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

Claire Risley, PCD
Donald Bundy, World Bank
Outline

- Introduction to the impact of HIV on education and the study
- Presentation of study
  - Methods and the Ed-SIDA modelling tool
  - Quantitative impacts
  - Financial impacts
  - Comparison with impact data
- Conclusions
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Impacts of HIV and AIDS on education supply

HIV/AIDS → Supply of education

- Quantity
  - Fewer trained teachers due to AIDS mortality
- Quality
  - Increased absenteeism
  - Psychological stress
  - Management capacity

Trained teachers lost to other sectors
Teachers have different characteristics to the general population which means they have a different susceptibility to HIV infection.
Age distribution of HIV infection

% of HIV positive Population

Age band

Male
Female
Age distribution of population (same country)
Age distribution of teachers

Male

Female

Age band

## Gender distribution of teachers

<table>
<thead>
<tr>
<th>Region</th>
<th>Percent female teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>46%</td>
</tr>
<tr>
<td>Caribbean</td>
<td>80%</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>69%</td>
</tr>
</tbody>
</table>

Countries are countries involved in this study, data from UIS
Wealth and Mobility

- Both might increase teacher’s risk of acquiring HIV
- We don’t know by how much
<table>
<thead>
<tr>
<th>Region</th>
<th>Ratio of teacher salary to GDP pc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>5.1</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>2.6</td>
</tr>
<tr>
<td>East Asia/Pacific</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Source: Schooling Quality in a Cross Section of Countries Lee and Barro 2000
Socio-economic characteristics of teachers

Education

- Education *per se* is protective against HIV acquisition
- Teachers in many countries are trained to teach others how to avoid infection directly
Purpose of study

To examine the systemic impact of HIV on the supply of education in countries with generalised epidemics in three continents

- What are the quantitative effects on teachers?
- What are the cost implications of HIV on the achievement of Education For All?
- In the era of Anti-Retroviral therapy, what impact would the immediate provision of universal therapy have?
Main findings

- In Sub-Saharan Africa, it is cost effective to implement universal testing and treatment of teachers.
- In the Caribbean, the savings to the education sector generated by universal treatment would pay for all necessary drugs.
- The additional teacher recruitment required to achieve EFA in SSA can be reduced to very low levels through universal access to VCT & ART.
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- Conclusions
Approach

- Models used:
  - UNAIDS models of HIV in the population
  - Ed-SIDA model of the impact of HIV on education
- Runs were performed for 53 countries with generalised epidemics across three continents
- Results were aggregated by continent
The **Ed-SIDA** Model of the impact of HIV and AIDS on education systems
Ed-SIDA modelling process

**INPUT DATA**
- Teachers
- Children
- HIV projections
- Costs

**PROCESS**
- Calculations by model

**PROJECTIONS**
- Teacher numbers
- Recruitment required
- Absenteeism
- Pupil-teacher ratio
- Financial

**OUTPUTS**
- Graphs
- Report
- EMIS info

---

**Process Flow**

1. **Input Data**
   - Teachers
   - Children
   - HIV projections
   - Costs

2. **Process**
   - Calculations by model

3. **Projections**
   - Teacher numbers
   - Recruitment required
   - Absenteeism
   - Pupil-teacher ratio
   - Financial

4. **Outputs**
   - Graphs
   - Report
   - EMIS info
## Ed-SIDA modelling process

### INPUT DATA
- Teachers
- Children
- HIV projections
- Costs

### PROCESS
- Calculations by model

### PROJECTIONS
- Teacher numbers
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- Pupil-teacher ratio
- Financial

### OUTPUTS
- Graphs
- Report
- EMIS info

---

### Table: Absolute number of teachers

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute number of teachers</td>
<td>96850</td>
<td>98174</td>
<td>1013</td>
<td></td>
</tr>
</tbody>
</table>
Inputs to the model

