

Costing of HIV interventions: What are the critical gaps?

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Introduction

Although great progress has been made in preventing new HIV infections and in extending treatment and care to those who are infected, the scope and evolving nature of the HIV epidemic response demand an improved investment approach that is strong, strategic, and contemporary. The annual number of people newly infected has declined by 20% between 2001 and 2011, with reductions in risky sexual behavior seen in numerous countries, and increases in HIV testing documented among targeted groups such as men who have sex with men and persons with tuberculosis. Antiretroviral therapy had been extended to 8 million people by the end of 2011, including 57% of pregnant and nursing women in low and middle income countries. However, progress in increasing coverage of basic HIV prevention and treatment programs has been uneven, and the number of people infected with HIV is expected to continue growing above the 2011 estimate of 34 million [UNAIDS, 2012]. Difficulty in addressing sensitive topics such as voluntary medical male circumcision and rape, resistance to antiretroviral and tuberculosis drug regimens, and limited human and financial resources across sectors have constrained the effectiveness of the response. In addition, other issues are emerging concerning expansion of treatment as prevention, the long-term care for those on antiretroviral therapy as they age, patient retention in treatment, and equity in targeting those who are most vulnerable [Schwartlander 2011, UNAIDS 2012].

To build upon the progress that has been made and achieve the 2015 targets in the United Nations Political Declaration on HIV and AIDS, policy makers are considering funding not only basic interventions that have proven effective, but also to fill in the gaps where services remain to be delivered, particularly for underserved key populations, all geographic areas or by using different types of providers. In addition, policy makers may fund the social and program enablers across sectors that raise interest, garner support, and set the legal and logistical stage for basic programme activities to be successful [Schwartlander 2011]. The process of identifying these gaps is a continual one, facilitated by the United Nations General Assembly Special Session(UNGASS) reporting process and the “Three Ones” framework for national coordination and monitoring of HIV efforts. Given recent estimates that funding will not be sufficient to meet all needs for HIV prevention and treatment, it is essential that the distribution of the limited resources available is planned for accordingly [Schwartlander 2011]. As gaps in HIV efforts are identified and considered in the mix for potential funding, there will be a call for realistic data on the unit cost of HIV prevention and treatment interventions that can be confidently compared and effectively utilized in the planning process.

Previous literature reviews and proposals for the standardization of costing HIV prevention, treatment, and care interventions have laid the foundation for the identification of future research needs. Summary reviews of the costing literature for both HIV and sexually transmitted infection (STI) interventions have noted that low and middle income countries are under-represented in the published costing literature when the search encompassed all countries. Within these articles from low and middle income countries, there was a geographic concentration, with comparatively few studies outside of South Africa, India, and Thailand [Beck et al. 2001, 2010, and 2013; Terris-Prestholdt and Vyas 2006]. *Beck et al.* report that among studies on HIV services delivered specifically through the community, the majority centered on outreach as a service delivery mode, targeted the general population, were conducted in urban areas, and followed the study population for less than 12 months. Despite published calls for costing beyond the provider perspective [Pinkerton 2008], both *Beck et al.* (community-based interventions) and *Terris-Prestholdt et al.* (STI interventions) find that only nine percent of articles collect any form of cost to the patient. Further, the systematic review of unit costs for HIV interventions has been complicated by difficulties in the interpretation of cost data, due to limited background and explanatory information provided by the authors of the published costing literature. Limited or non-existent intervention descriptions, a lack of detail as to the items included in cost estimates, an unknown duration for the study, and missing data on exchange rates and the year of currency conversion are all cited by reviewers as problematic in the attempt to compare reported unit costs.

The objectives of this paper are therefore threefold. The first objective is to provide an update regarding gaps in the published costing studies on HIV interventions with respect to geographic areas, key populations, service delivery levels, types of provider, and basic interventions. The second objective is to ascertain the availability of costing information on the social and program enablers critical to the success of basic interventions, the integration of HIV services with other services, the changing costs as programs mature, and the extent of programme-level data. Finally, a discussion of limitations in the quality of published unit cost data on HIV prevention and treatment is provided to facilitate improved standardization of costing methodology and reporting.

Methods

Articles for this study were identified through a search conducted in three stages, beginning in 2010, continuing at the end of 2012, and finishing in early 2013. The original purpose of the search was for the development of an online database of unit costs for HIV prevention interventions, which gives unit costs for a specified period of time (usually one year)[see <http://policytools.futuresinstitute.org/UC/>]. The database can be sorted by category of intervention, primary population served, region, country, sector (public, private, NGO), investment framework category, HIV epidemic category (general, concentrated, IDU), country income level, service delivery location, and whether or not an entry disaggregates the unit cost data into the categories of personnel, drug/supplies, laboratory costs, other recurrent costs, and capital costs. Users may also access more information about each entry to better determine the reasons why the unit cost provided may be relatively higher or lower than others in the same intervention

category. This information includes the intervention description and duration, costing methodology and any information available on economies of scale for the intervention.

In the first stage, abstracts were drawn from grey literature submitted through a call for papers and peer-reviewed published literature available through PubMed, POPLINE, HIV InSite, and Google, using the principal keywords "HIV" and "Cost", and a publication date of 1990-2010. Abstracts were excluded if they were conducted in upper-income countries (with the exception of studies concerning methadone maintenance therapy for people who inject drugs), used modeled unit cost estimates that were not based on primary cost data collected in-country, repeated the same study population/program already in another study, gave costs only in charts, did not present any basis for the unit cost given in the study, did not provide a cost per person over a defined period or data from which that unit could be determined, or provided costs only on opportunistic infections, tuberculosis (except as packaged with HIV interventions), or commodities (unless they included the cost for procurement, shipping, insurance and/or social promotion). In cases where a determination could not be made from the abstract, the full article was reviewed to determine inclusion. Conference presentations, posters, and PowerPoint presentations were additionally excluded.

For the second stage, articles on treatment for HIV/AIDS identified separately by the London School of Hygiene and Tropical Medicine were reviewed, and added to the unit cost database if the inclusion criteria were met. Finally, the third stage began in early 2013 to perform an updated literature search through PubMed, POPLINE, HIV InSite, and Google using all key terms from the first stage search for prevention, and additional keywords for antiretroviral therapy and HIV care and support, including "antiretroviral", "cotrimoxazole", "nevirapine", "HAART", "pediatric", "first line", "second line", "treatment" and "home based care." The time frame included the years 1990-2013. The search was also expanded to include articles in French and Spanish.

Due to the diversity in unit costs for HIV interventions [Menzies 2012] and the need for policy makers to have an easy way to compare unit costs confidently, we developed a quality review instrument concurrently with the literature review [DeCormier Plosky 2012]. Through this instrument, a score of 0 to 80 is assigned to each article included in the unit cost database to give a sense of how completely the factors affecting unit costs are reported by the author(s). The structure of the quality review instrument was based upon a template developed by *Beck et al.* for reviewing HIV/AIDS treatment studies [Beck 2010], other quality reviews of economic evaluations [Drummond 1996, Evers 2005], and peer reviewer comments regarding the categories of information that should be captured by the unit cost database. Thus, the indicators presented by *Beck et al.* such as "geographical settings covered", "data client sample size", "source of cost data" and "patient characteristics reported" were augmented by indicators such as whether a study clearly describes the: year that the cost data were gathered; currency that was used; service delivery sector and location; duration of follow-up; depreciation rates used; existence of donated goods and services; existence of user fees; HIV prevalence in the area and/or target population; whether economies of scale are calculated; and external factors such as losses in funding or police raids that would affect program functioning and hence cost.

Results

In total, 9515 abstracts were reviewed and 299 articles were read. Of these, 121 studies on HIV prevention, treatment, and care were included in the unit cost database in the first two stages of the literature review process, and a further 38 articles were selected for inclusion during the third stage, for a total of 159 articles. In the unit cost database, each article was divided into multiple entries if cost information was reported for multiple: (1) countries, (2) categories of intervention, (3) target populations, (4) sectors, and/or (5) (if pertinent to variability in cost) delivery locations, for a total of 329 entries. The results presented below for the availability of cost data by different characteristics are based on the multiple entries provided by the 159 studies. Thus the number of entries provided by each study varies; the exception to this is for costing studies with time series data, which is entered by study. For example, when a study reports results for more than one country, there are database entries for each country, which is why there are 159 studies but there are 165 countries represented. In addition, interventions are considered to be “separate” within the same study if applied to separate key populations and costed individually. For example, if a study combines target groups under a single cost (as in the case of adult and pediatric antiretroviral therapy (ART)), the intervention is considered to be in the joint category adult/pediatric ART. As other examples, a study reporting results for outreach interventions targeting sex workers (SW), men who have sex with men (MSM), and people who inject drugs (PWID) would be considered three interventions, while a study that examines costs separately for voluntary counseling and testing (VCT) and STI management - both targeted to the general population - would be considered two different interventions and entered individually in the database.

The regional diversity of HIV intervention studies in low and middle income countries continues to be skewed heavily toward sub-Saharan Africa and, to a lesser extent, Asia (see Table 1). Sub-Saharan Africa was the setting for 71 percent of the 165 countries studied by the authors of the included articles, and Asia was the setting for 19 percent of the entries. Latin America and the Caribbean, Eastern Europe and Central Asia, and the Middle East and North Africa accounted for eight percent, two percent, and 0.6 percent of the entries, respectively. At a country level, entries for South Africa represented 31 percent of all of the entries for the countries in the sub-Saharan Africa region, and 22 percent of the entries for all of the countries in the data set. India represented 46 percent of the entries for all of the Asia countries, and eight percent of the entries for all of the countries in the data set. Brazil, Haiti, and Mexico were the setting for three studies each, accounting for 69 percent of the 13 entries for Latin America and Caribbean and five percent of the entries for all of the countries in the data set.

