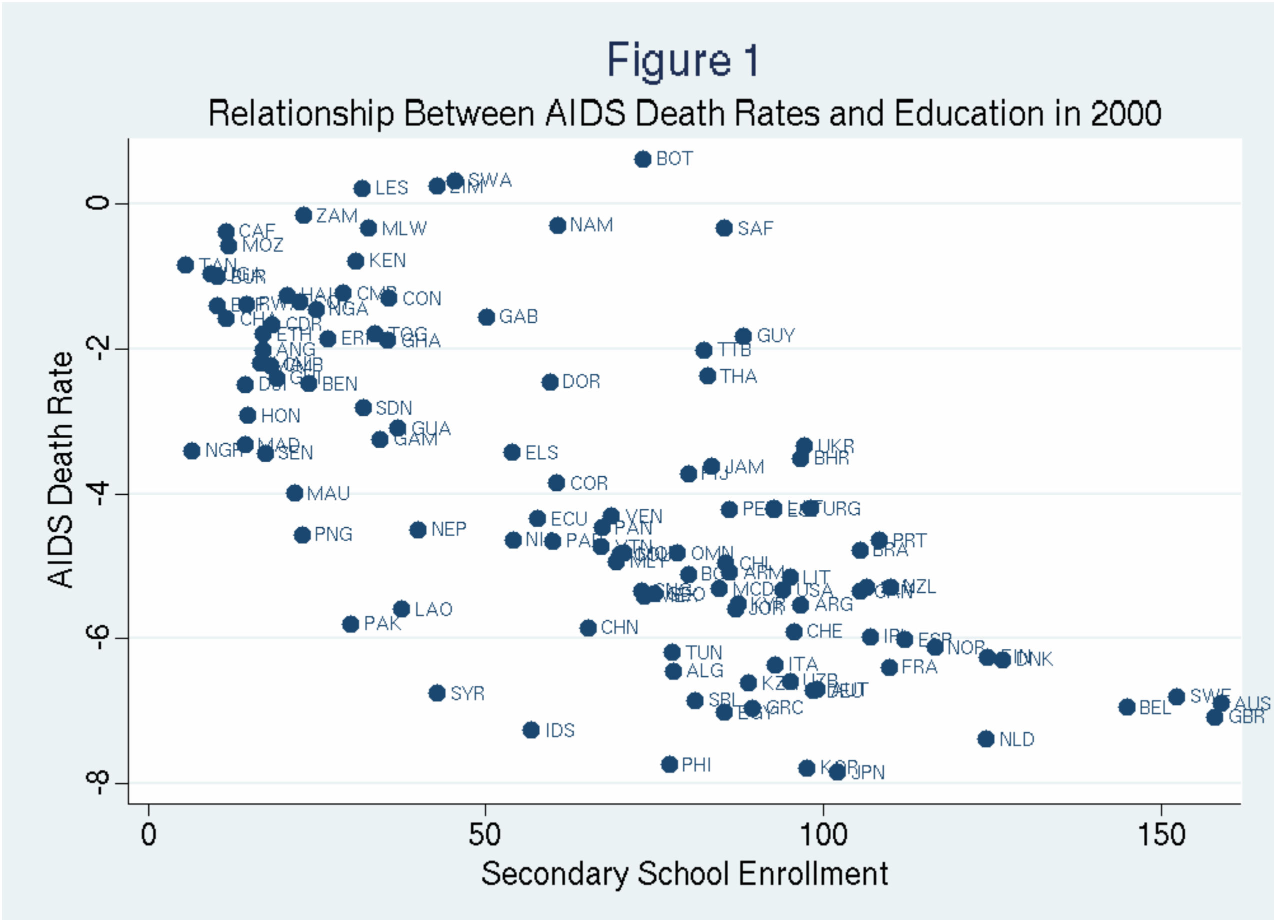


Figure 1
Relationship Between AIDS Death Rates and Education in 2000
AIDS Death Rate
Secondary School Enrollment
0
-2
-4
-6
-8
0
50
100
150
BOT
LES
SWA
ZAM
NAM
SAF
CAF
MLW
MOZ
KEN
CON
GAB
GUY
TTB
THA
DOR
BEN
SDN
HON
GUA
ELS
JAM
UKR
BHR
COR
MAU
ECU
VEN
PNG
NEP
URG
PRT
BRA
OMN
LIT
USA
NZL
ARG
LAO
PAK