- Demographic information on teachers
- Teacher relative risk of infection
- UNAIDS model outputs
- Costs:
  - Salary of replacement teacher
  - Cost of training a new teacher
  - Death benefit payable to families
  - ART per year and VCT per visit
Ed-SIDA modelling process

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=IF((D151+D150)<D119,D119,(D151+D150))
Model diagram

Recruitment of HIV negatives

Recruitment of HIV positives

Infection

HIV negative teachers

HIV positive teachers

Non-AIDS deaths plus other attrition

AIDS absences

AIDS deaths

Time-since-infection death probabilities

ART

Blocks % of AIDS deaths and absences

Recruitment \times (1\text{-}population\ prevalence)

Recruitment \times population prevalence

Incidence \times teacher risk

Prevalence \times AIDS illness rate
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INPUT DATA → PROCESS → PROJECTIONS → OUTPUTS
Ed-SIDA modelling process

**INPUT DATA**
- Teachers
- Children
- HIV projections
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**PROCESS**
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**Ed-SIDA results scenario 1: Optimistic, no ART provided**

Average prevalence; 0x increase in risk from 2005; Teachers 1x at risk compared to population; 0% teachers who require ART treated in 2015

Figure 1. Teacher plot
Ed-SIDA

- A Planning Tool. It outputs the teacher recruitment rate required to achieve:
  - 100% enrolment
  - Low PTR (<40)
- Scenario analysis, allowing the user to explore:
  - High/low impact scenarios
  - Treatment provision scenarios
Multi-country analyses

- Model was run for
  - 40 sub-Saharan African countries
  - 8 Caribbean countries
  - 5 South-East Asian countries

- Where data were unavailable
  - Data were sourced from the nearest country
  - Costs were scaled on per capita GDP
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Sub-Saharan African countries
ART at current levels
Sub-Saharan African countries
ART accessed by all teachers requiring it
Mortality rate of teachers in 2006

Percent of teachers dying of AIDS
- <0.05%
- 0.05%-0.1%
- 0.1%-0.15%
- 0.15%-0.2%
- >0.2%
Caribbean countries, ART at current levels
Caribbean countries ART accessed by all teachers requiring it

**HIV prevalence in teachers**

- **Year**: 1980, 1990, 2000, 2010
- **% of teachers**
  - Medium
  - High
  - Low

**Teacher AIDS mortality rate**

- **Year**: 1980, 1990, 2000, 2010
- **% of teachers**
  - Medium
  - High
  - Low

**Teacher absenteeism due to AIDS**

- **% of teachers**
  - 0.0%
  - 1.0%
  - 2.0%
  - 3.0%
  - 4.0%
  - 5.0%

**HIV Positive teachers**

- **Year**: 1980, 1990, 2000, 2010
- **Number of teachers**
  - 0
  - 50
  - 100
  - 150
  - 200
  - 250
  - 300
  - 350
  - 400
  - 500
  - 1000
  - 2000
  - 3000
  - 4000
  - 5000
  - 6000
  - 7000
  - 8000
  - 9000
  - 10000
  - 20000
  - 40000
  - 60000
  - 80000
  - 100000
Mortality rate of teachers in 2006

Percent of teachers dying of AIDS

- <0.15%
- 0.15%-0.2%
- 0.2%-0.25%
- 0.25%-0.3%
- >0.3%
South-East Asian countries, ART remains at current levels

**HIV prevalence in teachers**

- 1980: Low
- 1990: Low
- 2000: Low
- 2010: Low

**Teacher AIDS mortality rate**

- 1980: Low
- 1990: Low
- 2000: Low
- 2010: Low

**Teacher absenteeism due to AIDS**

- 1980: Low
- 1990: Low
- 2000: Low
- 2010: Low

**HIV Positive teachers**

- 1980: Low
- 1990: Low
- 2000: Low
- 2010: Low
South-East Asian countries
ART accessed by all teachers requiring it