Table 1: Distribution of countries by region

<i>Region</i>	<i>Percentage</i>
Sub-Saharan Africa	71%
Asia	19%
Latin America and Caribbean	8%
Eastern Europe and Central Asia	2%
Middle East and North Africa	0.6%

The studies are fairly evenly divided when organized by the different income level classifications of the World Bank (upper-middle income, lower-middle income, and low income (see Table 2)). Upper-middle income countries accounted for 36 percent of the entries for all of the countries represented in the database, lower-middle income countries accounted for 27 percent, and low income countries accounted for 37 percent. Note that South Africa and Mexico alone account for 66 percent of the studies for the upper-middle income countries in the database. The other two income levels have more diverse representation, particularly the low-income countries, which have 16 different countries reporting intervention costs. In terms of the HIV epidemic category, 72 percent of the entries in the data set are from countries where the HIV epidemic is generalized (greater than one percent in the general population), 24 percent of the entries are from countries where the epidemic is concentrated among key populations, and the remaining four percent of the entries are from countries where the epidemic is limited primarily to PWID.

Table 2: Distribution of countries by income level classification and HIV epidemic type

<i>Income classification/ HIV epidemic type</i>	<i>Percentage</i>
Upper-middle income	36%
Lower-middle income	27%
Low income	37%
Generalized HIV epidemic	72%
Concentrated HIV epidemic	24%
PWID HIV epidemic	4%

Examining the database by intervention category changes the unit of observation from number of countries to number of interventions. We define interventions as unique if they serve different populations, but not if they use different service delivery modes or providers, resulting in a total of 219 interventions. The interventions reported in the database articles included in this review are clustered primarily in basic programme activities for HIV prevention, treatment, and care. These include interventions for prevention such as: behavior change, condom promotion and distribution, drug substitution for PWID, voluntary medical male circumcision (VMMC), and outreach to key populations such as SW, MSM, and PWID. Basic programme activities for treatment, care, and support include adult pre-ART (care and treatment of opportunistic infections), adult ART (mono or dual therapy, first line HAART, second line HAART), pediatric pre-ART, pediatric ART, PMTCT, combined TB/HIV treatment, home based care (either through workers connected to a health facility, or through volunteers/family based in the community), orphan support, and other support services (such as nutrition, clean water, and patient retention). Under this structure, of the 219 interventions, 68 percent are in basic programme activities (see Table 3). Within the subcategory of basic programme activities, 38 percent report results for prevention activities, 54 percent report costs for treatment activities, and 8 percent are for care and support. Within the basic prevention programme activities, 49 percent of the interventions are for outreach to key populations, 35 percent are for VMMC, nine percent are for condom promotion, five percent are for drug substitution, and two percent are for behavior change.

Within the basic treatment interventions, 64 percent are for adult ART and 18 percent for adult pre-ART, four percent are for pediatric ART, one percent is for pediatric pre-ART, 13 percent report results for PMTCT, and one percent pertain to TB treatment for HIV patients. Among the few entries for interventions concerning basic care and support, 58 percent are for home based care, eight percent are for orphan care, and 33 percent are for other care and support services such as pediatric nutritional support, clean water for diarrhea prevention, patient retention services, and intensified case finding for TB.

Table 3: Distribution of interventions by intervention type

<i>Intervention type</i>	<i>Percentage</i>	<i>Percentage of Basic programme activities</i>	<i>Percentage of subtotal</i>
Basic programme activities	68%	100%	
Prevention		38%	100%
Key population outreach			49%
Voluntary medical male circumcision			35%
Condom promotion			9%
Drug substitution			5%
Behavior change			2%
Treatment		54%	99%
Adult ART			64%
Pre-ART			18%
Pediatric ART			4%
Pediatric Pre-ART			1%
PMTCT			13%
TB/HIV			1%
Basic care and support		8%	100%
Home-based care			58%
Orphan care			8%
Other support (nutrition, clean water, patient retention, intensified case finding)			33%
Critical enablers	20%		100%
HCT			70%
Community mobilization			16%
Mass media			14%
Development synergies	12%		100%
Management of STIs			50%
Youth-focused (school-based)			15%
Blood safety			12%
“Bundled” (combined)			12%

Post-rape care			8%
Prevention of GBV			4%

Unit costs are available in the literature for markedly fewer programs classified as critical enablers or development synergies that support the success of basic programme activities. Critical enablers can be implemented within the political or legal arena, or can draw general population support for the prevention and treatment of HIV through mass media or community mobilization. They may also be logistical and managerial interventions such as communication, procurement, and research.

Development synergies consist of programs across sectors such as education and social protection, which work together to fight the HIV epidemic. Among the 219 interventions included in the database studies, 20 percent are considered critical enablers and 12 percent are classified under the category of development synergies. The critical enablers are primarily counseling and testing interventions (both voluntary and provider-initiated), but there are also small percentages of entries for community mobilization and mass media. These comprise 70 percent, 16 percent, and 14 percent of the critical enabler group, respectively. Interventions under the development synergies category consist of management of STIs (50 percent), youth focused (school-based, 15 percent), blood safety (12 percent), “bundled” (combined) service (12 percent), post-rape care (8 percent), and prevention of gender-based violence (GBV) interventions (4 percent).

Of the 159 studies that are summarized in the database, only 47, or about 30 percent, also calculate cost-effectiveness ratios (see Table 4). Since some studies only calculate cost-effectiveness ratios for some of the interventions, while others calculate cost-effectiveness ratios across interventions, we will use the number of studies here as the unit of observation. Note that the denominator of the various cost-effectiveness ratios that are calculated vary by intervention; for example, the denominator for the cost-effectiveness ratio for a PMTCT intervention might be infant HIV infections averted, while the denominator for the cost-effectiveness ratio for counseling and testing might be the number of people completing the counseling sequence. Basic programme activities account for the vast majority of the studies that calculate cost-effectiveness ratios, 38 studies or 81 percent, split fairly evenly between studies examining Prevention interventions (42 percent) and Treatment interventions (39 percent). Three-quarters of the Prevention intervention studies calculating cost-effectiveness ratios are either for voluntary medical male circumcision (44 percent) or key population outreach interventions (31 percent), with the remaining 25 percent consisting of drug substitution interventions (13 percent), and condom promotion and behavior change (six percent each). The remaining 18 percent of the studies in Basic programme activities are studies examining interventions in Basic care and support, with over half of these in the home-based care sub-category (57 percent), followed by other types of support (29 percent) and finally orphan care (14 percent). There are six studies in the category of Critical enablers, accounting for 13 percent of the total studies in the database that calculate cost-effectiveness ratios. The vast majority of these studies are for various permutations of counseling and testing interventions, including provider-initiated counseling and testing, voluntary counseling and testing, and HIV counseling and testing (83 percent). There is one community mobilization study, or 17 percent of the Critical enabler category, that measures cost-effectiveness. Finally, there are three studies, or six percent of the

total number of studies that measure cost-effectiveness, in the Development synergies category, consisting of two studies measuring the cost-effectiveness of STI management (67 percent of the sub-category), and one study measuring the cost-effectiveness of blood safety (33 percent of the sub-category).

Table 4: Distribution of interventions with cost-effectiveness information by intervention type

<i>Intervention type</i>	<i>Percentage</i>	<i>Percentage of Basic programme activities</i>	<i>Percentage of subtotal</i>
Basic programme activities	81%	100%	
Prevention		42%	100%
Key population outreach			31%
Voluntary medical male circumcision			44%
Condom promotion			6%
Drug substitution			13%
Behavior change			6%
Treatment		39%	100%
Adult ART			47%
Adult Pre-ART			7%
Pediatric ART			7%
Pediatric Pre-ART			0%
PMTCT			33%
TB/HIV			7%
Basic care and support		18%	100%
Home-based care			57%
Orphan care			14%
Other support (nutrition, clean water, patient retention, intensified case finding)			29%
Critical enablers	13%		100%
HCT			83%
Community mobilization			17%
Mass media			0%
Development synergies	6%		100%
Management of STIs			67%
Youth-focused (school-based)			0%
Blood safety			33%
“Bundled” (combined)			0%
Post-rape care			0%
Prevention of GBV			0%

The populations targeted by the interventions of the included studies are diverse, ranging from orphan school girls to truckers. The majority of studies, however, target the general population, and a number of key populations are under-represented. Within all of the prevention studies, that is, across all three categories of interventions of basic programme activities, critical enablers, and development synergies, 39 percent of the 127 interventions are targeted to the general population (see Table 5). This is largely because testing and counseling makes up a quarter of the studies detailing cost data of prevention interventions, and nearly all of those are targeted to the general population. Adolescent and adult males also have a relatively high percentage of studies with cost information for interventions targeting them, 13 percent, all of which are VMMC. Within the category of VMMC, 80 percent of the costs provided are for adult and adolescent males, while only 15 percent are for infant males. The primary population targeted by the one remaining study for VMMC is health professionals, as the intervention is to train health professionals on VMMC using a male penile model. Youth are fairly well represented in the database, with cost data available in 12 percent of prevention interventions. Note that the majority of these are interventions such as outreach and school-based programs that are specifically designed for youth; in programs such as STI management, counseling and testing, and mass media there are only four interventions targeting youth. Interventions targeting MSM, truck drivers, employees in the workplace, prisoners, transgenders, migrant laborers, and street children each constitute two percent or less of the interventions that have been costed. Of the 80 interventions in the treatment category, 83 percent are directed towards the general population (adults), five percent are providing treatment to children, and 13 percent are focused on pregnant women. Among the 12 interventions in care and support, 83 percent are targeted to the general population, while children and orphans each account for eight percent of the care and support interventions.