CHN
CHE
FRA
TUN
ALG
ITA
SYR
BEL
NLD
IDS
PHI
JPN
GBR
DNK
GRC
SEN
ETH
ANG
GHA
NGA
CMR
NOR

Figure 2

Relationship Between AIDS Death Rates and Education in 1990

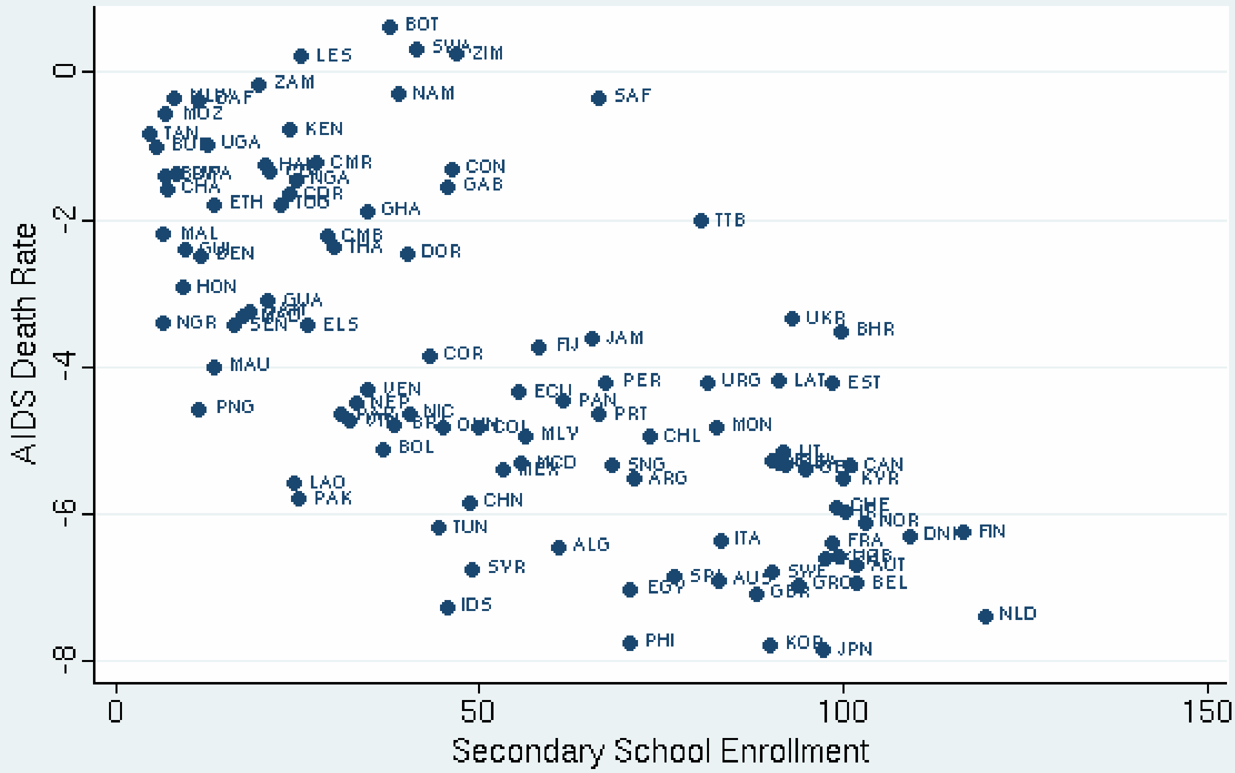


Table 1. Contemporary OLS Panel Models of AIDS Death Rate on Secondary School Enrollment and Other Structural Variables in 2000 (N=115)*

