Estimating the impact of HIV&AIDS on the supply of basic education

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Abstract

The study described here explores, for three regions with generalized HIV and AIDS epidemics, the impact of the epidemic on teacher supply now and up to 2015, the target date for the achievement of education for all. The study uses the Ed-SIDA model to make projections of the impact on education supply for 53 countries in three areas hardest hit by the epidemic: sub-Saharan Africa, the Caribbean and the Greater Mekong sub-region of south-east Asia. The study estimates the incremental economic cost attributable to HIV, of providing sufficient teachers to achieve universal primary education by 2015, and projects the costs under two scenarios reflecting different levels of availability to teachers of care and support, including anti-retroviral therapy. The results suggest that, in sub-Saharan Africa, the 2006 costs to education are less than half those estimated in 2002, reflecting reductions in HIV prevalence and better understanding of HIV epidemiology. Never-the-less, the impact on teacher supply is estimated to be sufficient to derail efforts to achieve EFA in sub-Saharan Africa unless teachers have universal access to treatment, care and support. We compare regions and examine the impact on basic education of two treatment scenarios: status quo and provision of ART and VCT to all teachers requiring it between 2007-2015. The results suggest that universal access to testing and treatment is always beneficial to education supply. In sub-Saharan Africa, universal access is cost-effective on education returns alone. In the Caribbean, the benefits to education could pay for universal access to ART (but not VCT), and in South-East Asia, where the epidemic has a lower impact, the cost of testing and treatment is greater than the education costs saved.

Introduction

Teachers play the central role in the achievement of Education for All (EFA) and the second Millennium Development goal (MDG) of universal access to quality basic education. UNESCO (2004) identifies strong governmental leadership and a sufficient supply of motivated, respected, supported and supervised teachers as the key elements to achieving EFA. Furthermore, sustaining the supply of teachers is a major component of the national budget for education, typically in the range 60% to 98% of total spending on education (EFA Global Monitoring Report, 2006) and is often one of the largest public salary bills overall since teachers often represent more

than 50% of the total public work force. The future supply of teachers is therefore a critical issue for both education quality and financial stability.

HIV threatens that stability, for some countries, through its impact on the mortality and morbidity of teachers. In those countries hardest hit by the HIV epidemic, AIDS mortalities have reduced the average life-span and altered the demographic profile. As for the population as a whole, this had potentially important consequences for the teaching force and placed new demands on the education sector, the focus of this paper.

Strengthening education planning systems became more important in the face of increased mortality and absences of education staff, increased demand for new types of education to respond to HIV & AIDS, and new budgetary demands to respond to the impact of the epidemic. One of the earlier planning tools developed to project the impact of HIV on education systems was the Ed-SIDA model (World Bank, Partnership for Child Development, 2001) which was used by Ministry of Education planning staff in countries with generalized epidemics, in particular to project he impact of HIV on EFA planning profiles for teacher recruitment.

In this paper we focus on estimating the economic impact of HIV and AIDS on teaching supply in three regions: sub-Saharan Africa, the Caribbean and South East Asia. All of these regions include countries where the epidemic prevalence exceeds 1% and is defined as generalized. Of the 44 sub-Saharan African countries evaluated by UNAIDS, 38 (86%) are experiencing a generalised epidemic, and only Madagascar, Mauritius, Mauritania, Senegal, Somalia and the Comoros are estimated to have an HIV prevalence of less than 1%. According to UNAIDS the Caribbean is the second most affected region in the world, with seventeen (63%) out of 21 Caribbean countries experiencing a generalized epidemic (UNAIDS 2006; CARICOM 2004). In Asia, the Greater Mekong sub-Region (GMSR) has an unusually high regional prevalence, with generalized epidemics in three of the 6 countries.

During the last decade, the world has entered a new era: one in which treatment can greatly reduce mortality and morbidity due to HIV and AIDS. Although many of the lowest-income countries are yet to achieve country-wide provision of ART, universal access to treatment is a global goal. The universal availability of effective care and support, including ART, has the potential to significantly change the impact of HIV on teachers' lives, with direct and positive consequences for the supply of education.

The study described here explores, for three regions with generalized HIV and AIDS epidemics, the impact of HIV on teacher supply in basic education now and up to 2015, the target date for the achievement of EFA. The study estimates the additional economic costs due to HIV of providing sufficient teachers to achieve EFA and the education MDG, and projects the costs under two scenarios reflecting different levels of availability to teachers of care and support, including anti-retroviral therapy.

Methods

Overall Approach

The Ed-SIDA model combines an epidemiological model, using UNAIDS processes to project the course of the HIV epidemic, and an education planning model, using standard education planning tools to project teacher supply needs for a given set of education parameters. An analysis was performed for each of a total of 53 countries in three regions: sub-Saharan Africa, the Caribbean and the Greater Mekong sub-region of South East Asia. The results for each country were then summed to provide an aggregate regional total.

Model description

The model used has been developed from that described in Grassly (2003). It enumerates the processes which affect the number of primary school teachers in each country. Costs are then applied to these processes and scenarios examined to generate cost estimates in various circumstances. The structure of the new model is illustrated in Figure 1. This model allows for the exploration of the addition of care and support for teachers, and the probability of death is based on age, gender and expected time since infection.

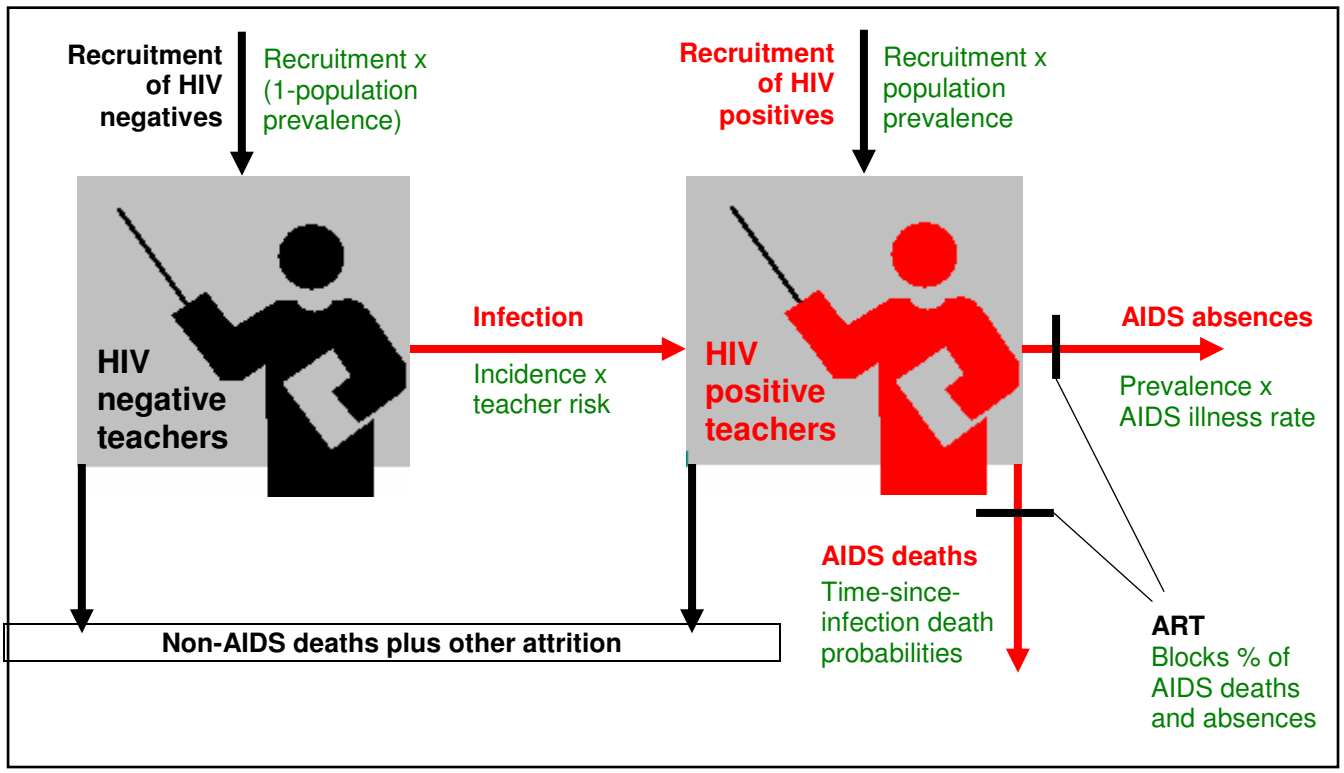


Figure 1. Processes in the model of impact on HIV and AIDS on education supply. All prevalence, incidence and death probability estimates are made using UNAIDS methods and are age, gender and year-specific.

The epidemiological model provides country-specific epidemiological projections of HIV prevalence, incidence and AIDS deaths. UNAIDS projections were used, which output these values for each gender and 5-year age group, and give high, low and medium estimates. The education model is a national planning tool, where education data were taken from the UIS online database where available, and sourced from Ministries of Education otherwise.

Incorporating age and gender patterns

Age- and gender- specific HIV prevalence and AIDS death rates were obtained using UNAIDS methods. The age and gender profile of teachers was then used to predict the HIV prevalence and AIDS death rates among teachers. Figure 2 shows examples of such data from Kenya. It is apparent that there are marked differences between the age distributions of male, female and newly recruited teachers. It is also apparent that there are marked differences between the age distributions of HIV infection by gender. These patterns are captured by the model.

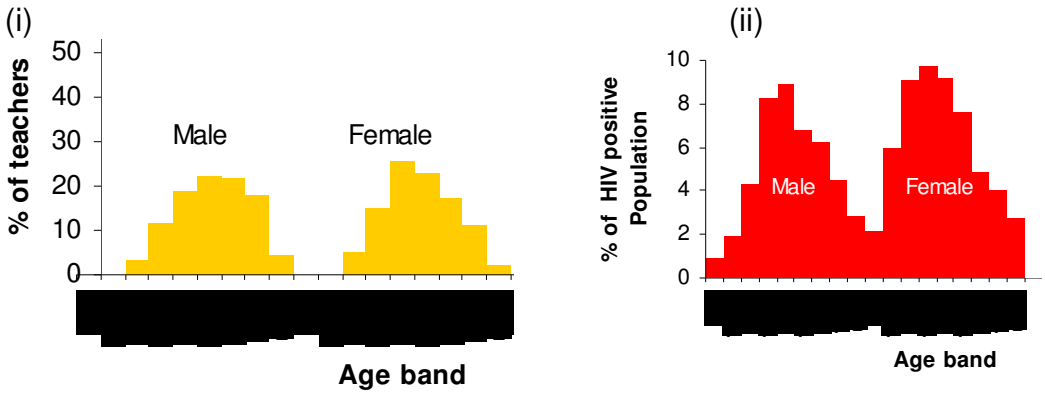


Figure 2. (i) Age distribution of teachers employed in Kenya, 2005, by gender input into the model for each country in the East Africa sub-region. (ii) Age distribution HIV infection in sub-Saharan Africa, 2005, by gender. The age-gender distribution of teachers parallels the age-gender distribution of those most at risk of being HIV positive.