Table 5: Distribution of interventions by primary target population

<i>Primary population</i>	<i>Prevention interventions</i>	<i>Treatment interventions</i>	<i>Care and support interventions</i>
Adolescent and adult females	3%	0%	0%
Adolescent and adult males	13%	0%	0%
Children	0%	5%	8%
Employees (workplace)	2%	0%	0%
General	39%	83%	83%
Health professionals	1%	0%	0%
Infant males	2%	0%	0%
Men who have sex with men	2%	0%	0%
Migrant laborers	1%	0%	0%
Orphan	0%	0%	8%
People who inject drugs	7%	0%	0%
Pregnant women	0%	13%	0%
Prisoners	2%	0%	0%

Sex workers	13%	0%	0%
Street children	1%	0%	0%
Transgender	1%	0%	0%
Truck drivers	2%	0%	0%
Youth	12%	0%	0%

Examining the interventions by type of provider is problematical, as the type of provider is not clearly stated for a large number of studies. Some authors only give the name of the facility, or state that the intervention is in the interest of “public” health. Where possible, facilities were looked up on Google to determine if the provider was public, private, or a non-governmental organization (NGO). All faith-based organizations are assigned to the NGO category, given that the costs and management structures for faith-based organizations are more similar to NGOs than to private organizations. The type of provider was divided for the purposes of this review into six categories: public, private, NGO, the cost is averaged across sectors, the cost is given individually per sector, and the sector is unknown. Each study was assigned to one of the sector categories. The public sector provided service delivery for 38 percent of the studies, while the NGO sector accounted for 21 percent of the studies and the private sector supplied services in three percent of the studies (see Table 6). Services were provided across multiple sectors in 12 percent of the studies, by individual sector in eight percent of the studies, while the sector was unknown for 18 percent of the studies.

Table 6: Distribution of interventions by provider type

<i>Provider type</i>	<i>Percentage</i>
Total	100%
Public	38%
Private	3%
NGO	21%
Across sectors	12%
Individual sector	8%
Unknown	18%

Service delivery location, encompassing any place that an HIV intervention is “held”, including media such as television or radio, was even more difficult to ascertain. When the costs reported by the studies are disaggregated by intervention category, target population, country, type of provider, and unit of measurement, there are 329 data entries. Please note that service delivery location was tracked by where and/or how (in the case of mass media) the services were received as stated by the author, and that some entries are for services received in multiple locations. In addition, for health facilities, if a service is reported to be given in a “clinic” for the service delivery location, it is often unclear what the author(s) means by that. It could mean a variety of sites, including a stand-alone clinic or a clinic attached to a facility such as a hospital or prison. The same is true for studies that give the service delivery location as a “hospital,” as it is not clear if the term hospital is meant to be for patients that get services only on a ward or could also include patients that receive services through a hospital clinic. The articles were reviewed carefully to determine the size of the facility, but very few studies give a bed capacity, location (provincial, district), or type (secondary, tertiary). In addition, although a study may

state that a facility is in a certain province, this does not necessarily indicate what portion of the province it serves. For example, for the 71 entries classified under “clinic,” only five give identifying information on the level of the clinic (see Table 7). In general, the majority of interventions are conducted through hospitals or clinics. If one were to look specifically at the service delivery of “clinic” alone (i.e. not clinic and hospital), 21 percent of the entries are for “clinic.” Other locations that account for a significant number of entries include services received in hospitals (16 percent), hospital clinics (nine percent), health centers (five percent), home (five percent), and two percent in mobile clinics (such as vans), mobile-site clinics (where staff from central base set up at community centers, churches, homes, and in tents), and semi-mobile container clinics (where the container is brought on a truck, and dropped somewhere). There have been some interesting service delivery locations from newer studies that report costs when services are delivered through text message (n=2), prison clinics (n=1), and dispensaries/pharmacies (n=2). The service delivery location could not be determined in 17% of the entries (see Table 7).

Table 7: Distribution of database entries by service delivery location

<i>Service delivery location</i>	<i>Percentage</i>	<i>Number</i>
Bars	0.3%	1
Billboards	0.3%	1
Brothel	0.3%	1
Cell phone (standard messaging service)	0.6%	2
Church clinic	0.3%	1
Clinic	20.7%	68
Clinic, Hospital	2.4%	8
Clinic, Hospital clinic	0.9%	3
Clinic, mobile clinic	0.3%	1
Commercial outlet	0.3%	1
Community	1.8%	6
Community, clinic	0.3%	1
Dispensary (Pharmacy)	0.6%	2
DREAM center	0.3%	1
Drop-in center (for PWID)	0.3%	1
Drop-in center, Mobile clinic	0.3%	1
Health center	5.2%	17
Health center, Hospital	3.0%	10
Home	5.2%	17
Home, Hospital	0.3%	1
Home, School	0.3%	1
Hospital	16.4%	54
Hospital clinic	9.4%	31
Hospital, Health center, Clinic	0.3%	1
Hospital, Hospital clinic, Clinic	0.6%	2

Hospital, Mobile clinic	0.3%	1
Laboratory	0.9%	3
Magazines	0.3%	1
Mobile clinic	1.5%	5
Mobile-site clinic	1.8%	6
Peer distribution, clinic	0.3%	1
Prison clinic	0.3%	1
Radio	0.3%	1
School	1.8%	6
School, Athletics (athletics location unknown)	0.6%	2
School, Community	0.6%	2
School, Community, Clinic	0.6%	2
Semi-mobile container clinic	0.3%	1
Street	0.6%	2
STI clinic	0.3%	1
Syringe-exchange point	0.6%	2
Television	0.9%	3
Unknown	17.0%	56

A majority of the studies in the database utilize a provider perspective in reporting costs, with 42 percent of the studies reporting from the provider perspective only, and another 14 percent reporting from both a provider and patient perspective. It is interesting to note that of the 159 studies in the database, only 21 percent gathered costs from the patient’s perspective. The expenses paid by patients that were collected range from simple user fees to comprehensive accounting of costs for clinic visits, medicines, laboratory tests, travel, food, medical supplies, faith healers, and lost work time (for the patient and/or the caregiver). It can be difficult to interpret if the cost perspective given in a study is from the health system perspective, due to limitations in providing cost-breakdowns, a description of the items included in a cost category such as “recurrent costs”, and/or suitable intervention description. Only one study gives thorough detail on the cost of supply chain management and wastage [Edgil 2011], and there is also only one study [McMennamin 2005] that describes costs borne by international donors.

Table 8: Distribution of studies by costing perspective

<i>Costing perspective</i>	<i>Percentage</i>
Total	100%
Provider	42%
Patient	7%
Provider and patient	14%
Health system	6%
Health system, provider and patient	1%
Unknown	27%

There are very few studies that report actual economies of scale in the HIV intervention unit cost literature, although some do estimate economies of scale based on cross-sectional data. Of the 159 studies in the database, only 12 percent give an actual unit cost for more than one period of time, while two percent give a modeled unit cost over time based upon primary source data for the first year. Within the 12 percent of studies that have unit costs collected from the intervention over time, 68 percent follow the study participants for more than one year and clearly report the cost on an annual basis. Another 16 percent follow the participants for more than one year, but report costs only as the original cost year and “scale-up” or “following years,” so it is difficult to utilize these data to estimate economies of scale. Further, there are difficulties in applying the time series data that are reported. For example, due to the lack of reporting concerning the program start year and costing of the programs, it can be difficult to determine if the first year that is reported is actually “Year 1” of the program. In addition, note that additional factors beyond the maturity of the program can affect the unit cost. These factors include the illness level of the patients, the receptiveness among the population to the intervention, the ease with which additional participants can be reached, whether or not task shifting occurs during the timeframe of the costing, and losses of funding and/or participation of a subset of facilities for a period of time during the time the cost data were collected. Of the total set of studies, 31 percent (n=49) discuss economies of scale, although to varying degrees. This includes direct observation of cost as related to participant numbers or test volumes, modeled estimates of economies of scale with increasing coverage that are based on the actual costs observed, and qualitative commentary regarding possible reduction in quality of services as coverage increases due to limited human and facility resources.

Several studies of the 159 studies that are included in the database use a terminology similar to “integrating HIV services with other services” in the title, but only two actually measure the cost of integrating services as compared to providing a single service in isolation, and each study has its limitations. *Tran et al.* (2012) models the cost providing ART alone, providing ART and methadone maintenance therapy (MMT) in separate sites, and integrating ART and MMT with direct administration. The information for the model parameters is based principally on data collected by the author at study sites and through the Ministry of Health, but some parameters are from secondary studies. The second study examines the integration of reproductive health (RH) services and VCT in a single site [Das et al. 2010]. The cost is reported by the total cost *per visit* for VCT only (total cost for VCT-only visits/number of VCT-only visits) or per visit for VCT and RH together in the same visit (total cost for VCT and RH visit/total number of visits for VCT and RH). A study by *Kahn et al.* (2011) gives both the cost of a complete program integrating diarrhea and malaria prevention with VCT, and the cost of the VCT portion of the program, but the study does not compare the cost of VCT as a stand-alone service against that of the integrated service. A final study reports only the cost of providing an integrated program at a single site to train care providers, provide care, treatment (STI, emergency contraception, and post-exposure prophylaxis (PEP)), mental health counseling, and data recording for legal purposes [Kilonzo 2009]. Although this program draws on expertise and departments across health services, it does not

provide any comparison cost for the provision of a single component (such as PEP) of the integrated package in isolation.

There is not a great deal of information regarding programme-level costs, that is, costs that are above the facility, which include costs at the district, province, national and international levels. In addition to the paucity of actual data, there are also uncertainties surrounding the definitions of these costs used by study authors. For example, a study may state that “central administrative costs” were gathered, but does not state clearly the definition of “central.” We have assumed that authors are applying the various definitions and terms correctly; even with this generous assumption, only 11 of the 159 studies in the database, or seven percent, mention some kind of programme-level cost (see Table 9).

