HIV/AIDS and its Impacts on Labor Markets

World Bank Labor Market Policy Core Course

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Development Research Group (DECRG)
The HIV/AIDS epidemic is “the most formidable development challenge of our time”

“By overwhelming the continent’s health and social services, by creating millions of orphans, and by decimating health workers and teachers, AIDS is causing social and economic crises which in turn threaten political stability.

In already unstable societies, this cocktail of disasters is a sure recipe for more conflict. And conflict, in turn, provides fertile ground for further infections."

UN Secretary-General Kofi Annan, January 2000
Overview of Presentation

- **Part I** - Introduction: Current status of the Epidemic
- **Part II** - How is AIDS Affecting Costs to Business and Labor? Findings from Southern Africa
- **Part III** - How is AIDS Affecting Agricultural Labor Productivity? The Case of Tea in Kenya
- **Part V** - Conclusions: Treatment and Prevention
Part I —

Introduction: 
Current Status of the AIDS Epidemic
2007 Global estimates for adults

Source: UNAIDS Dec. 2007 Epidemiological Update

- Adults: 30.8 million [28.2 – 33.6]
- Women: 15.4 million [13.9 – 16.6]
- New HIV infections (adults): 2.1 million [1.4 – 3.6]
- Deaths due to AIDS (adults): 1.7 million [1.6 – 2.1]
Adults and children estimated to be living with HIV, 2007

- **North America**: 1.3 million [1.4 – 1.9 million]
- **Caribbean**: 230,000 [210,000 – 270,000]
- **Latin America**: 1.6 million [1.4 – 1.9 million]
- **Eastern Europe & Central Europe**: 760,000 [600,000 – 1.1 million]
- **Eastern Europe & Central Asia**: 1.6 million [1.2 – 2.1 million]
- **Middle East & North Africa**: 380,000 [270,000 – 500,000]
- **South & South-East Asia**: 4.0 million [3.3 – 5.1 million]
- **Eastern Europe & Central Asia**: 1.6 million [1.2 – 2.1 million]
- **South & South-East Asia**: 4.0 million [3.3 – 5.1 million]
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- **Sub-Saharan Africa**: 22.5 million [20.9 – 24.3 million]
- **Oceania**: 75,000 [53,000 – 120,000]

**Total**: 33.2 (30.6 – 36.1) million
### Estimated adult and child deaths from AIDS, 2007

<table>
<thead>
<tr>
<th>Region</th>
<th>Deaths</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western &amp; Central Europe &amp; Central Asia</td>
<td>12,000</td>
<td>[12,000 – 15,000]</td>
</tr>
<tr>
<td>Eastern Europe &amp; Central Asia</td>
<td>55,000</td>
<td>[42,000 – 88,000]</td>
</tr>
<tr>
<td>Middle East &amp; North Africa</td>
<td>25,000</td>
<td>[20,000 – 34,000]</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>1.6 million</td>
<td>[1.5 – 2.0 million]</td>
</tr>
<tr>
<td>North America</td>
<td>21,000</td>
<td>[18,000 – 31,000]</td>
</tr>
<tr>
<td>Caribbean</td>
<td>11,000</td>
<td>[9,800 – 18,000]</td>
</tr>
<tr>
<td>Latin America</td>
<td>58,000</td>
<td>[49,000 – 91,000]</td>
</tr>
<tr>
<td>East Asia</td>
<td>32,000</td>
<td>[28,000 – 49,000]</td>
</tr>
<tr>
<td>South &amp; South-East Asia</td>
<td>270,000</td>
<td>[230,000 – 380,000]</td>
</tr>
<tr>
<td>Oceania</td>
<td>1,200</td>
<td>[&lt;500 – 2,700]</td>
</tr>
</tbody>
</table>

**Total:** 2.1 (1.9 – 2.4) million
Over 6900 new HIV infections a day in 2007

- More than 96% are in low and middle income countries
- About 1150 are in children under 15 years of age
- About 5750 are in adults aged 15 years and older of whom:
  - almost 50% are among women
  - about 40% are among young people (15-24)
Global estimates of Adult Deaths