The available data on HIV age-distribution are for the population as a whole, and not for teachers specifically. The best and only data available on age-infection profiles in teachers are from a study in South Africa (Shisana et al. 2005). The relative risk of teachers being infected with HIV is calculated from this study, as described in Figure 3.

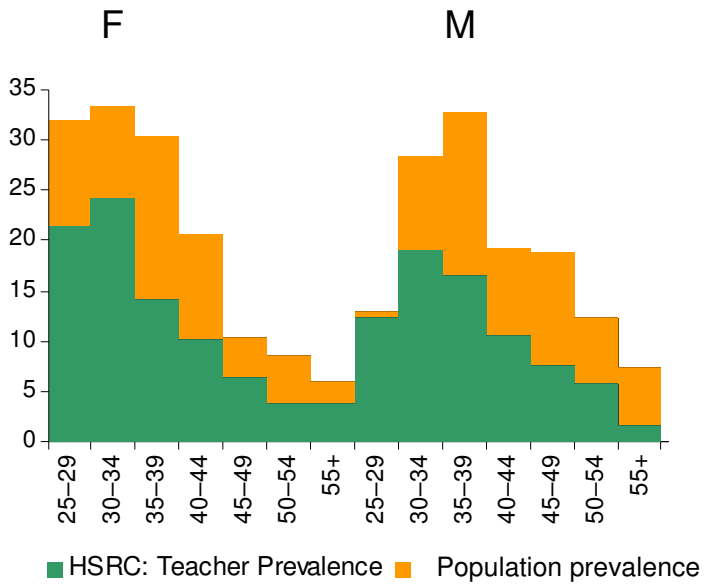


Figure 3. HIV prevalence by age and gender in a large sample of educators in South Africa in 2004 and that estimated for the general population using UNAIDS methods for South Africa in the same year. Teachers had on average 56% of the prevalence of the general population. The shape of the prevalence-age distribution is similar in educators and in the general population, which lends credibility to projections based on these distributions. The peak age of infection among male teachers is slightly lower in educators than in the general population, and male educators aged 25-29 have an almost indistinguishable prevalence to that of the general population. This may indicate that young male teachers are engaging in behaviour just as risky as the general population

Historical data, from 1980 to 2006

The UNESCO Institute of Statistics (UIS) and Ministry of Education planning departments were the primary sources for country-specific data. Teacher numbers and pupil teacher ratios were determined from a pre-epidemic start date of 1980 until 2006. Age and gender profiles for the teachers were presumed to be equal to those in 2006, or the latest available year. Where data were unavailable for one year, values were estimated to increase or decrease linearly between bounding years. Where data from boundary years (1980 or 2006) were unavailable, data were estimated to be equal between 1980 and the first year with available data, or between 2006 and the last year with available data. Where no recruitment data and/or attrition data were available, the attrition was initially set at the value given in appendix 1, and first the recruitment was varied until the number of teachers calculated by the model equalled the number of teachers given by UIS in that year. If

there was a drop in teacher numbers which could not be accounted for by zero recruitment, the attrition rate was increased until the calculated and observed numbers of teachers were equal. The UIS-collected number of teachers was not therefore entered into the calculations directly, but was used to adjust attrition and recruitment rates so that the model produced the observed number of teachers. The actual data entered for each country is listed in the Appendix.

Projection benchmarks, from 2007-2015

Enrolment: The enrolment benchmark is associated with goal 2 of both EFA and the MDG: to achieve universal primary education by 2015. In this analysis, this is interpreted as a net enrolment target of 100% by 2015. The model projects a linear increase in enrolment between 2007 and 2015, the rate of which can be adjusted by the user.

Pupil-teacher ratio: The PTR benchmark for primary schools, based on Education For All (EFA) goal 6, is a ratio of 40 students per teacher by 2015. As with the enrolment rate, this is achieved in the model by a linear increase in the number of teachers from 2007-2015, the rate of increase can be varied by the user.

Note that while the pupil-teacher ratio is currently high in sub-Saharan Africa (50:1 for the region as a whole in 2004, UIS data), it is typically lower in the Caribbean (24:1). In South East Asia there is considerable variation between countries, with Cambodia having the highest ratio of 55 (in 2004), and ratios in the other countries ranging from 21-32.

For the present estimations recruitment rate was set such that where the most recent PTR exceeded 40:1, the ratio was reduced to equal 40:1 by 2015. Where the PTR was already below 40, we set recruitment to maintain this low ratio, and did not allow reducing teacher numbers to be compensated by rising PTRs.

Estimating costs

Cost data to estimate the economic impact of HIV on education were sourced from the WHO (cost of ART), World Bank (GDP), and country and other published sources (teacher salary, costs of absenteeism and death).

Table 1: Principal costs used in the model

Region	Country/countries	Item	Cost/cost range (US$)	year	Source
Each	Each	ART	24-1200	2005	WHO 3 by 5 reports
Caribbean	Guyana	VCT	15	2006	Ministry of Education
South East Asia	Thailand & Cambodia	VCT	6-30	2002, 2006	Various sources

Sub-Saharan Africa	Tanzania, Sudan, Kenya, Uganda	VCT	14-29	1997-2002	Various sources
Caribbean	Guyana	Teacher salary	775-1371	1998-2001	Ministry of Education
South East Asia	Cambodia, Viet Nam, Lao PDR	Teacher salary	180-480	2001-2002	UNESCO
South East Asia	Thailand	Teacher salary	5,230	2005	Web source
Sub-Saharan Africa	Many	Teacher salary	333-13,9000	1990-1996	UIS
Caribbean	Guyana	Teacher Training	1475	2006	TTI
Caribbean	Trinidad and Tobago	Teacher Training	11,000	2003	MUSTER Report
South East Asia	Viet Nam	Teacher Training	250	2001	UNESCO
Sub-Saharan Africa	Ghana, Tanzania, Mozambique, Zambia, Eritrea, Tanzania	Teacher Training	311-2031	1999-2003	MoE and various reports
Caribbean	Guyana	Death Benefit	1728	2001	Ministry of Education
South East Asia	Thailand	Death Benefit	263	2006	Web sources
Sub-Saharan Africa	Zambia, Swaziland, Ghana, Uganda, Zambia, Kenya	Death Benefit	176-3873	2000-2004	Various sources, mainly MoE policy documents

Costs were converted to 2007 equivalent using a rate of inflation of 3%. For future and past years, they were then discounted at a rate of 3%. If costs were unavailable for a country, a neighbouring country's costs were then scaled on the relative GDP per capita and subsequently discounted at 3%.

Treatment scenarios

If teachers who are HIV positive know their status and have access to ART if they require it, the impact of HIV on education supply is greatly diminished. We chose to examine two policy scenarios, one in which VCT and ART are supplied at current estimated levels and one where ART and VCT is immediately increased to 100%. ART use as a % of those who require it is as estimated by UNAIDS for the general population, which is assumed to be equal to the % of the population undergoing annual VCT.

The scenarios examined are therefore as follows:

1. Teacher ART use remains at 2005 levels between 2006-2015
2. All teachers undergo VCT and those found to require ART are provided with it

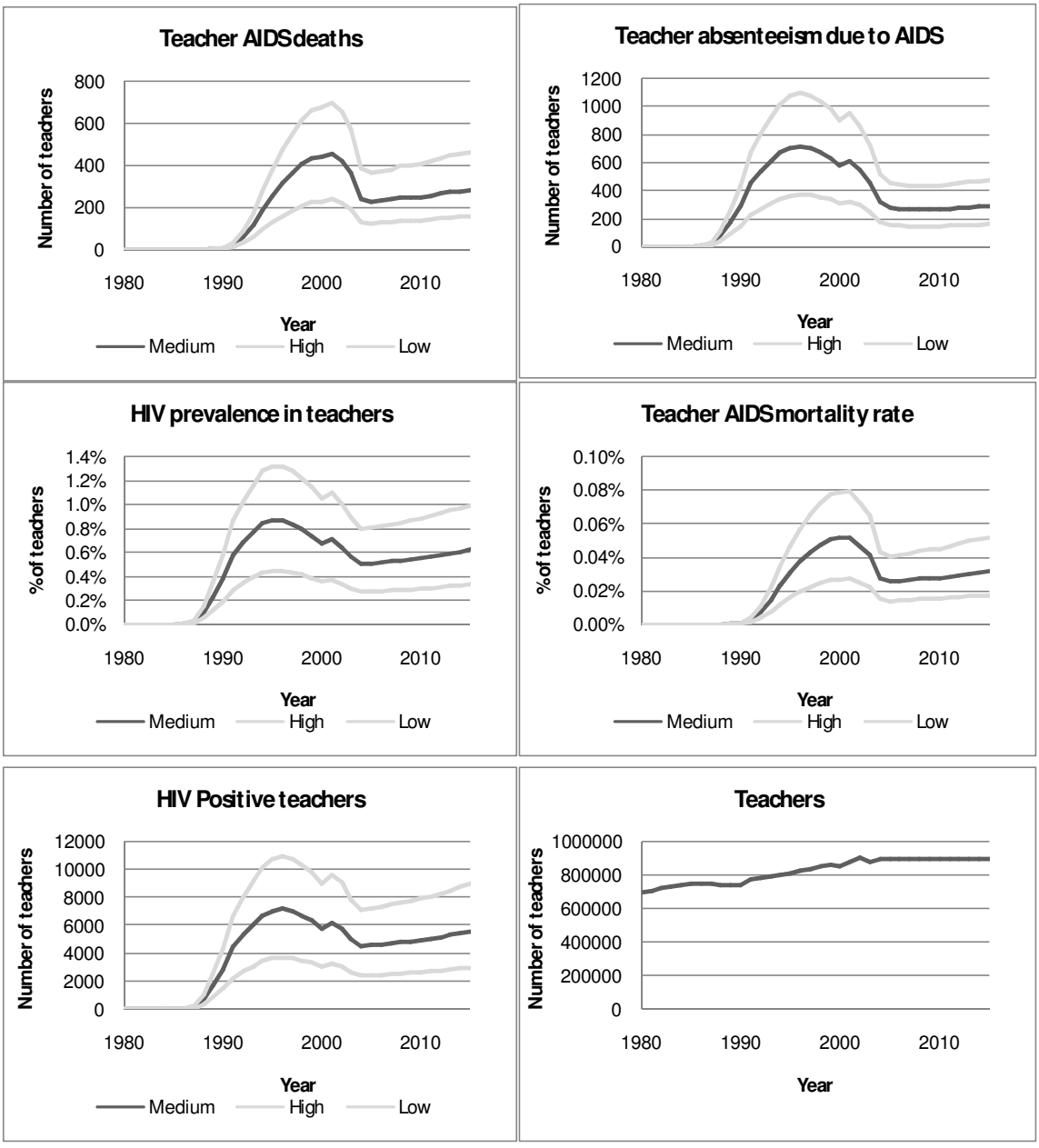
Summing by region

The individual country results were summed to provide regional results. An analysis was performed for each of a total of 53 countries covering three regions: in sub-Saharan Africa (41 countries), the Caribbean (8 countries) and the Greater Mekong sub-region in Asia (5 countries).