Table 9: Distribution of studies by availability of programme-level costs

<i>Level</i>	<i>Number of studies</i>
Total	11
Central	6
District	1
National	1
International	1
District, International	1
National, International	1

Of the 11 studies with some kind of programme-level cost reported, six studies report some kind of central-level cost, one study reports a district-level cost, one study reports a national-level cost (which may or may not be the same category as central-level), one study reports both district-level and international-level costs, while one study reports both national-level and international-level costs. Given the extent to which programme-level costs can impact the costs of an intervention, it is important that future data collection efforts attempt to include programme-level costs.

The quality review described above was undertaken for the prevention articles identified in stage one of the literature review. The scores for the 56 articles reviewed ranged from a low score of seven to a high score of 59, with an average score of 38. Of the 56 articles, 18 percent scored above 50 and 16 percent scored below 25. Major problems with the studies included (1) poor intervention description, (2) a lack of reporting as to the year for currency and the exchange rate, (3) no description of the donated items that were included in economic costs, (4) no description of the study population, (5) opacity in the costing methodology, (6) limiting the costing to one facility, (7) a lack of cost breakdown between categories such as personnel and recurrent items, and (8) not reporting the year(s) the study was conducted. This last problem is very surprising; despite undergoing a peer review process for most studies, 13 of the 159 articles included in the full review do not even give a year during which the costing was done, or a context from which the year could be guessed. Note that the scoring instrument will need to be adapted in order to perform a quality review of the treatment, care, and support articles identified in stages two and three of the literature review. Since unit costs for treatment, care and support can vary considerably depending on a variety of factors, including the drug regimens provided, if

pediatric patients are included in the sample, the stage of illness of the patients, whether outpatient and/or inpatient services are considered, if tuberculosis testing and treatment are included, the maturity of the program, and the type of personnel rendering the care [Menzies 2012], these factors will have to be accounted for when performing quality reviews. It is important, however, to complete these reviews, in order to facilitate the interpretation of available unit cost data in the policy planning and resource needs estimation process for HIV interventions in developing countries, and to contribute toward guiding published scholarship in this area.

Discussion

The studies currently available in the costing literature for HIV prevention, treatment, and care give valuable information for the purposes of policy planning and funding. There are an increasing number of countries, interventions, and populations represented by the studies and new ways of thinking about how services can be delivered. However, there are also significant gaps that need to be filled in to more comprehensively support the planning process for HIV interventions at all levels. Regional diversity continues to be limited by a lack of studies in Latin America and the Caribbean, Eastern Europe and Central Asia, and in the Middle East and North Africa. Within regions, there is also a lack of diversity. The two regions with the largest representation, sub-Saharan Africa and Asia, are weighted heavily by studies in South Africa and India. This is particularly important not only in trying to get a range of unit costs across countries and settings, but also to get greater specificity in costs that policy makers will want to use in particular settings. For example, interventions were costed in only three Eastern European countries, which impacts the ability to draw conclusions about the cost of providing programs for people who inject drugs, both within Eastern Europe and Central Asia, and in other countries that seek to address HIV prevention through a reduction in injection drug use or associated risk behavior. Further, South Africa is an upper middle income country and India is a lower middle income country with rapid GDP growth. Therefore, the costs for HIV services in these countries, particularly inpatient care, may be much higher and not representative for many countries.

The range of interventions that have published unit cost data is also of concern. A large majority of studies are in the basic programs of PMTCT, key population outreach (including drug substitution), condom promotion, treatment and care, voluntary medical male circumcision, and behavior change. And, within the basic programs category, the majority of studies focus on PMTCT and treatment specifically. Cost analysis of care and support for people living with HIV and their families and drug substitution for people who inject drugs are particularly neglected. Interventions within the categories of critical enablers and development synergies are not well represented in the cost literature, which is difficult for trying to understand the true cost it will take to make an intervention or program successful. As has been seen with the attempt to implement VMMC programs, for example, acceptance is a large part of the battle. In addition, interventions such as post-rape care that require cooperation across sectors have few data in the HIV costing literature upon which program planners can draw.

Although it is important to evaluate interventions in terms of both cost and effectiveness, only 30 percent of the studies in the database calculate cost-effectiveness ratios. The same concentration of effort in certain areas noted above occurs here, as well. The majority of the studies (81 percent)

examine interventions in the basic programmes category, split fairly evenly between prevention and treatment at 42 percent and 39 percent respectively. Within each of the categories, however, two intervention types account for three-quarters of the studies: in prevention, the two interventions are key population outreach (31 percent) and VMMC (44 percent), while in treatment, the two interventions are adult ART (47 percent) and PMTCT (33 percent). More studies are needed to fill in the apparent gaps here, as well.

Conclusions regarding disaggregations in the cost information available by type of service provider and program-level are difficult to make, given limitations in how authors report the setting, intervention, and items included in cost totals. Terminology for service delivery location is not standardized, and few studies give an indication about at which level a given facility operates. To the best that we can determine, the costing literature is primarily conducted in the health sector and focuses upon facility-based costs. Given that the HIV epidemic can't be confronted in the public sector alone, and requires extensive health system and international-level management and support, these gaps should be urgently addressed. Further, high costs to the patient affect program recruitment and retention, not to mention affecting people and families already living in difficult circumstances, and as such should be obtained more frequently.

Few studies provide information on changing unit costs over time or economies of scale, and those that do need to be interpreted with caution. Without the context of how long a country and facility/program have been providing the type of service being costed and the intervention in particular, it is difficult to understand what the actual "maturity" of the intervention is. Also, patient populations and morbidity levels may be quite different between studies, and thus patients on the first year of ART in a study with an average CD4 count of 100 in the study group, for example, may require more expensive inpatient care and drug regimens. Economies of scale may not correlate directly with changes in cost, due to issues such as the cost difference in reaching various target populations, and should be considered in the context of how quality of services would be affected.

There are several limitations to this study. Although very few articles were found with keywords other than "cost" and "HIV", it is possible that the additional keywords used to describe all prevention and treatment interventions did not capture some studies, particularly those in the areas of critical enablers and development synergies. A full search of grey literature such as studies by WHO regional offices, PEPFAR and USAID was not conducted, and may yield more information on unit costs for HIV prevention, treatment, care and support. In addition, by analyzing the number of interventions through selection for intervention type and provision to specific populations within each study, there may be a small underestimation of the number of interventions where the category of intervention and population served are the same in a particular study but the unit of measurement (such as home based care through cell phone messaging and home based care through peer support) or service delivery location is different. However, sorting by all categories possible (including service provider) where costs were given separately by authors would greatly overestimate the number of interventions. The results are broken out as faithfully to the information provided by the authors, and as comprehensively for the needs of policy makers and program planners, as possible.

Conclusion

The information base for unit cost data on HIV prevention, care, and treatment interventions is substantial, but with some gaps. These gaps are mainly prominent in analysis of countries outside of South Africa and India, in interventions outside of outreach to key populations and HIV treatment, costing above the facility level, and measuring the costs of programs over a period of time greater than one year. It is hoped that with greater standardization of cost methodology and reporting, in addition to more awareness of the areas in which unit costs are needed, the information base for costs of providing HIV services will become more complete, inclusive, and functional. With limited resources to devote to HIV services, cost plays a large role in the determination of what services can be provided and who they can be provided for. Accurate unit cost data will enable program planners at all levels to better make these difficult decisions.

BIBLIOGRAPHY

Afriandi I, Siregar AYM, Meheus F, Hidayat T, van der Ven A, van Crevel R, Baltussen R. "Costs of hospital-based methadone maintenance treatment in HIV/AIDS control among injecting drug users in Indonesia." *Health Policy*. 2010; 95:69-73.

Aliyu HB, et al. "What is the cost of providing outpatient HIV counseling and testing and antiretroviral therapy services in selected public health facilities in Nigeria?" *Journal of Acquired Immune Deficiency Syndrome*. 2012; 61(2): 221-225.

Ama NO, Seloilwe ES. "Estimating the cost of care giving on caregivers for people living with HIV and AIDS in Botswana: A cross-sectional study." *J Int AIDS Soc*. 2010; 13:14.

Apanga s, Punguyire D, Adjei G. "Estimating the cost to rural ambulating HIV/AIDS patients on highly active antiretroviral therapy (HAART) in rural Ghana: A pilot study." *Pan African Medical Journal*. 2012; 12: 21.

Aracena-Genao B, Navarro JO, Lamadrid-Figueroa H, Forsythe S, Trejo-Valdivia B. "Costs and benefits of HAART for patients with HIV in a public hospital in Mexico." *AIDS*. 2008; 22 (suppl 1): S141-S148.

Barton GR, Fairall L, Bachmann MO, Uebel K, Timmerman V, Lombard C, Zwarenstein M. "Cost-effectiveness of nurse-led antiretroviral treatment in South Africa: pragmatic cluster randomized trial." *Tropical Medicine and International Health*. 2013.

Bassett I, Giddy J, Nkera j, Wang B, Losina E, Lu Z, Freedberg KA, Wallensky RP. "Routine voluntary HIV testing in Durban, South Africa: The experience from an outpatient department." *J Acquir Immune Def Syndr*. 2007; 46(2): 181-186.

Bautista-Arredondo S, Dymtraczenko T, Kombe G, Bertozzi S. "Costing of scaling up HIV/AIDS treatment in Mexico." *Salud Publica Mex*. 2008; 50 Suppl 4: S437-S444.

Beauliere A, Toure S, et al. "The financial burden of morbidity in HIV-infected adults on antiretroviral therapy in Côte d'Ivoire." 2010. *PLoS ONE* 5(6): e11213. doi:10.1371/journal.pone.0011213.

Beck EJ, Miners AH, Tolley K. "The cost of HIV treatment and care: a global review." *Pharmacoeconomics*. 2001; 19: 13-39.

Beck EJ, Harling G, Gerbase S, Delay P. "The cost of treatment and care for people living with HIV infection: implications of published studies, 1999-2008." 2010. *Current opinion in HIV and AIDS*. 2010; 5:215-224.

