Global estimates for the lifetime cost of managing HIV: a systematic review

Huynh T[1,2], Saleem K MPH[3], Lim MHA[4], Chow EPF PhD[1,2,4], Fairley CK PhD[1,2], Terris-Prestholt F PhD[5], Ong JJ PhD[1,2,4,6]

[1] Central Clinical School, Monash University, Melbourne, Australia

[2] Melbourne Sexual Health Centre, The Alfred, Melbourne, Australia

[3] Department of Paediatrics, University of Melbourne, Melbourne, Australia

[4] Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Australia

[5] Department of Global Health, London School of Hygiene and Tropical Medicine, London, England, United Kingdom

[6] Department of Clinical Research, London School of Hygiene and Tropical Medicine, London, England, United Kingdom

§ **Corresponding author:**
Jason Ong

580 Swanston Street

Carlton, Victoria 3053, Australia

Telephone: +613 9341 6200

email: Jason.Ong@monash.edu or Jason.Ong@lshtm.ac.uk

Conflicts of Interest and Source of Funding

All authors declare they do not have any conflicts of interest. JJO, CFK, EPF are supported by the Australian National Health and Medical Research Council Fellowship grants (GNT1104781, GNT1172900 and GNT1172873 respectively).

Meeting where data was presented:

Australasian Sexual Health and HIV Conference 2020 (Virtual), November 16-20th 2020

Word count: 3000 words

ABSTRACT

Objective:

There are an estimated 38 million people living with HIV, with significant economic consequences. We aimed to collate global lifetime costs for managing HIV.

Design:

We conducted a systematic review (PROSPERO:CRD42020184490) using five databases from 1999-2019.

Methods:

Studies were included if they reported primary data on lifetime costs for people living with HIV. Two reviewers independently assessed the titles and abstracts, and data were extracted from full texts: lifetime cost, year of currency, country of currency, discount rate, time horizon, perspective, method used to estimate cost, and cost items included. Descriptive statistics were used to summarize the discounted lifetime costs (2019 USD).

Results:

Of 505 studies found, 260 full-texts were examined and 75 included. Fifty (67%) studies were from high-income, 22 (29%) from middle-income and 3 (4%) from low-income countries. Of 65 studies which reported study perspective, 45 (69%) were healthcare provider and the remainder were societal. The median lifetime costs for managing HIV differed according to: 1) country income level: $5,221 (IQR:2,978–11,177) for low-income to $377,820 (IQR:260,176–541,430) for high-income; 2) study perspective: $189,230 (IQR:14,794–424,069) for healthcare provider, to $508,804 (IQR:174,781–812,418) for societal; and 3) decision model: $190,255 (IQR:13,588–429,772) for Markov cohort, to $283,905 (IQR:10,558–453,779) for microsimulation models.

Conclusions:

Estimating the lifetime costs of managing HIV is useful for budgetary planning and to ensure HIV management is affordable for all. Furthermore, HIV prevention strategies need to be strengthened to avert these high costs of managing HIV.

Key words: HIV, cost, systematic review, health economics

INTRODUCTION

People living with HIV have seen dramatic improvements in life expectancy and reductions in morbidity since HIV first came to medical attention in the early 1980s.[1-3] Antiretroviral therapy(ART) has revolutionized the management of people living with HIV. AIDS has shifted from what once was a fatal disease to now being a highly treatable chronic condition, becoming a condition people die with, rather than die from.[4, 5]

ART initiation using CD4 cell count criteria has evolved since the late 1990s, at a time when drugs were expensive, less robust, with considerable side effects, and where the risk of resistance was high.[6] However, with ART becoming more affordable and less toxic, the decision to commence treatment regardless of CD4 cell counts is supported worldwide.[6] This is reflected in the WHO guidelines over time, in which the recommended CD4 cell count for initiation of ART rose from <200 cells/mm^3 in 2002, to <350 cells/mm^3 in 2010, to <500 cells/mm^3 in 2013.[7] The latest WHO guidelines in 2015 recommend commencing ART in all people living with HIV regardless of CD4 cell count, as evidence shows the clinical and preventative benefits of starting ART early at high CD4 cell counts now outweigh their minimal risks.[6, 7]

