Societal cost of the Mother-to-Child transmission of HIV/AIDS in Ethiopia: urban high HIV prevalence versus rural low HIV prevalence settings

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Background

Since 1980’s the impact of HIV/AIDS on the society has been devastating (Piot et al., 2001, Piot et al., 2007, UNAIDS, 2012a).

Globally in 2015, 36.7 (34.0–39.8) million people were living with HIV/AIDS, 2.1 (1.8-2.4) million were newly infected with HIV, while about 1.1 (940,000–1.3) million died of HIV/AIDS (UNAIDS, 2016).

New HIV infections in 2015 were 5% lower as compared to the 2010 infections (UNAIDS, 2016).

Access to antiretroviral treatment has had a significant impact on results.

Background...

Resource allocation has became a critical question.

- Globally USD 9.0 to USD 9.2 billion required for the HIV/AIDS interventions (Marseille et al., 2002; Schwartländer et al., 2001)
- Half of the resources would be needed in SSA countries (Schwartländer et al., 2001).
- One-third to one-half of the annual estimated (USD 9 billion) would be expected to be financed from the domestic resources.
- Most of the LMICs countries contributed only between <0.05% and 1.9% of their GDP for HIV/AIDS response, suggesting the need for a substantial external funding support (up to 87%) (Resch et al., 2015).

- The recent economic crisis and downturn affected the antiretroviral treatment programs (World Bank, 2009).
- Threaten the long-term sustainability of the maternal and child health program in SSA.
Background and Research

Problem...

Ethiopia:
- Second most populous nation in Africa. (94.1 million, 2013)
- One of the 22 countries targeted for the elimination of new HIV infection among children by 2015 (UNAIDS, 2015)
- GDP per capita of $410. (WB, 2013)
- National HIV prevalence among pregnant women was 2.0% in 2012. (EPHI 2014)
- MMR = 420/100,000 live births. (WHO, 2013)
- One of the 5 countries account for 50% of the world’s maternal deaths. (Hogan et al, 2011)

Background and Research

Problem...

HIV Infection:
- 154,084 children under 14 years are living with HIV
- 5,492 New HIV Infections in 2013
- More than 90% of these infection is through mother-to-child transmission. (EPHI, 2014)

PMTCT:
- However, PMTCT coverage is low
  - Of 38,405 targets, only 9,775 women received treatment in 2012 (FMOH, 2012)
  - Less than 50% coverage (UNAIDS, 2013)

HIV prevalence:
- Urban - 4.5% (5.2%)
- Rural - 1.7% (0.8%)
  (EPHI 2014, EDHS 2011)
Background and Research Problem...

What is the challenge? Prevention of mother to Child HIV transmission (PMTCT) program in Ethiopia

- 79 percent fund cut in 2013 from 2012 funding level. (EATG, 2012)
- Heterogeneous HIV prevalence (urban and rural) among pregnant women. (Berhane et al, 2008)
  - In low income countries, like Ethiopia, there was no satisfactory costing data from health care system, patient and societal perspectives.
- Poor perception and practice of the application of economic evaluation in the PMTCT program cycle (Zegeye et al, 2016 in press)
Study Objectives...

This study assesses the societal cost of mother-to-child transmission of HIV/AIDS across HIV prevalence heterogeneity (high, low) urban-rural contexts by estimating:

- the cost of PMTCT program from the health care provider perspective.
- the cost-of-illness attributed to patients with HIV on the PMTCT program from the patient perspective.

Materials and Methods

- Health service provider ingredient costing was collected from twelve health facilities in Ethiopia.
  - Six health facilities with the highest HIV prevalence among pregnant women (8.1% to 17.3%) were chosen in urban setting, and six health facilities with the lowest prevalence rate (0.0% to 0.1%) were surveyed from the rural setting.
  - Simultaneously, patient cost data were collected from 85 HIV positive pregnant women attending the surveyed health facilities, 17 Mother Support Groups (MSGs) and 12 health care professionals.
Materials and Methods...