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Population Growth	0.366 ***0.177*** (0.232)	-0.136 ***-0.066*** (0.268)	-0.281 ***-0.136*** (0.285)	-0.171 ***-0.083*** (0.206)	-0.351* ***-0.170*** (0.177)	-0.356+ ***-0.172*** (0.185)
Urban Population Growth	0.186 ***0.170*** (0.128)	0.067 ***0.061*** (0.143)	-0.003 ***-0.003*** (0.192)	0.056 ***0.052*** (0.100)	0.048 ***0.044*** (0.084)	0.036 ***0.033*** (0.080)
Real GDP Per Capita PPP	-11.49 E-5** ***-0.488*** (0.000)	-7.27 E-5** ***-0.309*** (0.000)	-2.26 E-5 ***-0.096*** (0.000)	-2.82 E-5 ***-0.120*** (0.000)	-1.55 E-5 ***-0.066*** (0.000)	-2.33 E-5 ***-0.099*** (0.000)
Under an IMF Agreement	-0.179 ***-0.808*** (0.419)	-0.165 ***-0.074*** (0.398)	-0.335 ***-0.150*** (0.378)	-0.018 ***-0.008*** (0.254)	-0.089 ***-0.040*** (0.207)	-0.123 ***-0.055*** (0.212)
Trade Openness	0.003 ***0.068*** (0.003)	0.002 ***0.034*** (0.003)	0.003 ***0.068*** (0.004)	0.004 ***0.085*** (0.003)	0.006* ***0.144*** (0.003)	0.006* ***0.133*** (0.003)
Democracy Score	0.038 ***0.104*** (0.041)	0.031 ***0.086*** (0.037)	0.041 ***0.112*** (0.038)	0.032 ***0.087*** (0.025)	0.006 ***0.015*** (0.024)	-0.003 ***-0.007*** (0.025)
Physicians per 1,000		-0.879** ***-0.516*** (0.250)	-0.622* ***-0.365*** (0.248)	-0.176 ***-0.103*** (0.202)	-0.096 ***-0.057*** (0.166)	-0.117 ***-0.069*** (0.165)
Secondary School Enrollment			-0.031** ***-0.528*** (0.008)	-0.024** ***-0.397*** (0.006)	-0.015** ***-0.262*** (0.005)	-0.014* ***-0.230*** (0.005)
Prevalence				0.188** ***0.548*** (0.024)	0.139** ***0.406*** (0.020)	0.143** ***0.418*** (0.016)
Sub-Saharan Africa					2.231** ***1.000*** (0.383)	2.128** ***0.953*** (0.383)
Latin America					1.516** ***0.679*** (0.342)	1.447** ***0.648*** (0.341)
School Enrollment* Sub-Saharan Africa						0.001 ***0.017*** (0.003)
School Enrollment* Latin America						-0.009* ***-0.100*** (0.004)
Constant	-4.357** (0.556)	-2.326** (0.835)	-0.754 (0.854)	-2.932** (0.663)	-4.298** (0.630)	-4.097** (0.643)
R^2	0.40	0.48	0.55	0.78	0.85	0.86

+ significant at 10%; * significant at 5%; ** significant at 1% (two-tailed tests)

*Notes: Independent variables are 2000 values, except for prevalence. Each cell contains the unstandardized coefficient, standardized beta coefficient in bold and italics, and standard error in parentheses. Coefficients for dichotomous variables (Under an IMF Agreement, Sub-Saharan Africa, and Latin America) are semi-standardized.