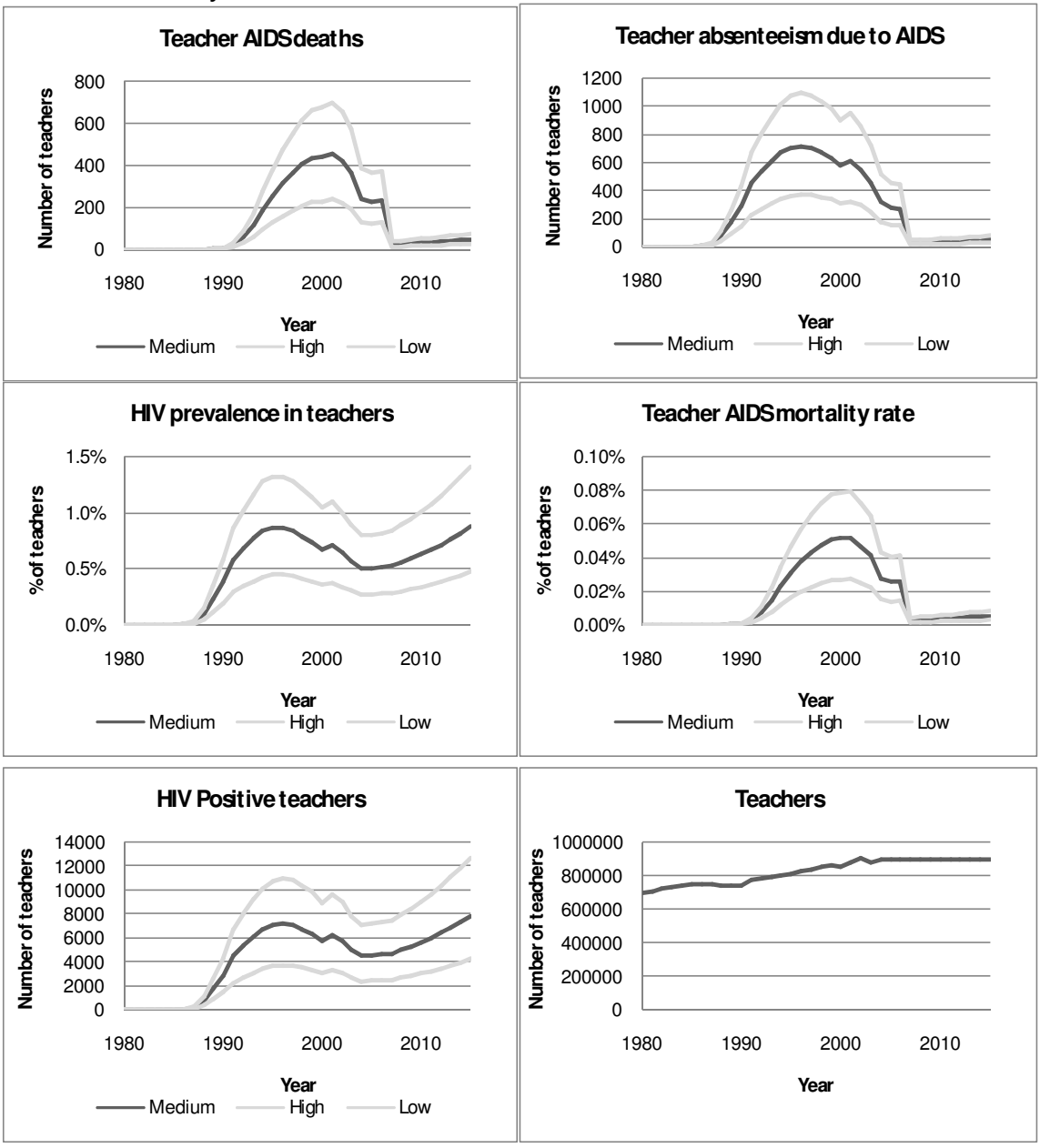
The Annex shows the data used for each country. Wherever possible country-specific data were used. Where data were unavailable for one country for a particular input, averaged data were used. Africa was divided into sub-regions based on HIV & AIDS prevalence, whereas the Caribbean and South-East Asia were treated as regions. Numerical data were scaled on population size, whereas financial data were scaled on GDP and expressed in 2007 US$. GDP was not converted using PPP, as an absolute, rather than relative, cost is required.

Results

South-East Asian countries, ART remains at current levels

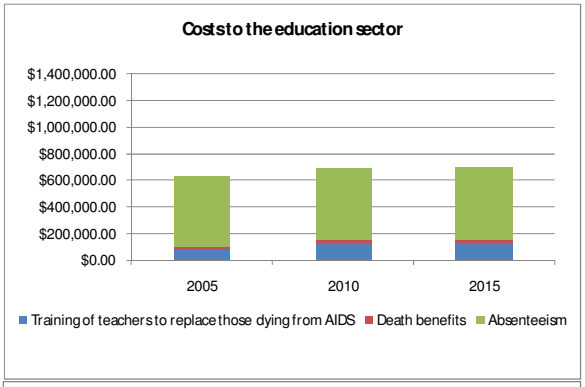


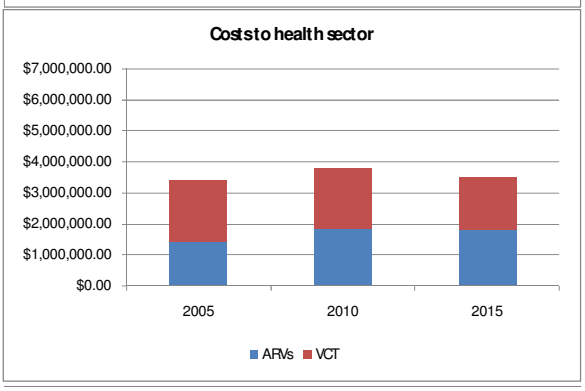
South-East Asian countries
ART immediately increased to all



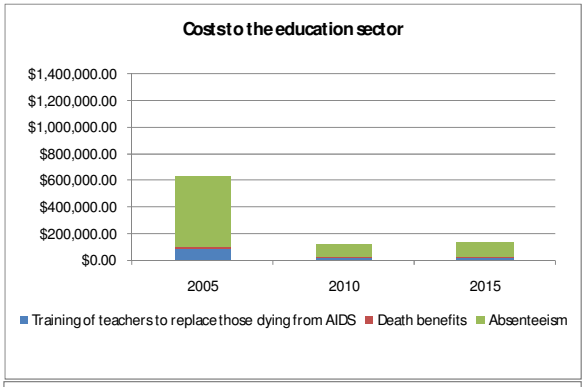
South-East Asian countries, some costs of HIV to the to health and education sectors of the impact of HIV on education

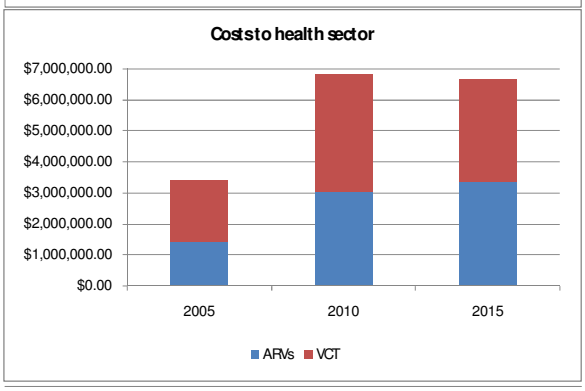
ART maintained at current levels between now and 2015