Beck EJ, Fasawe O, Ongpin P, Ghys P, Avilla C, De Lay P. "Costs and cost-effectiveness of HIV community services: Quantity and quality of studies published 1986-2011." *Forthcoming*.

Bikilla AD, Jerene D, Robberstad B, Lindtjorn B. "Cost estimates of HIV care and treatment with and without anti-retroviral therapy at Arba Minch Hospital in southern Ethiopia." *Cost Effectiveness and Resource Allocation*. 2009; 1-7.

"Binagwaho A, Pegurri E, Muita J, Bertozzi. ""Male circumcision at different ages in Rwanda: A cost-effectiveness study."" 2010; *PLoS Med* 7(1): e1000211.

doi:10.1371/journal.pmed.1000211."

Bollinger LA, Stover J, Musuka G, Fidzani B, Moeti T, Busang L. "The cost and impact of male circumcision on HIV/AIDS in Botswana." *Journal of the International AIDS Society*. 2009; 12(1):7.

Borghji J, Gorter A, Sandiford P, Segura Z. "The cost-effectiveness of a voucher scheme to reduce sexually transmitted infections in high-risk groups in Nicaragua." *Health policy and Planning*. 2005; 20(4):222-31.

Bratt J, Torpey K, Kabaso M, Gondwe Y. "Cost of HIV/AIDS outpatient services delivered through Zambian public health facilities." *Tropical Medicine and International Health*. 2010; 16(1): 110-118.

Burke HM, Pederson KF, Williamson NE. "An assessment of quality, cost, and outcomes for five HIV prevention youth peer education programs in Zambia." *Health Education Research*. 2012; 27 (2): 359-369.

Carrara V, Terris-Prestholt, Kumaranayake L, Mayaud P. "Operational and economic evaluation of an NGO-led sexually transmitted infections intervention: north-Western Cambodia." *Bulletin of the World Health Organization*. 2005; 83: 434 - 442.

Chandler R, Decker C, Nziyige B. "Estimating the Cost of Providing Home-based Care for HIV/AIDS in Rwanda." *PHRPlus*, June 2004.

Chandrashekar S, Guinness L, Kumaranayake L, Reddy B, Govindraj Y, Vickerman P, Alary M. "The effects of scale on the costs of targeted HIV prevention interventions among female and male sex workers, men who have sex with men and transgenders in India." *Sexually Transmitted Infections*. 2010; 86(Suppl 1): i89-i94.

Chandrashekar S, Vassall A, Reddy B, Shetty G, Vickerman P, Alary M. "The costs of HIV prevention for different target populations in Mumbai, Thane, and Bangalore." *BMC Public Health*. 2011; 11 (Suppl 6): 1-10.

Chang LW, Kagaayi J, Nakigozi G, et al. "Cost analyses of peer health worker and mHealth support interventions for improving AIDS care in Rakai, Uganda." *AIDS Care*. 2012; DOI:10.1080/09540121.2012.722600

Chiwevu C. "Costing of male circumcision in Zambia and the impacts of scaling up the male circumcision program." Unpublished.

Cleary S, Tshehlo R, Jouquet G, Makakole L. "Ensuring access to free HIV/AIDS care and treatment in Lesotho: a cost analysis of the decentralized HIV/AIDS programme in Scott Hospital health service area."

Cleary SM, McIntyre D, Boulle AM. "The cost-effectiveness of antiretroviral treatment in Khayelista, South Africa- a primary data analysis. *Cost Effectiveness and Resource Allocation*. 2006; 4(20):1-14.

Cobb G and Bland RM. "Nutritional supplementation: the additional costs of managing children infected with HIV in resource-constrained settings." *Tropical Medicine and International Health*. 2013; 18(1): 42-52.

Contreras-Hernandez I, Becker D, Chancellor J, Kuhne F, Mould-Quevedo J, Vega G, Marfatia S. "Cost-effectiveness of Maraviroc for antiretroviral treatment-experienced HIV-infected individuals in Mexico." *Value in Health*. 2010; 13(8): 903-914.

Dandona L, Kumar SGP, Ramesh YK, Chalapathi Rao M, Anod Kumar A, Marseille E, Kahn JG, Dandona R. "Changing cost of HIV interventions in the context of scaling-up in India." *AIDS*. 2008; 22 (suppl 1) : S33-S49.

Dandona L, Kumar SGP, Ramesh YK, Rao MC, Marseille E, Kahn JG, Dandona R. "Outputs, cost, and efficiency of public sector centres for prevention of mother to child transmission of HIV in Andhra Pradesh, India." *BMC Health Services Research*. 2008; 8:26.

Dandona L, Prem Kumar SG, Anil Kumar G, Dandona R. "Cost-effectiveness of HIV prevention interventions in Andhra Pradesh state of India." *BMC Health Services Research*. 2010; 10/117: 1-8.

Dandona L, Sisodia P, Prasad TLN, Marseille E, Chalapathi Rao M, Someshwar M, Kahn JG. "Cost and efficiency of public sector sexually transmitted infection clinics in Andhra Pradesh, India." *BMC Health Services Research*. 2005; 5(69).

Das R, Biswas K, Panda P, Khan ME, Homan R. "Strengthening financial sustainability through integration of voluntary counseling and testing services with other reproductive health services." 2007. Population Council, Frontiers, and USAID.

de Sousa Marques HH, Couttolenc BF, de Oliviera Latorre MdRD, de Aquino MZ, Aveiro MIG, Pluciennik AMA. "Costs of care provided in a university hospital for children exposed to or infected with the HIV/AIDS." *Cad. Saude Publica*. 2007; 23 (Suppl 3): S402-S413.

de Tolly K, Skinner D, Nembaware V, Benjamin P. "Investigation into the use of short messaging services to expand uptake of human immunodeficiency virus testing, and whether content and dosage have impact." *Telemedicine and e-Health*. 2012. Jan/Feb, 18(1):18-23.

Deghaye N, Pawinski RA, Desmond C. "Financial and economic costs of scaling up the provision of HAART to HIV-infected health care workers in KwaZulu-Natal." *South African Medical Journal*. 2006; 96(2): 140-143.

Denison JA, Tsui S, Bratt J, Torpey K, Weaver MA, Kabaso M. "Do peer educators make a difference? An evaluation of a youth-led HIV prevention model in Zambia schools." *Health Education Research*. 2012; 27(2): 237-247.

Desmond C, Franklin L, Steinberg M. "The prevention of mother-to-child transmission. Costing the service at four sites in South Africa." 2004. Health Systems Trust. Durban.

Dowdy DW, Sweat MD, Holtgrave DR. "Country-wide distribution of the nitrile female condom (FC2) in South Africa: a cost-effectiveness analysis." *AIDS*. 2006; 20:2091-2098.

Edgil D, Stankard P, Forsythe S, et al. "Voluntary medical male circumcision: Logistics, commodities, and waste management requirements for scale-up of services." 2011. *PLoS Med* 8(11): e1001128. doi:10.1371/journal.pmed.1001128.

Feely F, Bindels E, Rinke de Wit T, De Beer I. "Comparison of key unit costs and outcomes for mobile and fixed site screening/testing programs in Namibia." 2010. Unpublished.

Flanagan L. "Transfusion of blood safer than ever." *The Star*. Johannesburg. 07/15/08.

Forsythe S, Arthur G, Ngatia G, Mutemi R, Odhiambo J, Gilks C. "Assessing the cost and willingness to pay for voluntary HIV counseling and testing in Kenya." *Health policy and Planning*. 2002; 20(4):222-31.

Forsythe S, Mangkalopakorn C, Chitwarakorn A, Masvichian N. "Costs of providing sexually transmitted disease services in Bangkok." *AIDS*. 1998; 12 (suppl 2): S73-80.

Forsythe S. "Estimating the potential cost and impact of expanding male circumcision in Namibia." Health Policy Initiative, Task Order 1. 2010; Washington, DC: Futures Group, Health Policy Initiative, Task Order 1.

Fung ICH, Guinness L, Vickerman P, Watts C, Vannela G, Vadhvana J, Foss AM, Malodia L, Gandhi M, Jani G. "Modelling the impact and cost-effectiveness of the HIV intervention programme amongst commercial sex workers in Ahmedabad, Gujarat, India." *BMC Public Health*. 2007; 7:195.

Futures Institute. Unit cost database for HIV prevention and treatment at <http://policytools.futuresinstitute.org/UC/>.

Gerlach J, Sequeira M, Alvarado V, Cerpas C, Balmaseda A, Gonzalez A, de los Santos T, Levin CE, Amador JJ, Domingo GJ. "Cost analysis of centralized viral load testing for antiretroviral therapy monitoring in Nicaragua, a low-HIV prevalence, low resources setting." *Journal of the International AIDS Society*. 2012; 13: 43.

Gilson L, Mkanje R, Grosskurth H, Mosha F, Picard J, Gavyole A, Todd J, Mayaud P, Swai R, Fransen L, Mabey D, Mills A, Hayes R. "Cost-effectiveness of improved treatment services for sexually transmitted diseases in preventing HIV-1 infection in Mwanza Region, Tanzania." *Lancet*. 1997; 350: 1805-9.

Grabbe KL, Menzies N, Taegtmeier M, Emuluke G, Angala P, Mwega I, Musango G, Marum E. "Increasing access to HIV counseling and testing through mobile services in Kenya: strategies, utilization, and cost-effectiveness." *Journal of Acquired Immune Deficiency Syndrome*. 2010; 54: 317-323.

Gray RH, Li X, Kigozi G, Serwadda D, Nalugoda F, Watya S, Reynolds S, Wawar M. "The impact of male circumcision on HIV incidence and cost per infection averted: a stochastic simulation model from Rakai, Uganda." *AIDS*. 2007; 21: 845-850.

Guinness L, Arthur G, Bhatt SM, Achiya G, Kariuki S, Gilks CG. "Costs of hospital care for HIV-positive and HIV-negative patients at Kenyatta National Hospital, Nairobi, Kenya." *AIDS*. 2002; 16: 901-908.