Table 2. Lagged OLS Panel Models of AIDS Death Rate on Secondary School Enrollment and Other Structural Variables in 1990 (N=106)*

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Population Growth	0.125	0.025	0.067	0.155	0.054	0.058
	0.074	***0.014***	***0.039***	***0.091***	***0.032***	***0.034***
	(0.205)	(0.206)	(0.234)	(0.111)	(0.096)	(0.096)
Urban Population Growth	0.226	0.146	-0.001	-0.215	-0.163	-0.138
	0.202	***0.131***	***-0.001***	***-0.192***	***-0.146***	***-0.123***
	(0.233)	(0.245)	(0.270)	(0.139)	(0.114)	(0.107)
Real GDP Per Capita PPP	-7.95 E-5**	-6.73 E-5	1.68 E-6	-8.79 E-6	-1.75 E-5	-2.66 E-5
	-0.272	***-0.231***	***0.006***	***-0.030***	***-0.060***	***-0.091***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Under an IMF Agreement	0.251	0.062	-0.264	0.481	-0.105	-0.113
	0.111	***0.027***	***-0.117***	***0.213***	***-0.046***	***-0.050***
	(0.548)	(0.531)	(0.496)	(0.322)	(0.270)	(0.283)
Trade Openness	0.000	0.001	0.005	0.003	0.004	0.003
	0.007	***0.027***	***0.098***	***0.050***	***0.074***	***0.066***
	(0.004)	(0.005)	(0.005)	(0.003)	(0.002)	(0.002)
Democracy Score	-0.050	-0.044	-0.033	-0.011	0.000	-0.003
	-0.166	***-0.146***	***-0.109***	***-0.035***	***0.001***	***-0.010***
	(0.040)	(0.040)	(0.040)	(0.026)	(0.030)	(0.029)
Physicians per 1,000		-0.425+	0.009	0.237	0.150	0.129
		-0.241	***0.005***	***0.134***	***0.085***	***0.073***
		(0.244)	(0.273)	(0.203)	(0.181)	(0.183)
Secondary School Enrollment			-0.045**	-0.036**	-0.022*	-0.019*
			-0.658	***-0.526***	***-0.332***	***-0.284***
			(0.013)	(0.010)	(0.009)	(0.009)
Prevalence				0.216**	0.147**	0.151**
				0.642	***0.435***	***0.449***
				(0.025)	(0.022)	(0.021)
Sub-Saharan Africa					2.195**	2.054**
					0.972	***0.909***
					(0.476)	(0.499)
Latin America					1.174**	1.121**
					0.520	***0.496***
					(0.408)	(0.413)
School Enrollment* Sub-Saharan Africa						0.001
						0.016
						(0.003)
School Enrollment* Latin America						-0.008*
						-0.096
						(0.004)
Constant	-4.396**	-3.540**	-1.932+	-3.089**	-4.119**	-4.135**
	(0.816)	(0.990)	(1.007)	(0.719)	(0.755)	(0.723)
R^2	0.39	0.41	0.49	0.78	0.83	0.84

+ significant at 10%; * significant at 5%; ** significant at 1% (two-tailed tests)
*Notes: Independent variables are 1990 values, except for prevalence. Each cell contains the unstandardized coefficient, standardized beta coefficient in bold and italics, and standard error in parentheses. Coefficients for dichotomous variables (Under an IMF Agreement, Sub-Saharan Africa, and Latin America) are semi-standardized.

Appendix I.

All countries in the original sample (N=130):
Algeria, Angola, Argentina, Armenia, Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Belize, Benin, Bolivia, Botswana, Brazil, Brunei, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Columbia, Costa Rica, Cote d'Ivorie, Cuba, Democratic Republic of Congo, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guyana, Haiti, Honduras, Hong Kong, Iceland, Indonesia, Iran, Ireland, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mexico, Mongolia, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Republic of Congo, Rwanda, Senegal, Serbia, Singapore, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syria, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Uganda, Ukraine, United Kingdom, United States, Uruguay, Uzbekistan, Venezuela, Vietnam, Zambia, Zimbabwe