Surveyed health facilities

<table>
<thead>
<tr>
<th>Surveyed health facilities</th>
<th>Region</th>
<th>HIV prevalence</th>
<th>Location from the center</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Felege Hiwot Hospital</td>
<td>Amhara</td>
<td>17.3</td>
<td>Northern Ethiopia</td>
<td>Urban</td>
</tr>
<tr>
<td>Hiwot Fana Hospital,</td>
<td>Harari</td>
<td>8.8</td>
<td>Eastern Ethiopia</td>
<td>Urban</td>
</tr>
<tr>
<td>Dile Chora Hospital</td>
<td>Dire Dawa</td>
<td>8.1</td>
<td>Eastern Ethiopia</td>
<td>Urban</td>
</tr>
<tr>
<td>ARRTE Hospital</td>
<td>Addis Ababa</td>
<td>8.7</td>
<td>Addis Ababa</td>
<td>Urban</td>
</tr>
<tr>
<td>Soddo Health Center</td>
<td>SNNPR</td>
<td>8.8</td>
<td>Southern Ethiopia</td>
<td>Urban</td>
</tr>
<tr>
<td>Tulemnawamt Health Center</td>
<td>Addis Ababa</td>
<td>8.8</td>
<td>Addis Ababa</td>
<td>Urban</td>
</tr>
<tr>
<td>Limuseka Health Center</td>
<td>Oromia</td>
<td>0.0</td>
<td>Western Ethiopia</td>
<td>Rural</td>
</tr>
<tr>
<td>Daddim Health Center</td>
<td>Oromia</td>
<td>0.0</td>
<td>Western Ethiopia</td>
<td>Rural</td>
</tr>
<tr>
<td>Tule Health Center</td>
<td>Oromia</td>
<td>0.0</td>
<td>Western Ethiopia</td>
<td>Rural</td>
</tr>
<tr>
<td>Chewaka Health Center</td>
<td>Oromia</td>
<td>0.0</td>
<td>Western Ethiopia</td>
<td>Rural</td>
</tr>
<tr>
<td>Kelossa Health Center</td>
<td>Oromia</td>
<td>0.0</td>
<td>Eastern Ethiopia</td>
<td>Rural</td>
</tr>
<tr>
<td>Haszego Health Center</td>
<td>Harari</td>
<td>0.0</td>
<td>Eastern Ethiopia</td>
<td>Rural</td>
</tr>
</tbody>
</table>

Source: Antenatal care (ANC) sentinel HIV/AIDS PMTCT surveillance report (EPHI, 2014)

Materials and Methods...

Societal cost analysis:

➢ The costing analysis was a micro-costing (ingredient based approach) to identify, measure and value the resource used to provide PMTCT service. (Drummond et al 2005)

➢ Patient cost-of-illness analysis was conducted through a retrospective bottom-up approach. (Tarricone 2006) and consisted of transportation cost, out-of-pocket expense, productivity loss (applying Human Capital Approach/HCA).

➢ The inputs was valued with 2014 USD dollar, at 3% discount rate and adjusted inflation.

Societal cost = healthcare provider + direct medical + direct non-medical + productivity cost
Materials and Methods…

Findings

A. Healthcare provider cost

<table>
<thead>
<tr>
<th>Urban health facilities</th>
<th>Unit cost PPY (ETB)</th>
<th>Unit cost PPY (USD)</th>
<th>Rural health facilities</th>
<th>Unit cost PPY (ETB)</th>
<th>Unit cost PPY (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teklehaimanot Health Center</td>
<td>6,280.39</td>
<td>319.28</td>
<td>Limuseka Health Center</td>
<td>5,729.87</td>
<td>291.29</td>
</tr>
<tr>
<td>Soddo Health Center</td>
<td>8,406.88</td>
<td>427.38</td>
<td>Chewaka Health Center</td>
<td>4,322.62</td>
<td>219.75</td>
</tr>
<tr>
<td>Hiwot Fana Hospital</td>
<td>20,778.64</td>
<td>1,056.34</td>
<td>Daddim Health Center</td>
<td>7,558.46</td>
<td>383.24</td>
</tr>
<tr>
<td>Dile Chora Hospital</td>
<td>14,410.24</td>
<td>732.58</td>
<td>Hasange health center</td>
<td>6,318.98</td>
<td>321.24</td>
</tr>
<tr>
<td>Felege Hiwot Hospital</td>
<td>11,194.85</td>
<td>569.12</td>
<td>Kokossa health center</td>
<td>5,103.47</td>
<td>310.29</td>
</tr>
<tr>
<td>AFRTH Hospital</td>
<td>21,620.19</td>
<td>1,099.12</td>
<td>Toke health center</td>
<td>5,598.17</td>
<td>284.60</td>
</tr>
<tr>
<td>Mean</td>
<td>13,781.87</td>
<td>700.64</td>
<td>Mean</td>
<td>5,935.26</td>
<td>301.73</td>
</tr>
<tr>
<td>Stdev (SD)</td>
<td>6,363.23</td>
<td>323.64</td>
<td>Stdev (SD)</td>
<td>1,049.02</td>
<td>53.33</td>
</tr>
</tbody>
</table>
Findings...

**Figure 1:** Costing resource distribution of PMTCT service in urban high-HIV prevalence health facilities setting – direct medical costs

**Figure 2:** Costing resource distribution of the PMTCT service in rural low-HIV prevalence health facilities setting – direct medical costs

Findings...