Guinness L, Kumaranayake L, Rajamaran B, Sankaranarayanan G, Vannela G, Raghupathi P, George A. "Does scale matter? The costs of HIV-prevention interventions for commercial sex workers in India." *Bulletin of the World Health Organization*. 2005; 83: 747-755.

Guinness L, Vickerman P, Quayyum Z, Foss A, Watts C, Rodericks A, Azim T, Jana S, Kumaranayake L. "The cost-effectiveness of consistent and early intervention of harm reduction for injecting drug users in Bangladesh." *Addiction*. 2010; 105: 319-328.

Gupta I, Trivedi M, Kandamuthan S. "Recurrent costs of India's free ART program." In Haacker M and Claeson M (Eds) *HIV in South Asia: An economic development risk*. The World Bank. Washington DC. 2009.

Hansen K, Chapman G, Chitsike I, Kasilo O, Mwaluko G. "The cost of HIV/AIDS care at government hospitals in Zimbabwe." *Health Policy and Planning*. 2000; 15(4): 432-440.

Hansen K, Woelk G, Jackson H, Kerkhoven R, Manjonjori N, Maramba P, Mutambirwa J, Ndimande E, Vera E. "The cost of home-based care for HIV/AIDS patients in Zimbabwe." *AIDS Care*. 1998; 10(6): 751-759.

Harling G, Bekker LG, Wood R. "Cost of a dedicated ART clinic." *South African Medical Journal*. 2007; 97(8): 593-596.

Harling G, Wood R. "The evolving cost of HIV in South Africa." *Journal of Acquired Immune Deficiency Syndrome*. 2007; 45: 348-354.

Harrison A, Karim SA, Floyd K, Lombard C, Lurie M, Ntuli N, Wilkinson D. "Syndrome packets and health worker training improve sexually transmitted disease case management in rural South Africa: Randomized control trial." *AIDS*. 2000; 14: 2769-2779.

Hausler HP, Sinanovic E, Kumaranayake L, Naidoo P, Schoeman H, Karpakis B, Godfrey-Fausett P. "Costs of measures to control tuberculosis/HIV in public primary care facilities in Cape Town, South Africa." *Bulletin of the World Health Organization*. 2006; 84: 528-536.

HealthNet Consultant Ltd. "Cost of PEPFAR-funded interventions in Uganda: Community mobilization and abstinence and be faithful." 2010. Washington, DC. Futures Group, Health Policy Initiative, Task Order 1.

Hounton SH, Akonde A, Zannou DM, Bashi J, Meda N, Newlands D. "Costing universal access of highly active antiretroviral therapy in Benin." *AIDS Care*. 2008; 20(5): 582-587.

Hsu J, Zinsou C, Parkhurst J, N'Dour M, Foyet L, Mueller D. "Comparative costs and cost-effectiveness of behavioural interventions as part of HIV prevention strategies." *Health Policy and Planning*. 2012; 1-10.

Jaffar S, Amuron B, Foster S, Birungi, Levin J, Namara G, Nabiryo C, Ndembi N, Kyomuhangi R, Opio A, Bunnell R, Tappero JW, Mermin J, Coutinho A, Grosskurth H. "Rates of virological failure in a home-based vs. facility-based HIV-care model in Jinja, southeast Uganda: a cluster randomised equivalence trial." *Lancet*. 2009; 374(9707): 2080-2089.

Jan S, Ferrari G, Wattoo CH, et al. "Economic evaluation of a combined microfinance and gender training intervention for the prevention of intimate partner violence in rural South Africa." *Health policy and Planning*. 2011; 26: 366-372.

John FN, Farquhar C, Kiarie JN, Kabura MN, John-Stewart GC. "Cost-effectiveness of couple-counselling to enhance infant HIV-1 prevention." *International Journal of STD and AIDS*. 2008; 19(6); 406-409.

John KR, Rajagopalan N, Madhuri KV. "Brief communication: Economic comparison of opportunistic infection management with antiretroviral treatment in people living with HIV/AIDS presenting at an NGO clinic in Bangalore, India." *MedGenMed*. 2006; 8(4): 24.

Jouquet G, Bygrave H, Kranzer K, Ford N, Gadot L, Lee J, Hilderbrand K, Goemaere E, Vlahakis N, Trivino L, Makakole L, Cleary S. "Cost and Cost-Effectiveness of Switching From d4T or AZT to a TDF-Based First-Line Regimen in a Resource-Limited Setting in Rural Lesotho." *Journal of Acquired Immune Deficiency Syndromes*. 2011; 58(3): e68-74.

Kahn JG, Harris B, Mermin JH, Clasen T, Lugada E, Grabowsky M, Frandsen MV, Garg N. "Cost of community integrated prevention campaign for malaria, HIV, and diarrhea in Rural Kenya." *BMC Health Services Research*. 2011; 11:346.

Kahn JG, Marseille E, Auvert B. "Cost-effectiveness of male circumcision for HIV prevention in a South African setting." *PLoS Med*. 2006; Dec 3(12)e517: 2349-2358.

Kania D, Sangare L, Sakande J, Koanda A, Nebie YK, Zerbo O, Combassere AW, Guissou IP, Rouet F. "A new strategy to improve the cost-effectiveness of human immunodeficiency virus, hepatitis B virus, hepatitis C virus, and syphilis testing of blood donations in sub-Saharan Africa: a pilot study in Burkina Faso." *Transfusion*. 2009; 49: 2237-2240.

Kasymova N, Johns B, Sharipova B. "The costs of a sexually transmitted infection outreach and treatment programme targeting most at-risk youth in Tajikistan." *Cost Effective Resource Allocation*. 2009; Nov 3; 7:19.

Kevany S, Meintjes G, Rebe K, Maartens G, Cleary S. "Clinical and financial burdens of secondary level care in public sector antiretroviral roll-out setting (GF Jooste Hospital)." *South African Medical Journal*. 2009; 99: 320-325.

Khan A, Khan A. "Performance and coverage of HIV interventions for injection drug users: insights from triangulation of programme, field and surveillance data from Pakistan." *International Journal of Drug and Policy*. 2011; 22: 219-225.

Kigozi G, Nkale J, Wawer M, Anyokorit M, Watya S, Nalugoda F, Kagaayi J, Kiwanuka N, Mwinike J, Kighoma N, Nalwoga G, Nakigozi G, Katwalo H, Serwadda D, Gray R. "Design and usage of a low-cost penile model for male medical circumcision skills training in Rakai, Uganda." *Urology*. 2011; 77: 1495-1497.

Kilonzo N, Theobald SJ, Nyamato E, Ajema C, Muchela H, Kibaru J, Rogena E, Taegtmeier M. "Delivering post-rape care services: Kenya's experience in developing integrated services." *Bulletin World Health Organization*. 2009; 87: 555-559.

Kim JC, Askew I, Muvhango L, Dwane N, Abramsky T, Jan S, Ntlemo E, Chege J, Watts C. "Comprehensive care and HIV prophylaxis after sexual assault in rural South Africa: the Refentse intervention study." *BMJ*. June 27 2009; 338: 1559-1564.

Kinsman J, Kamali A, Kanyesigye E, Kamulegeya, Basajja V, Nakiyingi J, Schenk K, Whitworth J. "Quantitative process evaluation of a community-based HIV/AIDS behavioral intervention in Rural Uganda." *Health Education Research*. 2002; 17: 253-265.

Kioko U. "Estimating the costs and impacts of male circumcision in Kenya." 2010. Unpublished.

Kipp W, Konde-Lule J, Ruballe T, Okech-Ojony J, Alibhai A, Saunders DL. "Comparing antiretroviral treatment outcomes between a prospective community-based and hospital-based cohort of HIV patients in rural Uganda." *BMC International Health and Human Rights*. 2011; 11(Suppl 2): S12.

Kitajima T, Kobayashi Y, Chaipah W, Sato H, Chadbunchachai W, Thuennadee R. "Costs of medical services for patients with HIV/AIDS in Khon Kaen, Thailand." *AIDS*. 2003; 17: 2375-2381.

Koenig SP, Bang H, Severe P, et al. "Cost-effectiveness of early versus standard antiretroviral therapy in HIV infected adults in Haiti." 2011. *PLoS Med* 8(9): e1001095. doi:10.1371/journal.pmed.1001095

Koenig SP, Riviere C, Leger P, Severe P, Atwood S, Fitzgerald DW, Pape JW, Schackman BR. "The cost of antiretroviral therapy in Haiti." *Cost Effectiveness and Resource Allocation*. 2008; 6(3): 1-10.

Kombe G, Galaty D, Gadhia R, Decker C. "The human and financial resource requirements for scaling up HIV/AIDS services in Ethiopia." Bethesda, MD: The Partners for Health Reformplus Project, Abt Associates Inc. February 2004.

Kombe G, Galtay D, Nwagbara C. "Scaling up antiretroviral treatment in the public sector in Nigeria: A comprehensive analysis of resource requirements." Bethesda, MD: The Partners for Health Reformplus Project, Abt Associates Inc. February 2004.

Kumaranayake L, Vickerman P, Walker D, Samoshkin S, Romantzov V, Emelyanova Z, Zviagin V, Watts C. "The cost effectiveness of HIV preventive measures among injecting drug users in Svetlogorsk, Belarus." *Addiction*. 2004; 99: 1565-1576.

Kuznik A, Lamorde M, Sekavuga DB, Picho B, Coutinho A. "Medical male circumcision for HIV/AIDS prevention in Uganda- the cost of disposable vs. reusable circumcision kits." *Tropical Doctor*. 2012; 42: 5-7.

Lafort Y, Geelhoed D, Cumba L, Lazaro CDDM, Delva W, Luchters S, Temmerman M. "Reproductive health services for populations at high risk of HIV: Performance of a night clinic in Tete Province, Mozambique." *BMC Health Services Research*. 2010; 10/144: 1-9.