Excluded due to missing data in the contemporary panel models (N=115):
Bahamas, Barbados, Belize, Brunei, Cuba, Hong Kong, Iceland, Iran, Lebanon, Liberia, Luxembourg, Malta, Myanmar, Serbia, Suriname

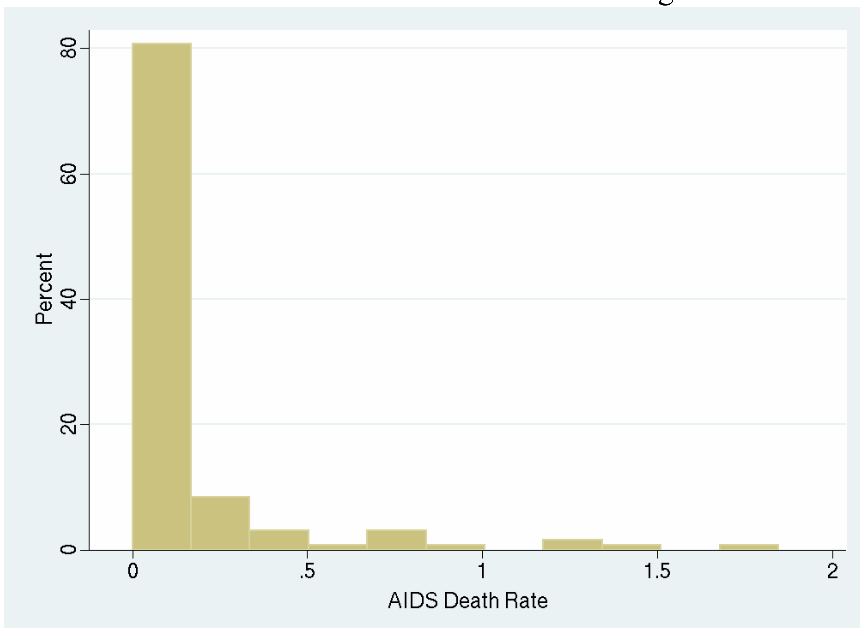
Excluded due to missing data in the lagged panel models (N=106):
Angola, Armenia, Bahamas, Barbados, Belize, Brunei, Cuba, Djibouti, Eritrea, Germany, Guyana, Hong Kong, Iceland, Iran, Jordan, Lebanon, Liberia, Luxembourg, Malta, Myanmar, Serbia, Spain, Sudan, Suriname

Sub-Saharan African countries included in contemporary panel models (N=37):
Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Republic of Congo, Cote d'Ivorie, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe

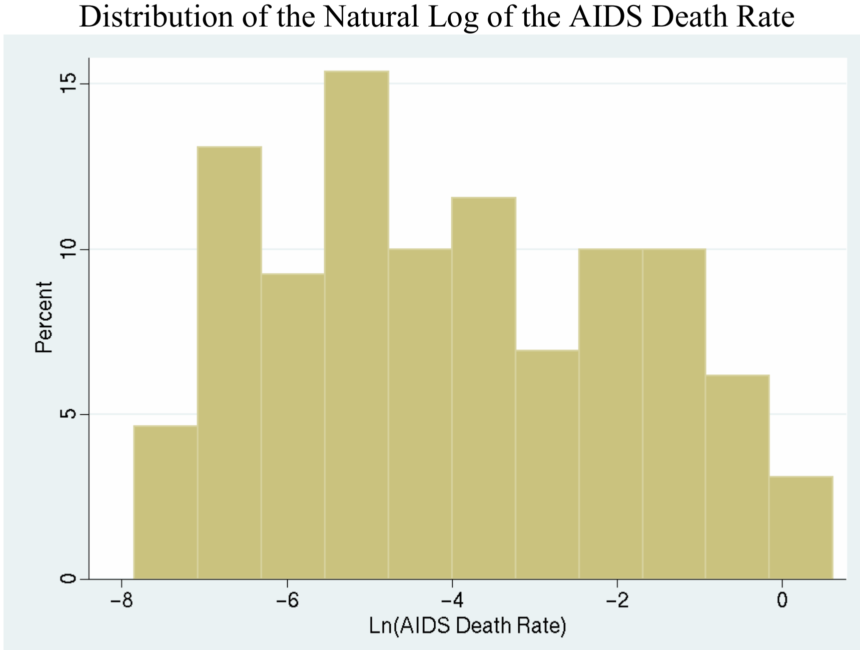
Latin American countries included in contemporary panel models (N=22):
Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobogo, Uruguay, Venezuela