HIV prevalence in teachers

Teacher AIDS mortality rate

% of teachers

1.5%
1.0%
0.5%
0.0%
1980 1990 2000 2010
Year

% of teachers

0.10%
0.08%
0.06%
0.04%
0.02%
0.00%
1980 1990 2000 2010
Year

Medium High Low

Medium High Low

HIV Positive teachers

Teachers
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Sub-Saharan African countries, costs of the impact of HIV on education to health and education sectors

Education

- Absenteeism
- Death benefits
- Training of teachers to replace those dying from AIDS

Health

- ARVs
- VCT

Bar charts showing costs for 2006 and 2015 (ART at current levels) and 2015 (all teachers needing ART taking it).
Caribbean countries, costs of the impact of HIV on education to health and education sectors

**Education**

- **Absenteeism**
- **Death benefits**
- **Training of teachers to replace those dying from AIDS**

**Health**

- **ARVs**
- **VCT**

![Bar Graphs](Image)
South-East Asian countries, costs of the impact of HIV on education to health and education sectors

Education

- Absenteeism
- Death benefits
- Training of teachers to replace those dying from AIDS

Health

- ARVs
- VCT

2006 vs 2015 (ART at current levels)

- 2006
- 2015

2015 (all teachers needing ART taking it)
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- **Comparison with impact data**

- Conclusions
Teacher deaths in Ghana 95-99

Source: Ministry of Education Workplan 2003
Impact data from Swaziland 2004

Absence statistic is absences due to illnesses

Death statistic is attrition due to death, cause undetermined

Data source: Bennell 2006 Countering the impact of the AIDS epidemic on the education sector in Swaziland
Introduction to the impact of HIV on education and the study

Presentation of study

Methods and the Ed-SIDA modelling tool

Quantitative impacts

Financial impacts

Comparison with impact data

Conclusions
Comparison with previous cost estimates of the impact of HIV on EFA achievement

<table>
<thead>
<tr>
<th>Annual cost to education supply</th>
<th>2002 EFA Global Monitoring Report</th>
<th>Bruns et al. 2003</th>
<th>Present study</th>
</tr>
</thead>
<tbody>
<tr>
<td>To the education sector in SSA</td>
<td>$300,000,000</td>
<td>$287,000,000</td>
<td>$111,000,000</td>
</tr>
</tbody>
</table>
Conclusions (1)

- 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.
## Costs and savings associated with increasing ART and VCT provision from current levels to 100%

<table>
<thead>
<tr>
<th></th>
<th>South-East Asia medium scenario x1000 US$</th>
<th>Caribbean medium scenario x1000 US$</th>
<th>Sub-Saharan Africa medium scenario x1000 US$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ART at current levels</td>
<td>ART at 100%</td>
<td>ART at current levels</td>
</tr>
<tr>
<td><strong>Total saving 2007-2015 to MoE of increasing ART and VCT use</strong></td>
<td>$7,265</td>
<td></td>
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</tr>
<tr>
<td><strong>Total cost of increasing ART between 2007-2015</strong></td>
<td>$11,217</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total cost of increasing VCT between 2007-2015</strong></td>
<td>$16,530</td>
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</table>
Universal access by teachers to VCT and ART is beneficial to education supply in all the three regions assessed.

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

In the Caribbean, the savings to the education sector generated by universal treatment would pay for all necessary drugs.
Extra teacher recruitment required to achieve EFA in sub-Saharan Africa

<table>
<thead>
<tr>
<th>ART at current levels</th>
<th>4.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART accessed by all teachers requiring it</td>
<td>0.2%</td>
</tr>
</tbody>
</table>
The additional teacher recruitment required to achieve EFA in SSA can be reduced to very low levels through universal access to VCT & ART.
Acknowledgements

- Lesley Drake and all members of the Partnership for Child Development
- Nick Grassly, Kamal Desai, Tim Hallet, Peter White of the Department of Infectious Disease Epidemiology, Imperial College London.