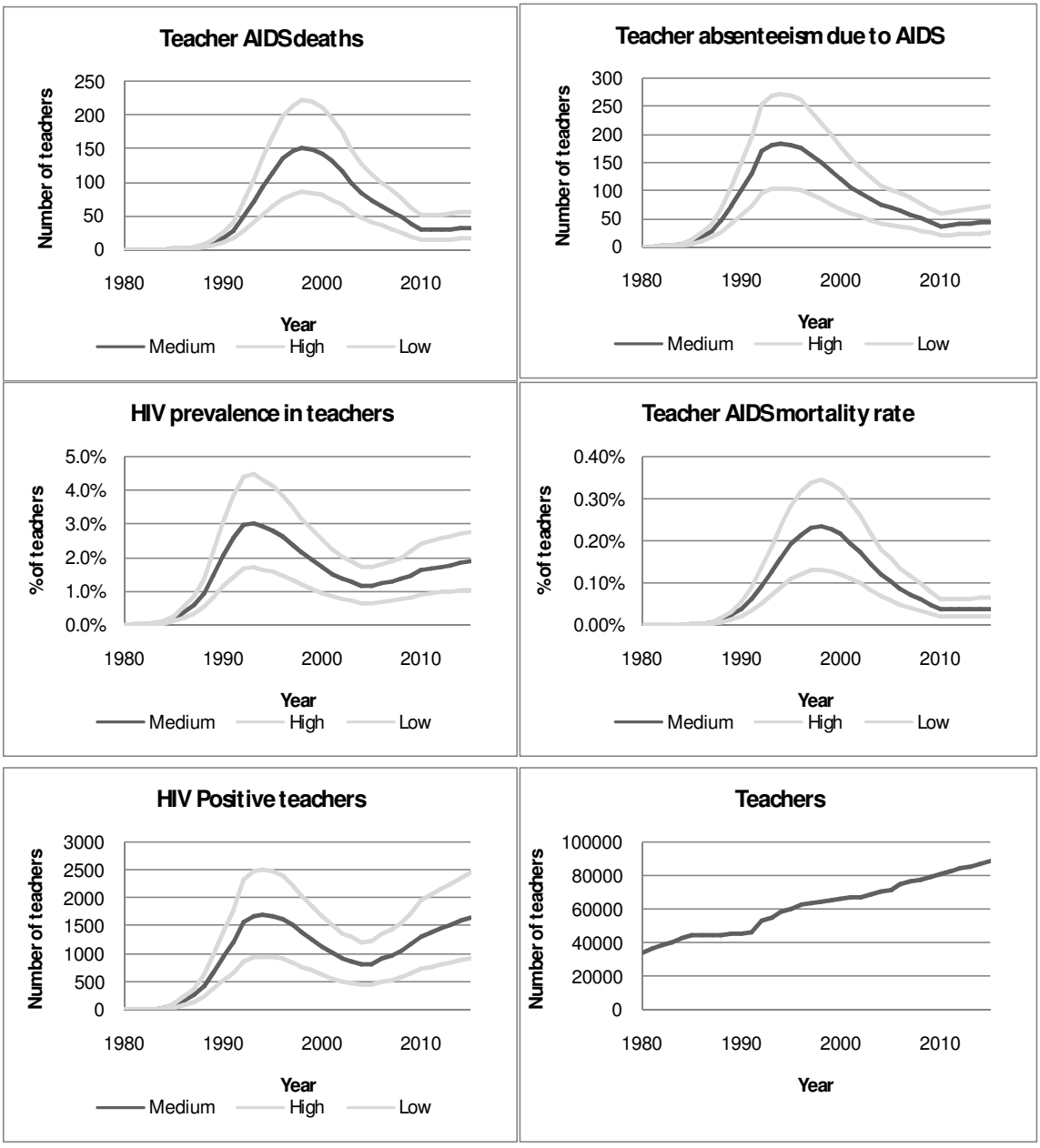


ART immediately increased to enable access for all teachers who need it

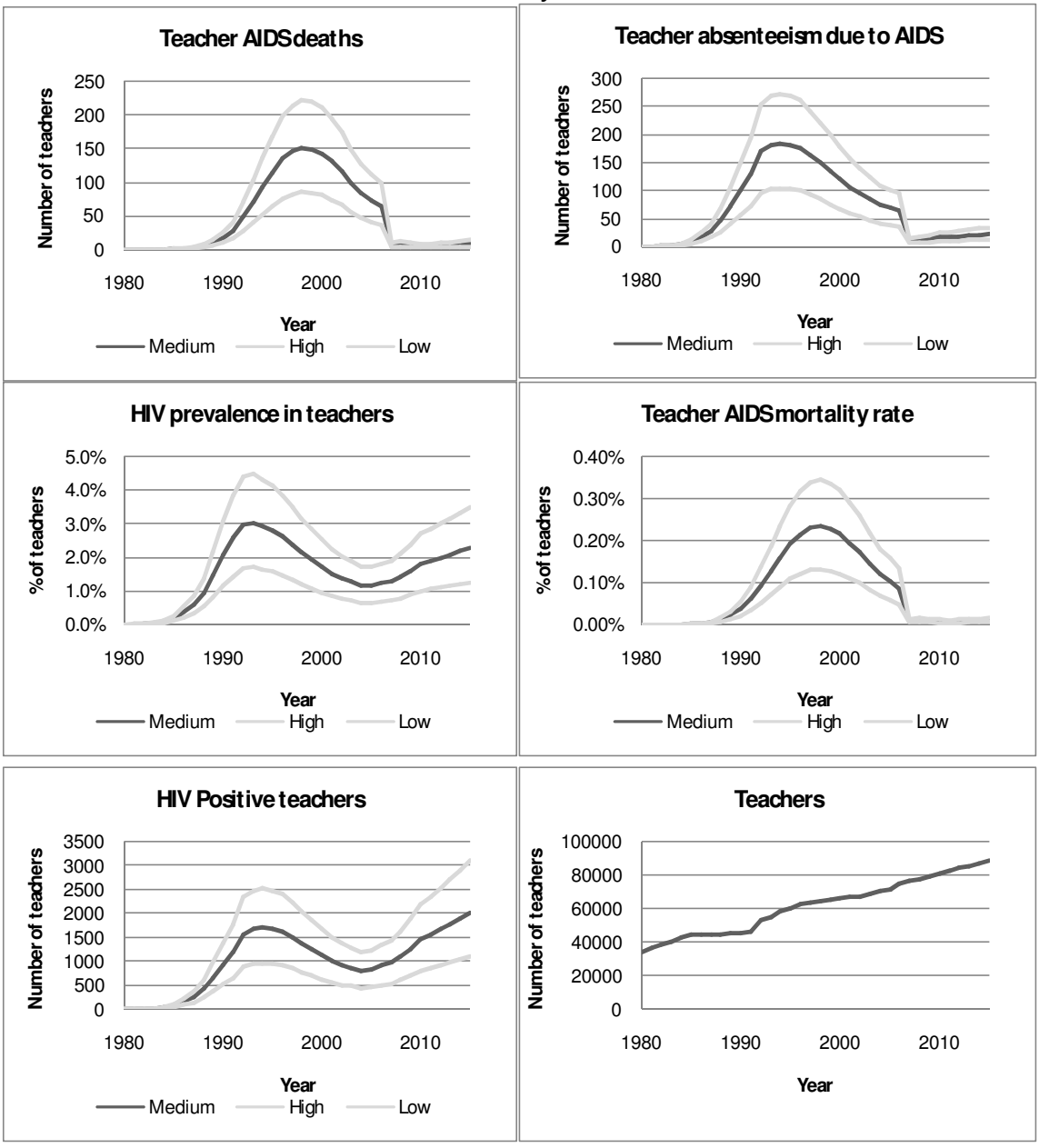




Caribbean countries, ART at current levels



Caribbean countries, ART use immediately increased to all those who need it



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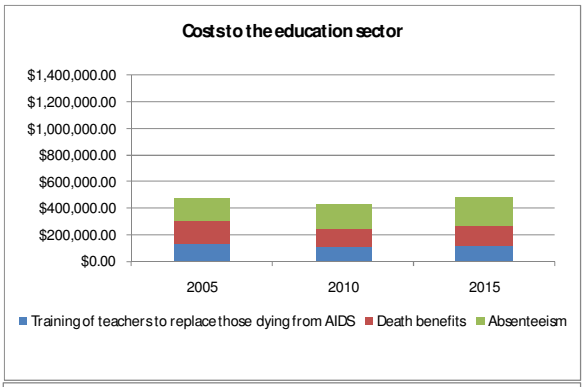

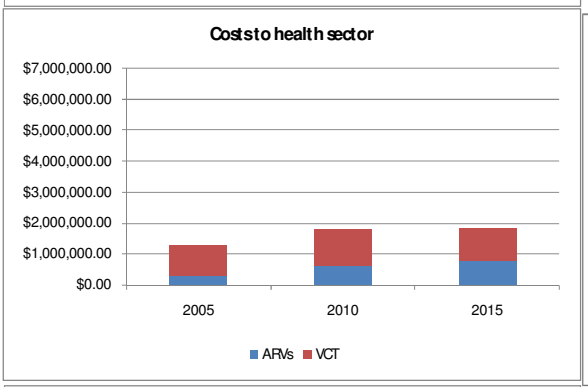

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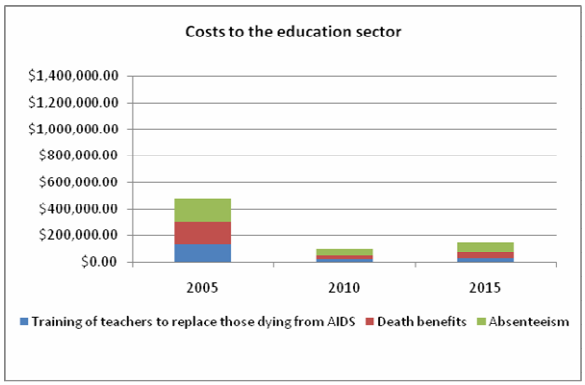
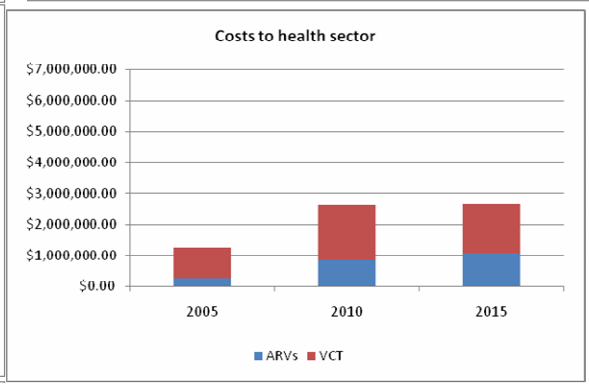
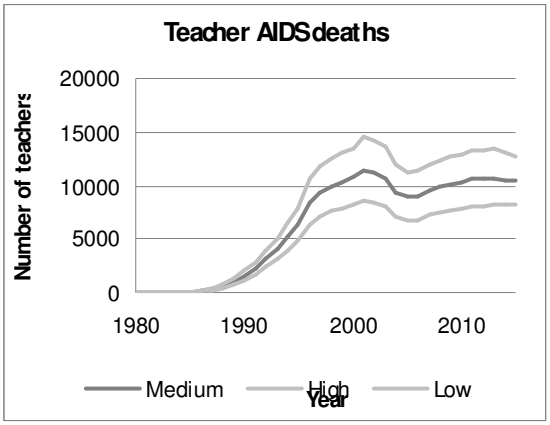
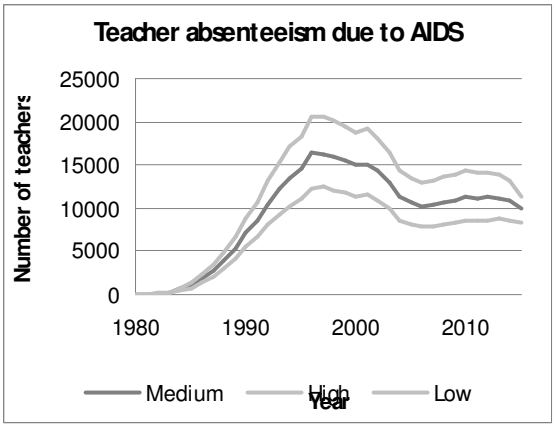
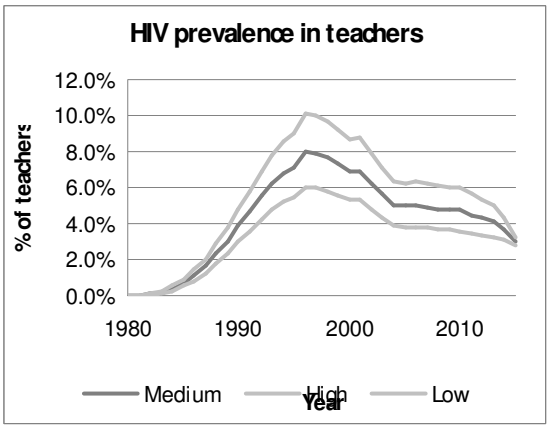


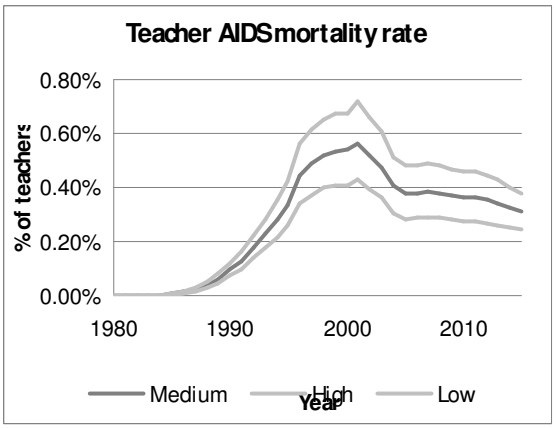


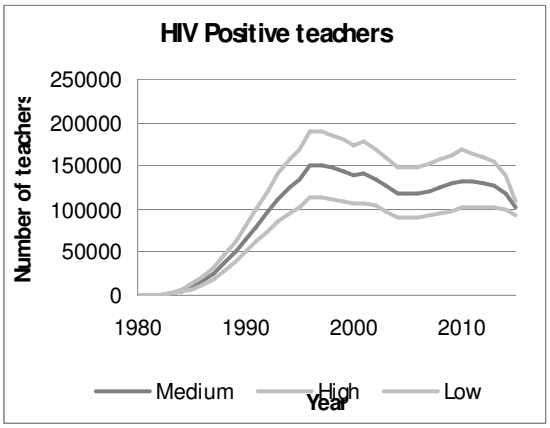
Sub-Saharan African countries, ART at current levels