Costing the PMTCT service packages – health service costs

- Linking with care and support services
- Program management, Monitoring and Evaluation
- Early infant diagnosis (EID) service
- CD4 count service
- Option B+ follow-up and counseling
- ART treatment initiation and counseling
- HIV positive post-test counseling
- HIV negative post-test counseling
- HIV testing
- Pre-test counseling

<table>
<thead>
<tr>
<th>Service</th>
<th>Rural health facilities</th>
<th>Urban health Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test counselling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV negative post-test counseling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV positive post-test counseling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ART treatment initiation and counseling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option B+ follow-up and counseling</td>
<td></td>
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<tr>
<td>CD4 count service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early infant diagnosis (EID) service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program management, Monitoring and Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linking with care and support services</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Findings...

Patient perspective cost-of-illness analysis

Table  Direct medical, direct non-medical and productivity loss per patient per year

<table>
<thead>
<tr>
<th>Cost per patient per year</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct medical cost</td>
<td>746.00 (749.68)</td>
<td>368.4 (161.91)</td>
</tr>
<tr>
<td>Direct non-medical costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport cost (by the patient)</td>
<td>1,276.07 (1099.38)</td>
<td>636.67 (349.31)</td>
</tr>
<tr>
<td>Transport cost (by Friends/relatives/guardians)</td>
<td>1,783.73 (1470.39)</td>
<td>2,066.44 (2193.88)</td>
</tr>
<tr>
<td>Food costs (by the patient)</td>
<td>4,700.5 (4226.35)</td>
<td>1,510.83 (376.18)</td>
</tr>
<tr>
<td>Food costs (by Friends/relatives/guardians)</td>
<td>81.29 (403.72)</td>
<td>832.78 (783.64)</td>
</tr>
<tr>
<td>Accommodation expense (by the patient)</td>
<td>458.54 (1157.1)</td>
<td>6.9 (37.14)</td>
</tr>
<tr>
<td>Accommodation expense (by Friends/relatives/guardians)</td>
<td>0.0 (0.0)</td>
<td>19.67 (44.5)</td>
</tr>
<tr>
<td>Productivity losses</td>
<td>7,432.69</td>
<td>624.6</td>
</tr>
<tr>
<td>Total cost per patient per year: <em>Total</em></td>
<td>17,208.82 (USD 874.85)</td>
<td>6,066.3 (USD 308.4)</td>
</tr>
</tbody>
</table>

Findings...

Patients: Household income and health care spending
Findings...

**Patient:** monthly health care spending before and after the HIV illness and the monthly health care spending associated with ART follow-up, in the urban and rural settings

- Monthly ART follow-up related expenses (for the pregnant women) per month
- Monthly ART follow-up related expenses (for the infant) per month
- Monthly healthcare spending before the HIV illness
- Monthly healthcare spending after the HIV illness

Findings...

**Patient:** Productivity lost per patient per year due to the HIV/AIDS illness

- Total productivity loss per patient per year
- Productivity losses (related to home care services)
- Productivity losses (loss of work/stop working)
- Productivity losses (due to inpatient admission)

Legend:
- Rural
- Urban
Findings...

**Societal cost:**
- A pregnant women-infant pair per year incurred a societal cost of ETB 30,990.69 (USD 1,575.49) and ETB 12,001.55 (USD 610.13) in urban high-HIV prevalence and rural low-HIV prevalence settings, respectively.
- The overall societal cost (per PPY) in urban high-HIV prevalence settings costs more than twice the cost in rural low-HIV prevalence settings.
- Of the societal cost ingredients, health care system/provider costs accounted for the highest proportion of the cost, which comprises of 44% and 49% in urban and rural settings, respectively.
Findings...

Societal unit cost per pregnant woman-infant pair per year, 

Rural Settings

- 5% Health care provider costs
- 49% Direct medical costs
- 3% Direct non-medical costs
- 42% Productivity loss

Conclusion

- The societal cost varied across HIV prevalence heterogeneity and urban-rural settings.

- The society in urban high HIV prevalence would incur a high cost as compared to low HIV prevalence rural population.

  - Patients are still incurring a substantial direct medical, direct non-medical and productivity loss, which affects the intended public health utilization for the HIV positive pregnant women and pediatrics attending lifelong antiretroviral treatment, and these hinder the path towards UHC.

  - The productivity losses and non-medical costs (transportation and food costs) accounts for a substantial proportion of costs, in both the urban and rural settings.
**Conclusion**

- In an effort to eliminate new HIV infection, it is vital to analyze the wider societal perspective costing so as to inform health care priority decisions, as well as to conduct a robust cost effectiveness analysis.
  - To improve the low PMTCT service coverage, local context costing evidence is required for continuous PMTCT program management.
    - Costing informs the budget preparation, program planning, intervention scale-up and highlight possible cost containment strategies
  - UHC aims for unhindered health care service access; HIV-positive pregnant women (including relatives/friends/families) incurred substantial direct medical, direct non-medical and productivity loss.

**THANK YOU SO MUCH**

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