- HIV/AIDS 1.7 million
- Tuberculosis 1.6 million
- Cardiovascular Diseases 16.7 million
  - 80% of CVD deaths in developing countries
- Smoking related 4.8 million
  - 80% in men, 50% in developing countries
- Violence and Injuries >5 million
- BUT, compared to other diseases, AIDS tends to kill relatively young and productive people.
Figure 1: Age profile of HIV prevalence. Males

HIV prevalence (in percent)

Age group

Burkina Faso Cameroon Ghana Kenya Tanzania
Figure 2: Age profile of HIV prevalence. Females

[Graph showing the age profile of HIV prevalence for females in various countries: Burkina Faso, Cameroon, Ghana, Kenya, Tanzania.]

Key:
- Burkina Faso
- Cameroon
- Ghana
- Kenya
- Tanzania
Part II —

The cost of HIV/AIDS to businesses in southern Africa

(Source: Rosen, Vincent, MacLeod et al., AIDS 2004, 18: 317-324)
Objectives of the Study

1. Develop a methodology for estimating the cost of HIV/AIDS to organizations.

2. Calculate the costs of AIDS in the workforce to companies of different sizes and in different locations and sectors.
### Framework for Analysis

**Increased expenses**
- Benefits payments
- Medical care
- Recruitment of replacement
- Training of replacement

**Lost productivity**
- Increased leave and absenteeism
- Reduced on-the-job productivity
- Supervisor’s time
- Vacancy
- Inexperienced replacement

**From one employee with HIV/AIDS (individual costs)**

- Accidents due to sick or inexperienced employees
- Litigation over benefits, dismissals, etc.

**From many employees with HIV/AIDS (organizational costs)**

- Production disruptions
- Loss of institutional memory, experience
- Breakdown of workforce morale, cohesion
- Diversion of senior managers’ time
- Deteriorating labour relations

**From high HIV prevalence in society (market or external costs)**

- Higher cost of material inputs
- More security needed due to breakdown in civil society
- Higher wages due to shortage of skilled workers

**Total costs of HIV/AIDS**

* Unmeasured

* Measured
## Timing of Cases, Costs, and Liability

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Progression of HIV/AIDS in the Workforce</th>
<th>Cost to Company</th>
<th>Liability Acquired by Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 0</td>
<td>Employee becomes infected</td>
<td>No cost to company at this stage</td>
<td>Discounted sum of all costs from years 0-10</td>
</tr>
<tr>
<td>Year 0-8</td>
<td>Employee remains asymptomatic and fully productive</td>
<td>No cost to company at this stage</td>
<td></td>
</tr>
<tr>
<td>Year 2-8</td>
<td>Morbidity begins (some early mortality, some long-term non-progressors)</td>
<td>Morbidity-related costs are incurred (absenteeism, productivity, management time, medical care)</td>
<td></td>
</tr>
<tr>
<td>Year 6-12</td>
<td>Employee leaves workforce through death or retirement (some long-term survivors)</td>
<td>Termination-related costs are incurred (death and disability benefits, loss of morale, experience, &amp; cohesion)</td>
<td></td>
</tr>
<tr>
<td>Year 6-12</td>
<td>Company hires replacement employee</td>
<td>Turnover costs are incurred (vacancy, recruiting, training)</td>
<td></td>
</tr>
</tbody>
</table>
## Companies in the Study

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sector</strong></td>
<td>Heavy industry</td>
<td>Agric.</td>
<td>Mining</td>
<td>Mining</td>
<td>Retail</td>
<td>Media</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>South Africa</td>
<td>KwaZulu Natal</td>
<td>Botswana</td>
<td>KwaZulu Natal</td>
<td>KwaZulu Natal</td>
<td>South Africa</td>
</tr>
<tr>
<td><strong>Size of workforce</strong></td>
<td>&gt;25,000</td>
<td>5,000-10,000</td>
<td>500-1,000</td>
<td>500-1,000</td>
<td>&lt;500</td>
<td>1,000-5,000</td>
</tr>
</tbody>
</table>