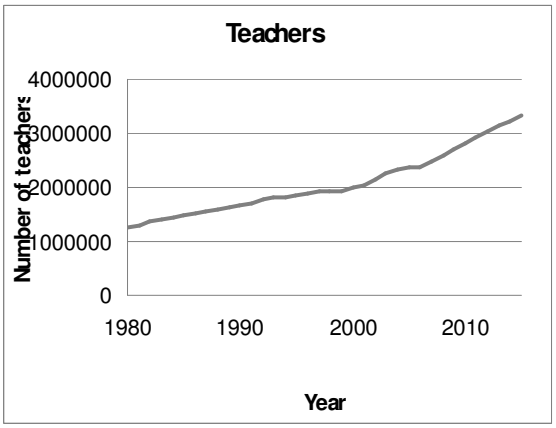




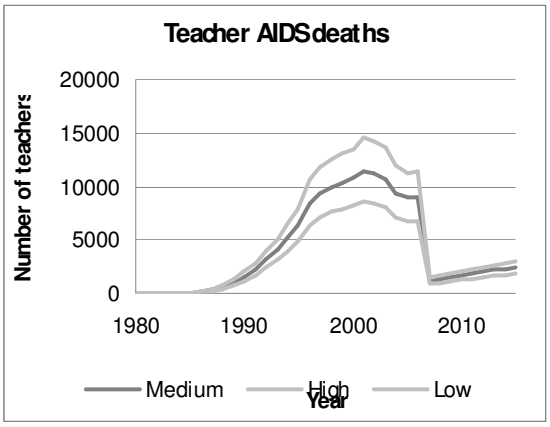


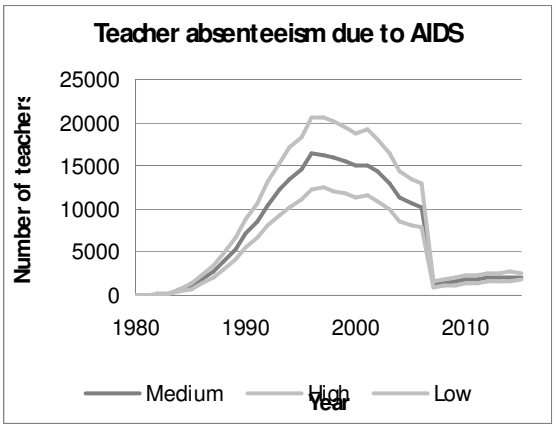


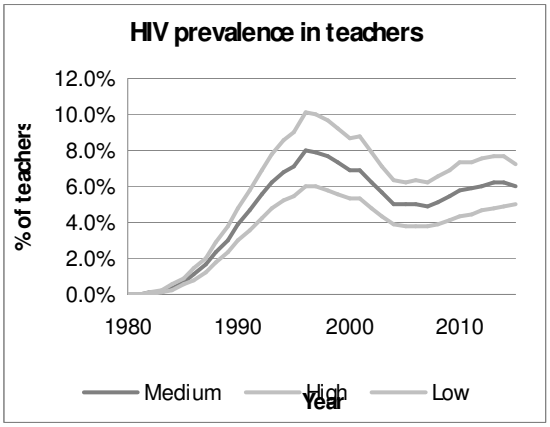


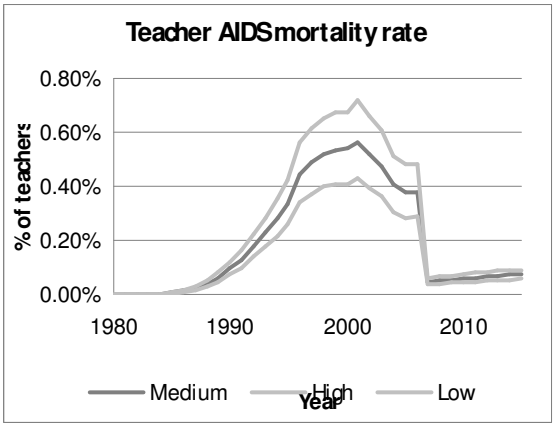


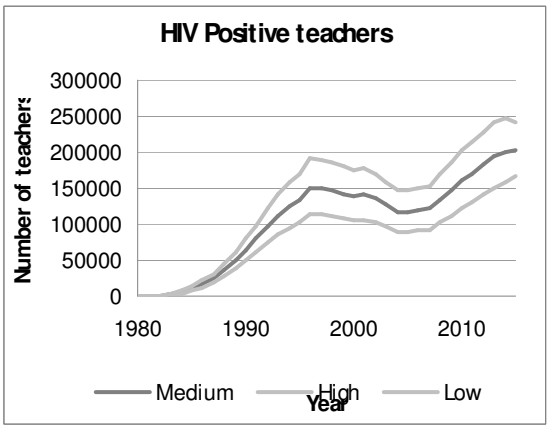
Sub-Saharan Africa, ART use immediately increased to enable access for all teachers requiring it

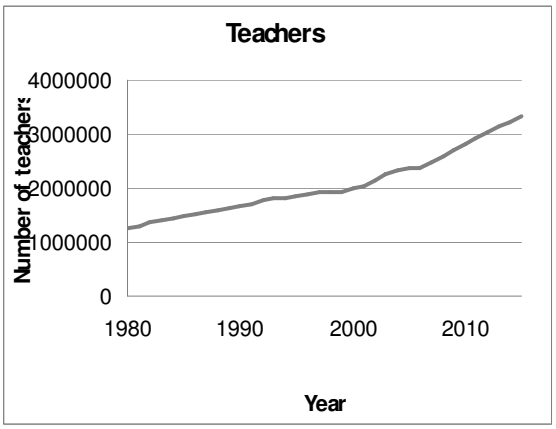












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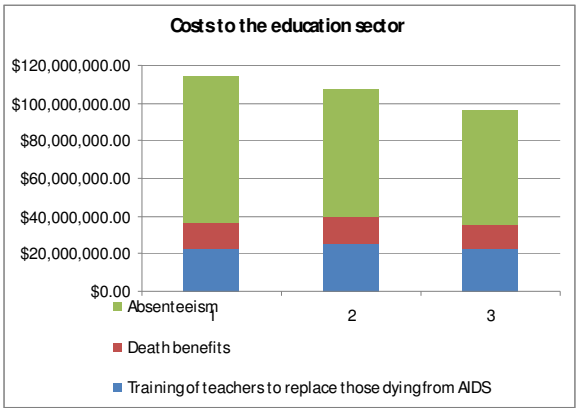

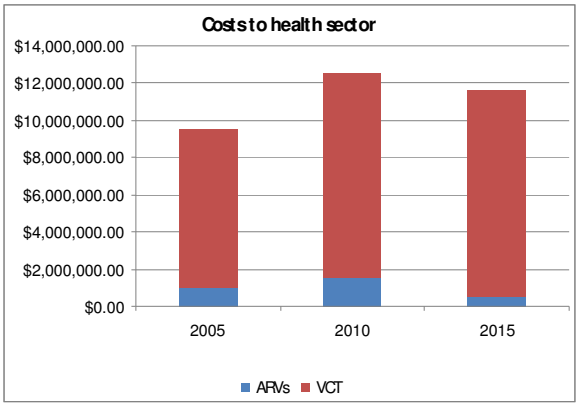

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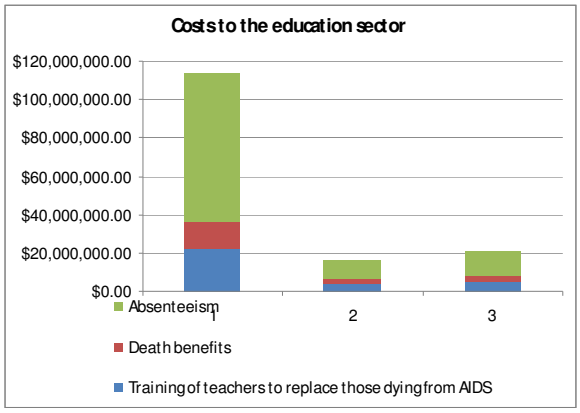

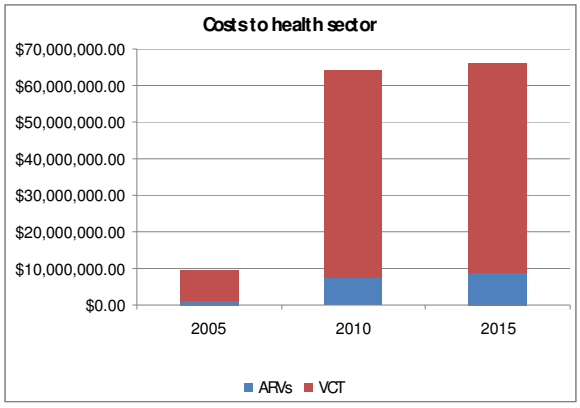

Discussion

Impact on Teacher Numbers

Teacher numbers are generally too low and PTRs generally too high in those countries which are furthest from attaining the UPE goal (2006 EFA Global Monitoring Report), and projections for high-PTR countries indicate that, quite independently of HIV, a major teacher shortage is looming, particularly in sub-Saharan Africa (Motivans, 2005). In much of Africa, the historical growth in teacher numbers between 1998 and 2002 would be insufficient for most countries to reach a PTR of 1:40 by 2015, even with the current low student enrolment ratios. To achieve UPE, growth rates in teacher numbers above 9% per year would be needed in several countries, and in some countries greater than 20%; rates which are probably impossibly high.

Table 2. Achieving education for all: extra recruitment of teachers required under each treatment scenario to reduce PTRs to 40:1 while net enrolment is increased to 100%. Also displayed is the substitute teachers needed to be recruited to replace teachers who are off sick as a result of AIDS illnesses, as a percentage of the teacher workforce. Unlike the other results presented in this study, this is not done country by country; the extra teachers who are kept alive in scenario 2 are assumed to be able to provide their services in any country in the continent.

	Sub-Saharan Africa	**Caribbean**	**South-East Asia**
ART at current levels: Additional recruitment required in order to achieve EFA between 2007 and 2015[1]	4.4%	2.2%	0%
ART taken by all teachers requiring it: Additional recruitment required in order to achieve EFA between 2007 and 2015[1]	0.2%	1.3%	0%
Substitute teachers that needed to be trained as a result of AIDS absences as a % of all teachers[2]	1.0%	0.3%	0.1%

[1]Denominator = total recruitment from 2007-2015

[2](sum over all countries of the maximum number of substitute teachers required in any one year) / (number of teachers in 2000)

Table 2 shows estimates of the extra recruitment effort required to achieve EFA, under the two treatment scenarios. In sub-Saharan Africa, the effect of increasing treatment access is to reduce the extra recruitment effort required from 4.4% to just 0.2%. An additional 1% of the teaching workforce in sub-Saharan Africa should be trained as substitute teachers if the classes during which teachers are absent due to AIDS illnesses are to be covered. The corresponding impacts of HIV on the achievement of EFA are less in the Caribbean and are irrelevant in South-East Asia, where the EFA goals are likely to be achieved despite any impact of HIV.