Larson B, Schnippel K, Ndibongo B, Long L, Fox MP, Rosen S. "How to estimate the cost of point-of-care CD4 ttesting in program settings: an example using the Alere Pima Analyzer in South Africa." 2012. *PLoS ONE* 7(4): e35444. doi:10.1371/journal.pone.0035444.

Larson BA, et al. "ART treatment costs and retention in care in Kenya: a cohort study in three rural outpatient clinics." *Journal of the International AIDS Society*. 2013; 16:18026

Leisegang R, Cleary S, Hislop M, Davidse A, Regensberg L, Little F, Maartens G. "Early and late direct costs in a South African antiretroviral treatment programme: A retrospective cohort analysis." 2009. *PLoS Med* 6(12): e1000189. doi:10.1371/journal.pmed.1000189.

Leiva A, Shaw M, Paine K, Manneh K, Mcadam K, Mayaud P. "Management of sexually transmitted diseases in urban pharmacies in the Gambia." *International Journal of STD and AIDS*. 2001; 12: 444-452.

Long L, Brennan A, Fox MP, Ndibongo B, Jaffray I, Sanne I, Rosen S. "Treatment outcomes and cost-effectiveness of shifting management of stable ART patients to nurses in South Africa: An observational cohort." 2011. *PLoS Med* 8(7): e1001055. doi:10.1371/journal.pmed.1001055.

Long L, Fox M, Sanne I, Rosen S. "The high cost of second-line antiretroviral therapy for HIV/AIDS in South Africa." *AIDS*. 2010; 24: 915-919.

Lopera MM, Einarson TR, Bula JI. "Out-of-pocket expenditures and coping strategies for people living with HIV: Bogotá, Columbia, 2009." *AIDS Care*. 2011; 23(12): 1602-1608.

Loubiere S, el Filal, KM, Sodqi M, Loundou A, Louchini S, Cleary S, Moatti JP, Himmich H. "When to initiate highly active antiretroviral therapy in low-resource settings: the Moroccan experience." *Antiviral Therapy*. 2008; 13: 241-251.

Marseille E, Giganti MJ, Mwangi A, Chisembele-Taylor A, Mulenga L, Over M, Kahn JG, Stringer JSA. "Taking ART to scale: Determinants of the cost and cost-effectiveness of antiretroviral therapy in 45 clinical sites in Zambia." 2012. *PLoS ONE* 7(12): e51993. doi:10.1371/journal.pone.0051993.

Marseille E, Kahn JG, Billingham K, Saba J. "Cost-effectiveness of the female condom in preventing HIV and STDs in commercial sex workers in South Africa." *Social Science and Medicine*. 2001; 52: 135-148.

Marseille E, Kahn JG, et al. "The cost-effectiveness of home-based provision of antiretroviral therapy in rural Uganda." *Applied Health Economic Policy*. 2009; 7(4): 229-243.

Marseille EA, Kevany S, Ahmed I, Feleke G, Graham B, Heller T, Kahn JG, Reyes M. "Case management to improve adherence for HIV-infected patients receiving antiretroviral therapy in Ethiopia: a micro-costing study." *Cost Effectiveness and Resource Allocation*. 2011; 9:18.

Martin G, Bollinger L, Pandit-Rajani T, Tshello R, Stover J. "Costing male circumcision in Lesotho and implications for the cost-effectiveness of circumcision as and HIV intervention." *USAID Health Policy Initiative*. September 2007.

Martin G, Bollinger L, Pandit-Rajani T, Tshello R, Stover J. "Costing male circumcision in Swaziland and implications for the cost-effectiveness of circumcision as and HIV intervention." *USAID Health Policy Initiative*. September 2007.

Martin G, Bollinger L, Pandit-Rajani T, Tshello R, Stover J. "Costing male circumcision in Zambia and implications for the cost-effectiveness of circumcision as and HIV intervention." *USAID Health Policy Initiative*. September 2007.

Martinson N, Mohapi L, Bakos D, Gray GE, McIntyre JA, Holmes CB. "Costs of providing care for HIV-infected adults in an urban, HIV clinic in Soweto, South Africa." *Journal of Acquired Immune Deficiency Syndrome*. 2009; 50 (3): 327-330.

McConnel CE, Stanley N, du Plessis J, Pitter CS, Abdullah F, Coovadia HM, Marseille E, Kahn JG. "The cost of a rapid-test VCT clinic in South Africa." *South African Medical Journal*. 2005; 95: 968-971.

McMennamin T, Fellow A, Fritsche G. "Cost and revenue analysis in six Rwandan health centres: 2005 costs and revenues." 2007. *USAID, Management Sciences for Health*.

Menzies N, Abang B, Wanyenze R, Nuwaha F, Mugisha B, Coutinho A, Bunnelli R, Mermin J, Blandford J. "The costs and effectiveness of four HIV and testing strategies in Uganda." *AIDS*. 2009; 23: 395-401.

Menzies NA, Berruti AA, Berzon R, Filler S, Ferris R, Ellerbrock TV, Blandford JM. "The cost of providing comprehensive HIV treatment in PEPFAR-supported programs." *AIDS*. 2011; 25: 1753-1760.

Meseret A. "Cost of PEPFAR-funded interventions in Ethiopia: abstinence, be faithful and community mobilization." 2010. Washington, DC. Futures Group, Health Policy Initiative, Task Order 1.

Meyer Rath G, Miners A, Santos AC, Variava E, Venter WDF. "Cost and resource use of patients on antiretroviral therapy in the urban and semiurban public sectors of South Africa." *Journal of Acquired Immune Deficiency Syndrome*. 2012; 61: e23-e32.

Miller T, Hallfors D, Cho Hyunsan, Luseno W, Waehrer G. "Cost-effectiveness of school support for orphan girls to prevent HIV infection in Zimbabwe." *Prev Sci*. 2013; DOI 10.1007/s11121-012-0315-0

Minh HV, Bach TX, Mai NY, Wright P. "The cost of providing HIV/AIDS counseling and testing services in Vietnam." *Value in Regional Health Issues*. 2012; 1: 36-40.

Mmopelwa G, Ngwenya BN, Cinha N, Sanders JPB. "Caregiver characteristics and economic cost of home-based care: A case study of Maun and Gumare villages in North West Diestric, Botswana." *Chronic Illness*. 2012; 9(1): 3-15.

Moon S, van Leemput L, durier N, Jambert E, Dahmane A, jie Y, Wu G, Philips M, Hu T, Saranchuck P. "Out-of-pocket costs of AIDS care in China: Are free antiretroviral drugs enough?" *AIDS Care*. 2008; 20(8): 984-994.

Muhamadi L, Tumwesigye NM, Kadobera D, Marrone G, Wabwire-Mangen F, Pariyo G, Peterson S, Ekstrom AM. "A single-blind randomized controlled trial to evaluate the effect of extended counseling on uptake of pre-antiretroviral care in Eastern Uganda."

Mukherjee K. "cost-effectiveness of childbirth strategies for prevention of mother-to-child transmission of HIV among mothers receiving Nevirapine in India." *Indian Journal of Community Medicine*. 2010; 35(1): 29-33.

Negin J, Wariero J, Mutuo P, Jan S, Pronyk P. "Feasibility, acceptability and cost of home-based testing in rural Kenya." *Tropical Medicine and International Health*. 2008; 14(8):849-855.

Ni MJ, Fu LP, chen XL, Hu XY, Wheeler K. "Net financial benefits of averting HIV infections among people who inject drugs in Urumqi, xinjiang, Peoples Republic of China (2005-2010)." *BMCPublic Health*. 2012; 12: 572.

Obiero W, Young MR, Bailey RC. "The PrePex device is unlikely to achieve cost-savings compared to the forceps-guided method in male circumcision programs in sub-Saharan Africa." 2013. *PLoS ONE* 8(1): e53380. doi:10.1371/journal.pone.0053380.

Obure CD, Vassall A, Michaels C, Terris-Prestholdt F, Mayhew S, Stackpool-Moore L, Warren C, The Integra Research Team, Watts C. "Optimising the cost and delivery of HIV counseling and testing services in Kenya and Swaziland." *Sexually Transmitted Infections*. 2012; 88: 498-503.

Orlando S, Marazzi MC, Mancinelle S, Liotta G, Ceffa S, Giglio P, Alumando E, Ziegler I, Shawa M, Palombi L. "Cost-effectiveness of using HAART in the prevention of Mother to Child Transmission in the DREAM-Project Malawi." *J Acquir Defic Syndr.* 2010; 55(5):631-634.

Ozayr M, Asmal S, Forsythe S. "Costing male circumcision in South Africa and Impacts of Scaling up the circumcision program." 2010. Health Policy Initiative, Task Order 1. Washington, DC: Futures Group, Health Policy Initiative, Task Order 1.

Parker KA, Koumans EH, Hawkins RV, Massanga M, Somse P, Barker K, Moran J. "Providing low-cost sexually transmitted diseases services in two semi-urban health centers in Central African Republic (CAR): Characteristics of patients and patterns of health care-seeking behavior." *Sexually Transmitted Diseases.* 1999;. 26(9): 508-516.

Partners for Health ReformPlus, Deliver, Policy Project. "Nigeria: rapid assessment of HIV/AIDS care in the public and private sectors." 2004. The Partners for Health Reformplus Project, Abt Associates Inc.

Pinto AD, van Lettow M, Rachlis B, Chan AK, Sodhi SK. "Patient costs associates with accessing HIV/AIDS care in Malawi." *Journal of the International AIDS Society.* 2013; 16: 18055.

Predis GA, Shapiro CD, Pierre I, Dyer MJ, Kozinetz CA, Grimes RM. "An effective low-cost approach to implementing HIV/AIDS education programs in low-literacy populations: An example from rural Haiti." *Journal of Health Care for the Poor and Underserved.* 2010; 21: 430-437.