**Assumptions:**
- Discount rate: 7% (real)
- Median survival time: 9 years
Cost Per Incident HIV Infection

Present value per infection for males age 35-49

(Multiple of median annual salary)

Cost Per Incident HIV Infection

Present value per infection for males age 35-49

(Multiple of median annual salary)
Why Is the Cost Per Infection So Different?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Higher cost to firm</th>
<th>Lower cost to firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of death and disability benefits</td>
<td>Large; defined benefit; benefit levels stable (Co A, C, F)</td>
<td>Premiums capped; benefit levels falling (Co B, D, E)</td>
</tr>
<tr>
<td>Medical care</td>
<td>Medical aid coverage for all employees (Co A, C, F)</td>
<td>Most use company clinics and public hospitals (Co B, D, E)</td>
</tr>
<tr>
<td>Status of unskilled workers</td>
<td>Permanent employees with full benefits (Co A, C, D, F)</td>
<td>Many are contractors with few benefits (Co B, E)</td>
</tr>
<tr>
<td>Salaries (labor productivity)</td>
<td>Higher, so absences and turnover cost more (Co A, C, D, F)</td>
<td>Lower, so absences and turnover cost less (Co B, E)</td>
</tr>
</tbody>
</table>
Distribution of the Cost of an Incident Infection

Company A (high cost)

- Medical care: 45%
  - Leave and absenteeism: 23%
  - Productivity loss: 15%
  - Retirement, death, and disability: 8%
  - Medical care: 8%
  - Recruitment and training: 45%

Company B (low cost)

- Medical care: 56%
  - Leave and absenteeism: 36%
  - Productivity loss: 4%
  - Retirement, death, and disability: 3%
  - Medical care: 56%
  - Recruitment and training: 36%
Magnitude of the Costs of a New Infection

Company A

Company B
Part III —

The Impact of HIV/AIDS on Labor Productivity in Kenya

(Source: Fox, Rosen, MacLeod et al., Tropical Medicine and International Health 2004, 9: 318-324)
Objectives of the Study

1. Determine the distribution of deaths in the workforce of a large agricultural firm in western Kenya.
2. Estimate the decline in on-the-job labor productivity associated with HIV/AIDS (impaired presenteeism).
3. Estimate the additional paid and unpaid leave taken by workers with HIV/AIDS.
4. Calculate the earnings loss caused by HIV/AIDS.
Study Site

- Tea estates owned by large agribusiness in Kericho District in the highlands of western Kenya.
- Company has ~10,000 tea pluckers (~ 79% male), paid by kilogram of tea leaf plucked.
- Labor supply adjusted for tea leaf supply daily.
- Free on-site medical care for all workers and dependents; workers get paid sick leave.
- VCT available but few accepted at time of study.
- Treat opportunistic infections, provide palliative care.
- No antiretrovirals at this time (started Oct. 2004).
Number of Deaths Per Year

- 600 natural cause deaths and medical retirements at company hospital
- 198 workers, 402 dependents
- Many HIV+ workers and dependents leave voluntarily and are not counted here.

Number of deaths in rainy year estimated based on Jan-May 03
> expected malaria and diarrheal disease in rainy year
Distribution of Deaths by Cause

All natural cause deaths, 1997-2002

Workers (n=197)
- HIV
- TB
- Other

Dependents (inc. children) (n=402)
- HIV
- TB
- Other
Impact of HIV/AIDS on Labor Productivity
Study Population

- “Cases” (n=54) are tea pluckers who
  - died at company health facilities of an AIDS-related cause (n=43)
  - were medically retired due to HIV/AIDS (n=11).
- “Controls” are pluckers who were working in the same fields over the same time period as the cases (4:1).
Effect of HIV/AIDS on Kgs Plucked/Day (Adjusted)

- Differences are adjusted for years of service and unit.
- Cases’ shortfall increases consistently starting 1.5 years before death.