Since the 1990s, it has been recognized that the HIV & AIDS pandemic is likely to exacerbate the issue of teacher shortages, particularly for sub-Saharan Africa (Kelly). Early sectoral strategy and policy papers on HIV &AIDS and education highlighted this issue (UNESCO, 2001, 2005; World Bank, 2002), but there has been some controversy about the impact of HIV & AIIDS on education system staffing, reflecting different sources of data on teacher mortality (Bennell, 2002; Boler, 2003; Kinghorn and Kelly, 2005). Subsequent work has shown that HIV & AIDS related mortality rates on the scale used here – less than 1.0% - can have significant consequences for teacher numbers (Desai and Jukes, 2005: Carr-Hill, 2004) and are in the range of empirical estimates (Bennell, 2005). Furthermore it is now recognised that successful efforts to provide universal access to care, treatment and support have significantly reduced teacher mortality in some counties, such as Botswana (Bennell, 2006).

The debilitating illness that generally precedes death from AIDS implies loss, of teacher contact time, quality, continuity and experience (Badcock.Walters et al, 2003). This has been recognized in previous analyses (Grant et al, 2004; Carr-Hill 2004; Desai and Jukes, 2005) and was shown by Grassly et al (2003) to be a potentially larger economic drain on the sector than the cost of recruitment and replacement of teachers resulting from AIDS-related mortality. The present analyses support this conclusion for all three regions examined. It is not known to what extent the impact of HIV&AIDS contributed to the high rates of absenteeism observed in the two most widely cited school surveys that examined teacher absenteeism (Schleicher, Siniscalco and Postlethwaite 1995; World Bank, 2004). The high cost of absenteeism reflects the cost of paying a salary for both the absent teacher and for a substitute teacher. In the regions described here, substitution for absent teachers is commonly practiced in the Caribbean and South East Asia, but is uncommon in sub-Saharan Africa, where the most common result of an absent teacher is no teaching for that class. This obviously has major implications for education cost and quality, but these could not be explored here.

Table 2 above shows the percentage recruitment of teachers required to achieve EFA or maintain UPE, and that required to replace those dying of AIDS illnesses. The two ART scenarios for sub-Saharan Africa provide contrasting conclusions. At present it is estimated that HIV is adding an additional 4.4% a year to recruitment needs, and if ART access is maintained at current levels then, on average, an additional 5.1% a year will be required between 2007 and 2015. Given that recruitment needs are already unlikely to be met Motivans, 2005), this may prove an intolerable extra burden. Achieving universal ART access for teachers would reduce the scale of the problem: only 0.9% more teachers would need to be recruited between now and 2015 if all teachers requiring it were taking ART during this time.

Epidemiology

The epidemiological results explored here suggest some optimism. In all three regions the UNAIDS model outputs indicate that prevalence of HIV infection peaked in the mid 1990s, and thus the estimated number of infected teachers has declined even though the total number of teachers has increased. Furthermore, for those teachers who are infected there is increased access to care and support, including ART. Access is reportedly greatest in the Caribbean, but increasing in sub-Saharan Africa. The estimates indicate that the number of teacher deaths, the mortality rate of teachers and the rate of teacher absenteeism in all three regions are lower now than in the mid 1990s.

The projections, which explore the epidemiological patterns to 2015, are based on two scenarios of access to ART. The first assumes that current levels of ART are maintained but not increased. This implies: almost universal access in the Caribbean; somewhat less access in South-East Asia, with its small but growing epidemic; and low levels of access in sub-Saharan Africa combined with a still significant epidemic. The projections suggest that if there continues to be effective coverage with ART in the Caribbean there will be a sustained decline in the number of teacher deaths, the mortality rate of teachers and the rate of teacher absenteeism. For Africa and South-East Asia these measures are projected to remain at approximately current levels and may increase.

The second scenario assumes that universal access to care and support, including treatment, is achieved immediately. In all three regions this is projected to result in a significant and rapid decline in death, mortality and absenteeism. Note that the underlying prevalence of HIV and the number of teachers infected will rise during this period when the impact is declining because it is the disease that is being managed and not the infection that is being prevented. Thus ART causes an increase in potentially vulnerable teachers and improvements in care and support systems may need to be instituted or improved to cope with the needs of this increasingly HIV positive population of teachers.

Costs

The estimated costs in 2007 of providing VCT and ART at current coverage in the different regions (Table 3) suggest that the highest investment is in Africa, then South East Asia and then the Caribbean. If these costs are scaled per teacher, they suggest a rather different picture, with both Africa and Greater Mekong spending some $5.00 per teacher and the Caribbean $21.5. This reflects both the greater costs in the Caribbean and the greater access. Note that the per capita costs scale with population for VCT, since all teachers are eligible for testing, but the cost of treatment scales with prevalence.

The results of the projections show that in all three regions the costs to the education sector are lower under scenario two, which assumes increased ART coverage. In both Africa and South-East Asia the reduction in additional costs of teacher supply attributed to HIV &AIDS is some 80% if there is universal access to VCT and ART. In the Caribbean the reduction is slightly less at 60%, largely because access is already high. These results suggest that in addition to the social and moral arguments, Ministries of Education have much to gain economically from encouraging their teachers to take full advantage of VCT and ART.

Table 3: Tabulated costs of HIV to the to health and education sectors of the impact of HIV on education

	South-East Asia medium scenario x1000 US$			**Caribbean medium scenario x1000 US$**			**Sub-Saharan Africa medium scenario x1000 US$**		
		ART at current levels	ART at 100%		ART at current levels	ART at 100%		ART at current levels	ART at 100%
	2006	2015	2015	2006	2015	2015	2006	2015	2015
Ministry of Education:									
Training new teachers to replace AIDS deaths	$101	$128	$24	$131	$118	$30	$23,430	$22,697	$5,348
Funeral costs	$20	$25	$5	$166	$152	$42	$13,730	$12,835	$3,082
Covering teachers absent due to AIDS illnesses	$540	$545	$108	$168	$208	$74	$74,236	$61,239	$13,234
Ministry of Health:									
ART	$1,582	$1,821	$3,366	$376	$743	$1,071	$1,250	$550	$8,672
VCT	$2,148	$1,665	$3,289	$1,078	$1,075	$1,608	$10,289	$11,125	$57,214
Total saving 2007-2015 to MoE of increasing ART and VCT use	$7,265			$4,595			$1,059,091		
Total cost of increasing ART between 2007-2015	$11,217			$2,207			$59,401		
Total cost of increasing VCT between 2007-2015	$16,530			$5,559			$411,641		

In the case of Africa, the high impact of HIV &AIDS and the relatively low baseline coverage of VCT and ART, conspire to make the interventions cost effective on the basis of the return to education alone. The projected cost of increased coverage between 2007-2015 is $470 million and this is estimated to result in a reduction in

HIV-related teacher supply costs of$1.06 billion. This suggests a return of 2.24 on the dollar, ignoring the additional and important health and social returns.

In the Caribbean, current levels of coverage are already relatively high, and teachers relatively few and well supported with treatment. In this region the move from current coverage to universal coverage requires an investment of only $7.8 million. But because the impact of HIV & AIDS on supply is already partially addressed, the reduction in HIV-related supply costs between 2007-2015 is estimated at only $4.6 million, suggesting an unfavorable return of 0.59. It should be noted, however, that the saving to the education sector given universal access to ART and VCT is enough to fund provision of the required drugs to all teachers.

In South-East Asia, the estimated HIV prevalence in teachers is low and ART coverage likewise. By 2015 the estimated increase in prevalence among teachers is modest, but the cost of universal access will be relatively high at $28 million, largely due to the fixed cost of VCT for the almost one million teachers. The reduction on HIV-related supply costs are estimated at $7.3 million which, due to the high fixed costs to the health sector, translates into a return of only 0.26.

The encouraging outcomes of scenario 2 are associated with significant costs to the health sector. It might be argued that these are sunk costs intended to save lives, reduce morbidity, and increase the quality of life, and that the benefits in terms of education are valuable additional consequences that may make teachers particularly important and cost-effective recipients for these health interventions.

The costs for which estimates can be made most readily are teacher training, absenteeism costs (salary) and ART. The cost of death benefits will probably vary greatly between countries depending on policy. Costs incurred by an in-service teacher death may be substantially more in countries which can afford greater payments. For example, in Guyana, the family of a teacher who has died receive at least one year's salary from the Ministry of Education on death, whereas many African countries have no policy of providing death benefit. Including the real costs incurred by the Ministries of Education in each country would increase the cost-effectiveness of ART provision in the Caribbean and South-East Asia. The per-person cost of VCT is likely to decrease with the scale of VCT provision. Unit costs will probably decrease over time, thus making testing more cost-effective than it currently is. In addition to the relative cost-effectiveness gain due to increased death benefits in high-income countries, the Caribbean and South-East Asia are likely to scale- up VCT faster, which will also increase cost-effectiveness.

It is also important to note that the epidemiological and economic patterns described here do not assume any specific prevention intervention. The costs estimated here are those for managing rather than controlling the epidemic, and so the projected costs will continue, all else being equal.

Previous estimates

There have been surprisingly few previous attempts to estimate the incremental costs of HIV & AIDS for achieving EFA, and only two which have sought to provide a regional perspective. Both of these are for sub-Saharan Africa and both were first published in the 2002 EFA Global Monitoring Report, though one was published subsequently in a different form (Bruns, Mingat and Rakotomalala, 2003). These two early studies both attempted a comprehensive estimate of costs, including the costs of prevention programs and support for affected children. The EFA-GMR estimate is $975million per year, of which $350 million is to address the supply side issues, replacement of teachers ($150 million) and temporary teachers ($150 million). The methodology for deriving these estimates is not presented, nor the specific countries covered. The Bruns et al (2003) estimate is $287 million per year for 33 countries in sub-Saharan Africa, including those worst affected by HIV & AIDS. This estimate includes the supply side issues, but also an element for support of orphans. The analysis was based on an economic model and it is not possible to separate out the supply side costs only from the published data. However, since the demand side support was specifically for orphans and did not extend to vulnerable children who were not actually orphaned, the additional amount may not be substantial.

Both these earlier estimates are more than twice the current estimate of $111million for sub-Saharan Africa. This probably reflects three factors. First, the current estimates are based on some 5 more years of understanding of the HIV & AIDS epidemic, and of its impact on education in particular. For example, the earlier studies assumed that infection prevalence was the same in teachers as in the general population, but we now know from detailed studies in South Africa that teachers have lower levels of infection. Second, the new estimates are based on the UNAIDS revised estimates of prevalence, most of which were revised downwards significantly (Brown et al 2006). Finally, the epidemic peaked in most of these countries in the late 1990s, and estimates from the early part of this decade would have assumed a greater ongoing impact of HIV & AIDS than is actually apparent today.