Prem Kumar SG, Dandona R, Schneider JA, Ramesh YK, Dandona L. "Outputs and cost of HIV prevention programmes for truck drivers in Andhra Pradesh, India." *BMC Health Services Research.* 2009; 9:82.

Renaud A, Basenya O, de Borman N, Greindl I, Meyer-Rath G. "The cost effectiveness of integrated care for people living with HIV including antiretroviral treatment in a primary health care center in Bujumbura, Benin." *AIDS Care.* 2011; 21: 1388-1394.

Riyarto S, Hidayat B, Johns B, Probandari A, Mahendradhata Y, Utarini A, Trisnantoro L, Flessenkaemper S. "the financial burden of HIV care, including antiretroviral therapy, on patients in three sites in Indonesia." *Health Policy and Planning.* 2010; 25: 272-282.

Robberstad B, Evjen-Olsen B. "Preventing mother-child transmission of HIV with highly active antiretroviral treatment in Tanzania- a prospective cost-effectiveness study." *J Acquir Immune Def Syndr.* 2010; 55(3): 397-403.

Rosen S, Ketlhapile . "Cost of using a patient tracer to reduce loss to follow-up and ascertain patient status in a large antiretroviral therapy program in Johannesburg, South Africa." *Tropical Medicine and international Health.* 2010; 15(Suppl 1): 98-104.

Rosen S, Ketlhapile M, Sanne I, DeSilva MB. "Cost to patients of obtaining treatment for HIV/AIDS in South Africa." *South African Medical Journal.* 2007; 97(7): 524-529.

Rosen S, Long L, Sanne I. "The outcomes and outpatient costs of different models of antiretroviral treatment delivery in South Africa." *Tropical Medicine and International Health*. 2008; 13(8): 1005-1015.

Ryan M, Griffin S, Chitah B, et al. "The cost-effectiveness of cotrimoxazole prophylaxis in HIV-infected children in Zambia." *AIDS*. 2008; 22: 749-757.

Sarti FM, Nishijima M, Campino ACC, Cyrillo DC. "A comparative analysis of outpatient costs in HIV treatment programs." *Rev Assoc Med Bras*. 2012; 58(5): 561-567.

Schutte C, Forsythe S. "Costing male circumcision in Zimbabwe and impacts of scaling up the circumcision program." Unpublished.

Schwartzlander B, Stover J, Hallett T, et al. "Towards an improved investment approach for an effective response to HIV/AIDS." *The Lancet*. 2011. Published online June 3, 2011 DOI:10.1016/S0140-6736(11)60702-2.

Shrestha RK, Marseille E, Kahn JG, Lule JR, Pitter C, Blandford JM, et al. "Cost effectiveness of home-based chlorination and safe water storage in reducing diarrhea among HIV-affected households in rural Uganda." *Am J Trop Med Hyg*. 2006;74(5):884-90.

Siregar AYM, Komarudin D, Wisaksana R, Baltussen R. "Costs and outcomes of VCT delivery models in the context of scaling up services in Indonesia." *Tropical Medicine and international Health*. 2011; 16(2): 193-199.

Sood S and Nambiar D. "Comparative cost-effectiveness of the components of a behavior change communication campaign on HIV/AIDS in North India." *Journal of Health Communication*. 2006; 11: 143-162.

Strategic Development Consultants, SA. "Analysis of PEPFAR funded community mobilisation and abstinence and be faithful interventions in South Africa." 2010. Washington, DC. Futures Group, Health Policy Initiative, Task Order 1.

Sutton BS, Arias MS, Chheng P, Eang MT, Kimerling ME. "The cost of intensified case finding and isoniazid preventive therapy for HIV-infected patients in Battambang, Cambodia." *Int J Tuberc Lung Dis*. 2009; 13(6):713-718.

Sweat M, Gregorich S, Sangiwa G, Furlonge C, Balmer D, Kamenga C, Grinstead O, Coates T. "Cost-effectiveness of voluntary HIV-1 counselling and testing in reducing sexual transmission of HIV-1 in Kenya and Tanzania." *The Lancet*. 2000; 356:113-121.

Sweat M, Kerrigan D, Moreno L, Rosario S, Gomez B, Jerez H, Weiss H, Barrington C. "Cost effectiveness of environmental-structural communication interventions for HIV prevention in the female sex industry in the Dominican Republic." *Journal of Health Communication*. 2006; 123-142.

Terris-Prstholdt F, Vyas S, Kumaranayake L, Mayaud P, Watts C. "The costs of treating curable sexually transmitted infections in low- and middle-income countries: a systematic review." *Sex Transm Dis.* 2006; 33(Suppl 10):S153-166.

Terris-Prestholt F, Kumaranakaye L, Foster S, Kamali A, Kinsman J, Basajja V, Nalweyso N, Quigley M, Kengeya-Kayondo J, Whitworth J. "The role of community acceptance over time for costs of HIV and STI prevention interventions: Analysis of the Masaka Intervention Trial, Uganda, 1996-1999." *Sexually Transmitted Diseases.* 2006; 33(10): S111-116.

Terris-Prestholt F, Kumaranakaye L, Obasi A, Cleophas-Mazige B, Makokha M, Todd J, Ross DA, Hayes RJ. "From trial intervention to scale-up: Costs of an adolescent sexual health program in Mwana, Tanzania." *Sexually Transmitted Diseases.* 2006; 33(10): S133-139.

Thielman NM, Chu HY, Ostermann J, Itemba DK, Mgonja A, Mtwever S, Bartlett JA, Shao JF, Crump JA. "Cost-effectiveness of free HIV voluntary counseling and testing through a community-based AIDS service organization in northern Tanzania." *American Journal of Public Health.* 2006; 96(1): 114-119.

Thomas L, Manning A, Holmes CB, Naidoo S, van der Linde F, Gray GE, Martinson NA. "Comparative costs of inpatient care for HIV-infected and uninfected children and adults in Soweto, South Africa." *Journal of Acquired Immune Deficiency Syndrome.* 2007; 46(4): 410-416.

Thomsen SC, Ombidi W, Toroitich-Ruto C, Wong EL, Tucker HO, Homan R, Kingola N, Luchters S. "A prospective study assessing the effects of introducing the female condom in a sex worker population in Mombasa, Kenya." *Sexually Transmitted Infections.* 2006; 82: 397-402.

Tran BX, Duong AT, Nguyen LT, Hwang J, Nguyen BT, Nguyen QT, Nong VM, Xu PX, Ohinmaa A. "Financial burden of health care for HIV/AIDS patients in Vietnam." *Tropical Medicine and International Health.* 2013; 18(2): 212-218.

Tran BX, Ohinmaa A, Duong AT, Nguyen LT, Vu PX, Mills S, Houston S, Jacobs P. "Cost-effectiveness of integrating methadone maintenance and antiretroviral treatment for HIV-positive drug users in Vietnam's injection-driven HIV epidemics." *Drug and Alcohol Depend.* 2012; doi:10.1016/j.drugalcdep.2012.02.021.

Tumwesigye E, Wana G, Kasasa S, Muganzi E, Nuwaha F. "High uptake of home-based, district-wide, HIV counseling and testing in Uganda." *AIDS Patient Care and STDs.* 2012; 24(11): 735-741.

Twahir A, Maggwa BN, Askew I. "Integration of STI and HIV/AIDS services with MCH-FP services: A case study of the Mkomani Clinic Society in Mombasa, Kenya." 1996. The Population Council.

UNAIDS. *UNAIDS report on the global AIDS Epidemic: 2012.* 2012, Geneva.

Uys L, Hensher M. "The cost of home-based terminal care for people with AIDS in South Africa." *South African Medical Journal.* 2002; 92(8): 624-628.

Vella V, Govender T, Scelo D, Taylor M, Moodley I, David V, Jinabhai CC. "Evaluation of antiretroviral therapy against HIV/AIDS in KwaZulu-Natal South Africa." 2008. Cooperazione Italiana.

Vickerman P, Kumaranayake L, Balakireva O, Guinness L, Artyukh O, Semikop T, Yaremenko O, Watts C. "The cost-effectiveness of expanding harm reduction activities for injecting drug users in Odessa, Ukraine." *Sexually Transmitted Diseases*. 2006; 33(10): S89-102.

Vickerman P, Terris-Prestholt F, Delany S, Kumaranayake L, Rees H, Watts C. "Are targeted HIV prevention activities cost-effective in high-prevalence settings? Results from a sexually transmitted infection treatment project for sex workers in Johannesburg, South Africa." *Sexually Transmitted Diseases*. 2006; 33(10): S122-S132.

Wabiwire-Mangen, Mbona Tumwesigye N, Sengooba F, Bagenda D, Opio A, Nalwadda C. "Assessing potential impact, costs of scaling-up medical male circumcision services in Uganda." Unpublished.

Wilkinson D, Floyd K, Gilks CF. "Antiretroviral drugs as a public health intervention for pregnant HIV-infected women in rural South Africa: An issue of cost-effectiveness and capacity." *AIDS*. 1998; 12: 1675-1682.

Wilkinson D, Wilkinson N, Lombard C, Martin D, Smith A, Floyd K, Ballard R. "On-site HIV testing in resource-poor settings: is one rapid test enough?" *AIDS*. 1997; 11: 377-381.

Xing Y, Sun J, Cao W, Lee L, Guo H, Li H, Duan S. "Economic evaluation of methadone maintenance treatment in HIV/AIDS control among injection drug users in Dehong, China." *AIDS Care*. 2011; DOI:10.1080/09540121.2011.630359.

Zhou F, Kominski GF, Qian HZ, Wang J, Duan S, Guo Z, Zhao X. "Expenditures for the care of HIV-infected patients in rural areas in China's antiretroviral therapy programs." *BMC Medicine*. 2011; Jan 17, 9:6.