Appendix II.

Distribution of the AIDS Death Rate Prior to the Log Transformation



Distribution of the Natural Log of the AIDS Death Rate



Appendix III. Descriptive Statistics

	Contemporary Panel Models N=115		Lagged Panel Models N=106	
Variable	***Mean***	***Std. Dev.***	***Mean***	***Std. Dev.***
AIDS death rate (logged)	-3.97	2.23	-3.99	2.26
Prevalence	3.49	6.51	3.56	6.70
Population Growth	1.53	1.08	1.90	1.33
Urban Population Growth	2.46	2.05	3.07	2.02
Real GDP Per Capita PPP	8318.41	9475.72	7149.28	7742.57
Under IMF Agreement	0.41	0.49	0.44	0.50
Trade Openness	82.83	49.98	67.22	43.53
Polity Score	3.77	6.13	1.72	7.46
Physicians per 1,000	1.33	1.31	1.18	1.28
School Enrollment	64.91	37.66	53.11	33.35
Sub-Saharan Africa	0.32	0.47	0.32	0.47
Latin America	0.19	0.40	0.20	0.40

Notes: Contemporary panel models use independent variables measured in 2000, and lagged panel models use independent variables measured in 1990. Across all models, the AIDS death rate is an average of 2001 and 2003 values, and prevalence is measured in 1999 only.

Appendix IV. Sensitivity Analyses of Alternative Measures of Education

Measure of Education	Unstandardized Coefficient (Standardized Coefficient)	R^2	N
Secondary School Enrollment (Logged)	-0.935** ***-0.328*** (0.236)	.78	115
Change in Secondary School Enrollment[1]	-0.013+ ***-0.093*** (0.006)	.74	114
Secondary School Enrollment Top-Coded[2]	-0.025** ***-0.360*** (0.007)	.78	115
Net Secondary School Enrollment[3]	-0.033** ***-0.442*** (0.010)	.79	85
Gross Primary School Enrollment[4]	-0.013* ***-0.120*** (0.007)	.76	113
Gross Tertiary School Enrollment[5]	-0.010 ***-0.107*** (0.017)	.75	89

+ significant at 10%; * significant at 5%; ** significant at 1% (two-tailed tests)

Notes: Each cell contains the unstandardized coefficient, standardized beta coefficient in bold and italics, and standard error in parentheses. Each alternative measure of education was included in a contemporary panel model with the baseline controls: prevalence, population growth, urban population growth, real GDP per capital PPP, under IMF agreement, trade openness, physicians per 1,000, and polity score. Data for each measure of education was obtained from WDI (World Bank 2006). Other details available upon request.

[1]Measured as the difference between the 2000 and the 1990 values of secondary school enrollment.

[2]Calculated by setting any value of secondary school enrollment over 100 percent, equal to 100 percent.

[3]Measured as the number of official school age children enrolled in school as a percentage of the population of corresponding age.

[4]Measured as the total enrollment in primary school, regardless of age, as a percentage of the population of the age group that officially corresponds to the primary level. According to the World Bank (2006), "Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music."

[5]Measured as the total enrollment in tertiary school, regardless of age, as a percentage of the population of the age group that officially corresponds to the tertiary level. According to the World Bank (2006), "Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level."