Interestingly, neither of the 2002 estimates included any assumptions about testing or treating teachers. It is a testament to rapid progress made since then that current policy assumes that treatment access should be universal. For sub-Saharan Africa this policy adds an estimated $11 million to the 2006 costs, and the projections suggest that this cost will rise to some $66 million by 2015 if universal access is achieved.

The Broader Context

This study focuses on the impact of HIV &AIDS on education supply specifically, and does not attempt to estimate all costs of the epidemic to the education sector. There

are two main areas which are not examined here but would add significantly to the economic impact of HIV &AIDS on the education sector. The first of these is the need to provide specific support to orphans and other children made vulnerable by HIV & AIDS so that they can have access to schooling and remain in school long enough to complete an education. These costs may address tuition fees, local school levies and uniform purchase, but may also need to cover social support and basic living expenses. With the numbers of such children in sub-Saharan Africa estimated to rise to 50 million by 2010 (UNICEF, 2005) these costs are likely to be substantial. The second major cost omitted is the investment in prevention efforts by the education sector. The sector is a natural conduit for prevention efforts since it not only has the greatest direct, ongoing contact with children and youth in most countries, but also provides access to what is often more than 50% of the public sector workforce. Prevention requires costs for curricular efforts, such as appropriate training of teachers and provision of teaching materials, and for co-curricular efforts, such as peer counseling and peer education. While the curricular costs may be at the margins of education costs generally, provision of teaching materials and in-service teacher training may represent substantial additional investments.

The third MDG target of gender equality in education by 2005 was missed, and the target of gender equity by 2015 looks unlikely to be met on the current trajectory (UNGEI, 2006). Gender is a critical element of both education and the HIV &AIDS response. In the present analyses gender is addressed specifically in terms of the input data, which are segregated to reflect the marked age- and gender-dependency of HIV infection. However, there are other almost certainly important gender-related factors that were not addressed through lack of data. For example, we do not know whether absenteeism is more likely to affect female teachers because of their care giving roles, nor whether care, support and treatment are more accessible to male teachers. Research in these areas would be of practical value since a more gendered analysis would allow for a more targeted response.

Conclusions

The key conclusions of these analyses are:

With current levels of ART coverage of teachers in sub-Saharan Africa, an additional 5.1% recruitment of teachers may be required between 2007 and 2015 to meet EFA goals. The requirement would be reduced to 0.2% by universal access to treatment, care and support.

The 2006 estimates of the cost of HIV for education supply are lower than the 2002 estimates, reflecting the lower prevalence of infection and a better understanding of the impact of HIV on the sector.

Total costs due to HIV in the education sector have however increased if the costs of VCT and ART are included.

Universal access by teachers to VCT and ART is beneficial to education supply in all the three regions assessed.

In the Caribbean, the saving to the education sector of ART provision to all teachers requiring it could fund the drugs to treat them (but not universal VCT).

In sub-Saharan Africa, where the impact of HIV is greatest, the investment in universal access to both ART and VCT is cost-effective on the returns to education supply alone.

References and publications

Amone, J. and Bukuluki, P. (2004) Examining the impact of HIV/AIDS on governance in the education sector Study 2 of The Impact of HIV/AIDS on the Education Sector in Uganda IIEP-UNESCO

Badcock-Walters, P. et al. 2003. Educator mortality in-service in KwaZulu Natal: A consolidated study of HIV/AIDS impact and trends. Paper presented at the Demographic and Socio-Economic Conference, Durban, South Africa.

Barnett, T and Whiteside, A. 2000. Guidelines for studies of the social and economic impact of HIV/AIDS. Geneva, Switzerland: UNAIDS.

Braitstein P , Brinkhof MW, Dabis F, Schechter M, et al (2006) Mortality of HIV-1-infected patients in the first year of antiretroviral therapy: comparison between low-income and high-income countries. Lancet.;367:817-24.

Bray, M. (ed.) 1991. Ministries of education in small states: Case studies of organisation and management. London: The Commonwealth Secretariat.

Bray, M. 1992. Educational planning in small countries. Paris: UNESCO.

Brown T, Grassly NC, Garnett G, et al. 2006 Improving projections at the country level: the UNAIDS Estimation and Projection Package 2005. Sex Transm Infect;82(Suppl 3):iii34–40.

CAREC. 2004. Status and trends: analysis of the Caribbean HIV/AIDS epidemic 1982–2002. Caribbean Epidemiology Centre. Accessible at http://carec.org/pdf/status_trends.pdf

Chawani, B.S. and Kadzamira, E (2004) Examining the impact of HIV/AIDS on governance in the education sector Study 2 of The Impact of HIV/AIDS on the Education Sector in Malawi IIEP-UNESCO

Collaborative group (2000) Time from HIV-1 seroconversion to AIDS and death before widespread use of highly-active antiretroviral therapy: a collaborative re-analysis. Lancet , 355, 1131-1137

Commonwealth Secretariat.1997. A future for small states. Overcoming vulnerability. London: Commonwealth Secretariat.

Desai, K. and Jukes, M. (2006) The impact of HIV/AIDS on education systems in five countries of sub-Saharan Africa Box 3.6, in Chapter 3, Education for all global monitoring report, UNESCO, 2006. http://portal.unesco.org/education/en/ev.php-URL_ID=43283&URL_DO=DO_TOPIC&URL_SECTION=201.html. Details of analysis in supporting material: http://portal.unesco.org/education/en/file_download.php/460d0d65194658487a9b3314b6f9958fJukes,+M.+Desai,+K.+Education+and+HIV+AIDS+Supporting+materi.doc

Fitzgerald, J. and Gomez, B. 2003. An open competition model for regional price negotiations yields lowest ARV prices in the Americas. In International proceedings of the 8th World STI/AIDS Congress. Bologna, Italy: Medimond.

Grassly NC; Desai K; Pegurri E; Sikazwe A; Malambo I; Siamatowe C; Bundy D. (2003) The economic impact of HIV/AIDS on the education sector in Zambia. AIDS. 17: 1039-1044

ILO and UNESCO. 2006. An HIV/AIDS workplace policy for the education sector in the Caribbean. Port of Spain: ILO and UNESCO. Accessible at http://www.ilo.org/public/english/dialogue/sector/papers/education/carib-ed-policy.pdf

Kelly, M. 2000. Planning for Education in the Context of HIV/AIDS. Paris: IIEP-UNESCO.

Kelly, M. and Bain, B. 2005. Education and HIV/AIDS in the Caribbean. Kingston: Ian Randle Publishers.

Kinghorn and Kelly, 2005: "'The Impact of the Aids Epidemic' Articles by Paul Bennell: Some Comments" The Journal of Development Studies, Vol.41, No.3, pp.489 – 499

Lewin K.M., Keller, C. and Taylor, E. 2000, revised 2002. Teacher education in Trinidad and Tobago: Costs, financing and future policy. Multi-Site Teacher Education Research Project (MUSTER) Discussion Paper No. 9. Brighton, UK: Centre for International Education, University of Sussex.

Lopman BA; Barnabas R; Hallett TB; Nyamukapa C; Mundandi C; Mushati P; Garnett GP; Gregson S. (2006) Assessing adult mortality in HIV-1-afflicted Zimbabwe (1998-2003) B WORLD HEALTH ORGAN. 84: 189-197

Michelo, Charles Sandøyb, Ingvild F. and Fylkesnes, Knut (2006) Marked HIV prevalence declines in higher educated young people: evidence from population-based surveys (1995–2003) in Zambia AIDS, 20:1031–1038

Mobile Task Team (2005) Educator Attrition and Mortality in South Africa retrieved 17/10/16 from http://hivaidsclearinghouse.unesco.org/ev_en.php?ID=5224_201&ID2=DO_TOPIC

Paul Bennell, 2005, Countering the impact of the aids epidemic on the education sector In Swaziland. Knowledge and Skills for Development, Brighton.

Shaeffer, S.1994. The impact of HIV on education systems. In Pridmore, P. and Chase, E. (eds) AIDS as an educational issue. DICE Occasional Papers No. 12. London: Institute of Education, University of London.

Shisana, Olive Peltzer, Karl Zungu-Dirwayi, Nompumelelo and Louw, Julia (2005) The Health of Our Educators: A focus on HIV/AIDS in South African public schools accessed October 2006 from http://www.hsrcpress.ac.za/freedownload.asp?id=2082

UNAIDS Inter Agency Task Team on Education. 2004. HIV/AIDS and education: The role of education in the protection, care and support of orphans and vulnerable children in a world with HIV and AIDS. Paris: IATT.

UNAIDS. 2004. Country fact sheets available at http://data.unaids.org/Publications/Fact-Sheets01

UNAIDS. 2006. Report on the global AIDS epidemic available at www.unaids.org/en/HIV_data

Urassa M., J.T. Boerma, R. Isingo, J.Ngalula, J. Ng'weshemi, G. Mwaluko, B. Zaba. The impact of HIV/AIDS on mortality and household mobility in rural Tanzania. AIDS. 2001 15:2017-23

USAID, UNAIDS and UNICEF. 2004. Children on the Brink 2004: A joint report of new orphan estimates and a framework for action. New York.

Wood, E Montanera, J. S.G. Chana, K, Tyndall, M.W. et al. Socioeconomic status, access to triple therapy, and survival from HIV-disease since 1996 AIDS 2002, 16:2065–2072

World Bank and Partnership for Child Development. 2001. Modeling the Impact of HIV/AIDS on Education Systems: A training manual. The Ed-SIDA initiative. Washington DC: World Bank. First edition.

World Bank and Partnership for Child Development. 2006. Modeling the Impact of HIV/AIDS on Education Systems: A training manual. The Ed-SIDA initiative. Washington DC: World Bank. Second edition.

World Bank. 2002. Education and HIV/AIDS: A window of hope. Washington DC: World Bank.