<table>
<thead>
<tr>
<th>YBD §</th>
<th>Shortfall (Kg/day)</th>
<th>Shortfall (%) †</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>-0.5</td>
<td>1.0%</td>
<td>0.834</td>
</tr>
<tr>
<td>2.0</td>
<td>-2.4</td>
<td>6.0%</td>
<td>0.220</td>
</tr>
<tr>
<td>1.5</td>
<td>-4.1</td>
<td>10.0%</td>
<td>0.028</td>
</tr>
<tr>
<td>1.0</td>
<td>-5.6</td>
<td>13.0%</td>
<td>0.004</td>
</tr>
<tr>
<td>0.5</td>
<td>-6.9</td>
<td>16.0%</td>
<td>0.002</td>
</tr>
<tr>
<td>0.0</td>
<td>-7.9</td>
<td>19.0%</td>
<td>0.003</td>
</tr>
</tbody>
</table>

§ Years before death
† Expressed as a percent of the average amount plucked by controls, 41.7 kgs/day
Effect of HIV/AIDS on Kgs Plucked/Day (Adjusted)

Average kgs plucked/day

Cases: 3.9 kgs/day
Controls: 9.3 kgs/day

Years before death
Effect of HIV/AIDS on Paid and Unpaid Leave

- In 3rd year before death, cases were absent 32 days more than controls.
- In 2nd year before death, cases were absent 35 days more than controls.
- In final year before death, cases were absent 31 days more than controls.

All differences significant at .05 level except annual leave in year 2-3 before death.
Overall Loss of Productivity and Earnings Due to HIV/AIDS

In each of the last two years before death, a tea plucker with HIV/AIDS:

- Is absent from work 31 days more often (an increase of 87 percent)
- Spends 22 more days on light duty (an increase of 66 percent)
- Plucks an average of 7.1 kg less tea leaf per day spent plucking (a decrease of 17 percent)
- Has reduced annual earnings of 18%.
- Produces 35.1% less tea in final year
Part IV

How AIDS Treatment is Changing the Impact of HIV/AIDS on labor markets and productivity?

Evidence from Kenya and Botswana
The impact of providing antiretroviral treatment (ART) to patients

- Source: Thirumurthy, Graff Zivin, and Goldstein: *The Economics of AIDS Treatment: Labor Supply in Western Kenya*,

- The intervention
  - Provide ART to patients, rule is for a CD4<200, but initial rationing
  - Treatment for opportunistic infections
  - Nutrition supplementation, but not much until later

- Data – two rounds of household survey – random sample & patients
Treatment: Evaluation Design

We know what happens to counterfactual group: Medical evidence: patients continued decline in health and death. Zero labor supply in round 2
CD4 Counts before and after treatment

Source: Goldstein, Graff Zivin and Thirumurthy 2007
Body Mass Index and Labor Force Participation Before and After ARV Therapy

Source: AMPATH Medical Records System – data as of March 2005.

Source (right): Household survey data.
Treatment: Main Findings – Labor supply

- Very large (and rapid) increases in patient labor supply
  - 16.7 percentage points LFP; 6.9 Hours
- Among other household members
- Sizable decreases in labor supply of young boys
  - 22.7 percentage points LFP; 8.6 Hours
- No significant response for girls, others living in the household
- Patient earnings are close to the cost of treatment
HIV/AIDS, ARV Treatment and Worker Absenteeism

- Evidence from a large firm in Botswana
CD4 count and absenteeism

Figure 1: Relationship between CD4 Count and Sick Days from Work

Panel A: Unbalanced Panel
Absenteism before and after treatment initiation

Panel B: unbalanced sample

Days absent per month

Months before treatment

-12 0 12
Main results from Botswana

- Enrolled workers miss about 20 days in the year prior to treatment initiation.
- Five times the annual absence duration from illness among other workers.
- The introduction of ARV treatment is followed by a large reduction absenteeism 6-12 months following treatment inception.
- Absenteeism 1 to 4 years after treatment is low and comparable to other workers.
Part V

Treatment and Prevention
How to sustain ART in the long run? Example: Thailand

Source: Revenga et al, 2007
Treatment in the long run?

- The greater the success of treatment, the more patients
- Second line therapy is much more expensive.
- Adherence crucial: role of health infrastructure and staff
- Still...
- Prevention, prevention, prevention!
Impact of condom use on the number of new HIV infections in India (Over et al. 2004)