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Abbreviations:
AIDS: Acquired Immune Deficiency Syndrome
ART: Anti-Retroviral Therapy
CARICOM: Caribbean Community and Common Market
EFA: Education For All
GDP: Gross Domestic Product
GMR: Global Monitoring Report
HIV: Human Immunodeficiency Virus
MDG: Millennium Development Goals
MoE: Ministry of Education
OVC: Orphans and Vulnerable Children
PPP: Purchasing Power Parity
PTR: Pupil: Teacher Ratio
SSA: sub-Saharan Africa
TSC: Teacher Services Commission
TTI: Teacher Training Institute
UIS: UNESCO Institute for Statistics
UNESCO: United Nations Education Scientific and Cultural Organisation
UPE: Universal Primary Education
VCT: Voluntary Counselling and Testing
WHO: World Health Organisation

Appendix: values input into the model

Country	Angola	Benin	Botswana	BurkinaFaso	Burundi	Cameroon	CAR	Chad	Congo	Cotedlvoire	DRC	Eritrea	Ethiopia
Age and gender distribution of teachers[1]	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 30-34	F 25-29 M 35-39	F 30-34 M 30-34	F 25-29 M 35-39	F 30-34 M 30-34	F 25-29 M 35-39	F 30-34 M 30-34	F 25-29 M 35-39	F 30-34 M 40-44	F 30-34 M 40-44
Age and gender distribution of recruited teachers[1]	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 25-29	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 25-29	F 20-24 M 25-29
Age and gender distribution of teachers leaving[1]	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70
Number of teachers	32144	25583	12717	23402	18899	55266	4004	18510	7058	48308	162797	7942	110945
Female teachers	24%	19%	79%	28%	54%	40%	25%	10%	45%	24%	26%	40%	45%
Background attrition rate	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
School-age population	3552000	1810000	232000	2974000	1790000	2785000	728000	2260000	971000	3205000	13910000	970000	15402000
Net enrolment	53%	83%	82%	40%	57%	74%	53%	57%	79%	56%	61%	46%	56%
Gross enrolment	64%	99%	105%	53%	80%	117%	56%	80%	89%	72%	62%	64%	93%
Relative risk of teacher infection	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%
HIV prevalence (UNAIDS medium estimates for 2005)	4%	2%	24%	2%	3%	5%	11%	4%	5%	7%	3%	2%	2%
Probability of AIDS death in HIV positive women aged 30-34 in 2000	2%	1%	14%	1%	2%	3%	5%	1%	3%	2%	1%	2%	1%
Reduction in mortality due to ART	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Reduction in absences due to ART	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Proportion of HIV positive teachers needing ART	17%	19%	38%	23%	19%	19%	18%	19%	18%	25%	17%	17%	17%
Access to ART by those who need it	6%	27%	90%	80%	26%	26%	4%	27%	16%	15%	5%	6%	15%
Teacher salary	$3,196	$1,632	$3,765	$2,156	$614	$2,688	$1,206	$1,092	$3,473	$3,572	$12,000	$0	$888
Teacher training cost	$510	$2,031	$510	$2,031	$355	$2,031	$355	$2,031	$355	$2,031	$355	$355	$355
Death benefits	$1,314	$50	$1,314	$50	$259	$50	$259	$50	$259	$50	$259	$3,873	$3,873
Cost of ART	$1,200	$380	$156	$912	$330	$72	$1,000	$380	$400	$40	$348	$600	$360
Cost of VCT	$4	$14	$4	$14	$14	$14	$14	$14	$14	$14	$14	$29	$29

Countries in sub-Saharan Africa.

All data shown except where stated are from the most recent available year. Data were input into the model for all years available. Costs are given pre-scaling on GDP, and are expressed in US$, 2007 equivalent.

[1]Peak 5-year age band(s)

Country	Gabon	Gambia	Ghana	Guinea	GuineaBissau	Kenya	Lesotho	Liberia	Madagascar	Malawi	Mali	Mauritania	Mauritius	Mozambique
Age and gender distribution of teachers1	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 30-34	F 35-39 M 40-44	F 40-44 M 30-34	F 30-34 M 30-34	F 25-29 M 35-39	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 30-34	F 25-29 M 35-39	F 35-39 M 25-29
Age and gender distribution of recruited teachers1	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 25-29 M 25-29	F 25-29 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24
Age and gender distribution of teachers leaving1	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70
Number of teachers	7807	4666	89278	25361	3518	149893	9702	12966	64270	40587	26737	10652	5322	54721
Female teachers	45%	31%	31%	24%	20%	44%	80%	28%	60%	46%	28%	26%	63%	30%
Background attrition rate	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
School-age population	224000	275000	3686000	229972	381000	7355000	252000	786000	3760000	2809000	1760462	184769	110000	3791000
Net enrolment	77%	75%	65%	64%	45%	76%	86%	66%	89%	95%	47%	74%	95%	71%
Gross enrolment	130%	81%	88%	79%	70%	111%	131%	99%	134%	125%	64%	94%	102%	95%
Relative risk of teacher infection	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%
HIV prevalence (UNAIDS medium estimates for 2005)	8%	2%	2%	2%	4%	6%	23%	4%	1%	14%	2%	1%	1%	16%
Probability of AIDS death in HIV positive women aged 30-34 in 2000	3%	1%	4%	1%	2%	7%	12%	2%	0%	7%	1%	0%	0%	6%
Reduction in mortality due to ART	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Reduction in absences due to ART	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Proportion of HIV positive teachers needing ART	19%	17%	18%	18%	17%	20%	19%	17%	17%	20%	20%	19%	11%	19%
Access to ART by those who need it	22%	5%	8%	14%	1%	25%	17%	5%	0%	50%	34%	25%	100%	7%
Teacher salary	$0	$1,295	$1,057	$1,119	$236	$2,421	$3,792	$0	$806	$640	$1,590	$2,349	$2,383	$915
Teacher training cost	$2,031	$2,031	$2,031	$2,031	$2,031	$355	$510	$2,031	$355	$510	$2,031	$2,031	$355	$479
Death benefits	$50	$50	$50	$50	$50	$3,873	$1,314	$50	$259	$1,314	$50	$50	$259	$1,314
Cost of ART	$380	$380	$380	$100	$380	$80	$24	$380	$180	$250	$380	$380	$180	$140
Cost of VCT	$14	$14	$14	$14	$14	$27	$4	$14	$14	$4	$14	$14	$14	$4

Countries in sub-Saharan Africa.

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[1]Peak 5-year age band(s)

Country	Namibia	Niger	Nigeria	Rwanda	Senegal	SierraLeone	SouthAfrica	Swaziland	Tanzania	Togo	Uganda	Zambia	Zimbabwe
Age and gender distribution of teachers1	F 35-39 M 35-39	F 30-34 M 30-34	F 30-34 M 30-34	F 25-29 M 35-39	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 30-34	F 30-34 M 40-44	F 30-34 M 30-34	F 30-34 M 40-44	F 25-29 M 25-29	F 30-34 M 30-34
Age and gender distribution of recruited teachers1	F 25-29 M 25-29	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 25-29	F 20-24 M 25-29	F 20-24 M 20-24	F 20-24 M 25-29	F 20-24 M 25-29	F 20-24 M 20-24
Age and gender distribution of teachers leaving1	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70
Number of teachers	14442	22427	579802	28254	32005	17327	220950	6680	135013	22210	143247	46414	61251
Female teachers	61%	36%	51%	51%	24%	30%	74%	75%	48%	13%	39%	48%	51%
Background attrition rate	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
School-age population	301000	3414000	25668000	1789000	2206000	1100000	5949000	143000	6947000	1237000	7853000	2321000	1884000
Net enrolment	74%	39%	60%	73%	66%	41%	89%	77%	91%	79%	87%	80%	82%
Gross enrolment	101%	45%	99%	119%	76%	145%	105%	101%	106%	101%	118%	99%	96%
Relative risk of teacher infection	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%
HIV prevalence (UNAIDS medium estimates for 2005)	20%	1%	4%	3%	1%	2%	19%	33%	6%	3%	7%	17%	20%
Probability of AIDS death in HIV positive women aged 30-34 in 2000	8%	0%	1%	3%	0%	1%	7%	13%	4%	1%	4%	10%	13%
Reduction in mortality due to ART	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Reduction in absences due to ART	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Proportion of HIV positive teachers needing ART	28%	17%	18%	22%	20%	18%	18%	21%	17%	19%	19%	19%	17%
Access to ART by those who need it	66%	5%	9%	47%	40%	3%	25%	33%	10%	34%	45%	26%	7%
Teacher salary	$0	$1,679	$2,074	$1,065	$2,382	$957	$13,925	$2,869	$1,181	$1,196	$984	$964	$3,196
Teacher training cost	$510	$2,031	$2,031	$355	$2,031	$2,031	$510	$510	$311	$2,031	$355	$510	$510
Death benefits	$1,314	$50	$50	$259	$50	$50	$1,314	$1,314	$3,873	$50	$259	$176	$1,314
Cost of ART	$156	$380	$368	$400	$380	$380	$156	$175	$245	$380	$180	$480	$222
Cost of VCT	$4	$14	$14	$14	$14	$14	$4	$4	$29	$14	$14	$4	$4

Countries in sub-Saharan Africa.

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[1]Peak 5-year age band(s)

Country	Bahamas	Barbados	Haiti	Trinidad and Tobago	Belize	Guyana	Suriname	Jamaica	Cambodia	Viet Nam	Lao PDR	Thailand	Myanmar
Age and gender distribution of teachers	F 50-54 M 50-54	F 50-54 M 50-54	F 50-54 M 50-54	F 50-54 M 50-54	F 50-54 M 50-54	F 50-54 M 50-54	F 50-54 M 50-54	F 50-54 M 50-54	F 35-39 M 35-39	F 35-39 M 35-39	F 35-39 M 35-39	F 35-39 M 35-39	F 35-39 M 35-39
Age and gender distribution of recruited teachers	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 25-29	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 20-24	F 20-24 M 25-29	F 20-24 M 25-29	F 20-24 M 25-29	F 20-24 M 25-29	F 20-24 M 25-29
Age and gender distribution of teachers leaving	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70	F 50-70 M 50-70
Number of teachers	1756	1377	46827	7863	2157	4185	3361	12087	50186	362627	28150	298270	160110
Female teachers	88%	78%	33%	72%	72%	86%	92%	89%	41%	78%	45%	58%	81%
Background attrition rate	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
School-age population	36617	20550	1229406	129161	39592	88450	54670	345090	302176	9531000	155344	499800	485510
Net enrolment	91%	98%	22%	90%	94%	89%	94%	90%	98%	93%	84%	76%	90%
Gross enrolment	101%	108%	48%	100%	127%	132%	120%	95%	137%	98%	116%	97%	100%
Relative risk of teacher infection	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%
HIV prevalence (UNAIDS medium estimates for 2005)	3%	2%	4%	3%	3%	2%	2%	2%	2%	1%	0%	1%	1%
Probability of AIDS death in HIV positive women aged 40-44 in 2000	17%	6%	16%	7%	28%	14%	16%	3%	7%	2%	0%	7%	4%
Reduction in mortality due to ART	93%	93%	93%	93%	93%	93%	93%	93%	94%	94%	94%	94%	94%
Reduction in absences due to ART	90%	90%	90%	90%	90%	90%	90%	90%	94%	94%	94%	94%	94%
Proportion of HIV positive teachers needing ART	34%	32%	40%	20%	20%	20%	20%	17%	29%	19%	17%	23%	22%
Access to ART by those who need it	90%	80%	100%	25%	50%	20%	20%	40%	40%	14%	25%	70%	30%
Teacher salary	$0	$0	$0	$0	$0	$1,371	$0	$13,354	$180	$480	$180	$5,230	$120
Teacher training cost	$1,475	$1,475	$1,475	$11,100	$1,475	$1,475	$1,475	$1,475	$250	$250	$250	$250	$250
Death benefits	$1,728	$1,728	$1,728	$1,728	$1,728	$1,728	$1,728	$1,728	$263	$263	$263	$263	$263
Cost of ART	$1,038	$1,038	$1,038	$1,038	$1,038	$1,038	$1,038	$1,038	$707	$846	$0	$0	$0
Cost of VCT	$15	$15	$15	$15	$15	$15	$15	$15	$30	$0	$0	$6	$0

Countries in the Caribbean and South-East Asia.

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[1]Peak 5-year age band(s).