These advances in HIV management impact the lifetime costs associated with HIV as patients are starting ART earlier and living longer.[3, 8] Estimating an accurate lifetime cost of managing HIV is vital for policy makers who are involved in future planning and decision making to ensure quality HIV treatment is cost effective and affordable for all.[8] Thus, it is important that lifetime costs are calculated accurately and consistently to draw true conclusions regarding the economic burden of HIV, and to be able to compare lifetime costs of HIV around the world.

To our knowledge, there have been no reviews that synthesized the global estimates of lifetime cost of managing HIV over time. In this review, we aimed to examine the published literature from 1999 onwards to compare the lifetime costs for a patient living with HIV in countries globally, and describe the methodologies used to estimate these costs.

METHODS

Search strategy and selection criteria

We searched databases PubMed, EconLit, Web of Science: Core Collection, Embase via Ovid and Global Health Cost Consortium[9] on 23rd January 2020. The MeSH search terms used were related to 'HIV', 'cost*', 'econ*' and 'lifetime'. When searching on the Global Health Cost Consortium database, we limited our review to 'HIV', 'Treatment and Care', and 'Adult ART'. We also restricted the language of studies to English. Our search strategy is shown in Appendix 1. The inclusion criteria were, any study published from 1999 onwards, and contained information about lifetime costs related to HIV. We excluded studies related to the costs of paediatric HIV management as these are quite different from adult HIV management costs and will be a subject of future research. Titles and abstracts were independently assessed for eligibility by at least two reviewers (TH, ML, KS). Another reviewer (JO) resolved any discrepancies. This systematic review has been registered at the International Prospective Register of Systematic Reviews (PROSPERO: CRD42020184490).

Data analysis

An extraction file was created in Microsoft Excel, to collate the following information: lifetime cost of HIV, age at which lifetime cost estimate begins, year of currency, country of currency, country, discount rate, time horizon, sensitivity analyses performed, perspective, methods used to estimate cost, model used to estimate lifetime cost, and cost items included. Data extraction was conducted by three reviewers (TH, ML, KS), and a fourth reviewer (JO) resolved any discrepancies. The quality of the study was assessed using the criteria from the methods section of the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist[10], with an average score of 7.5 (range 5-10) (Supplementary Table 3).

To ensure consistency of comparison for the lifetime cost, we converted all currencies to US dollars (USD) using OFX Historical Exchange Rates.[11] We then inflated costs to 2019 using the relevant consumer price indices.[12] For studies that reported multiple estimates of lifetime costs, we used the average of the lowest and highest estimates in our model. For studies which had two price years for their lifetime cost, e.g. 2018/19, we used the latest year for the conversion and inflation. We classified the study country income level into high, upper middle, lower middle or low income using The World Bank classification.[13] We categorized the studies into healthcare provider (only costs incurred by the health provider), societal (includes the full range of social opportunity costs including productivity losses), and

modified societal perspective (which may exclude some individual costs) based on what the study reported. If no perspective was reported, the study was categorized into an unknown perspective. We also categorised the decision models as cohort (based on populations), microsimulation (based on individuals) or other.

Descriptive statistics were used to summarize the lifetime costs, including box plots to visualize the impact of the country income level, study perspective, decision model on the resultant lifetime cost of HIV. Costs were converted to a log scale in the box plots. We used the Kruskal Wallis test to determine if there was a statistically significant difference between the groups described above. We also examined for significant changes in price over time using a linear regression model. We defined a *p* value of <0.05 as statistically significant. All statistical analysis was performed using STATA version 16 (StataCorp. 2019. *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC). This review is reported as per PRISMA guidelines.

RESULTS

Seventy-five studies were included in the analysis, where information on estimated lifetime costs and economic models used in informing these estimates were extracted (Fig. 1).

Lifetime costs according to country-income level (Figure 2)

Of 75 studies, 50 (66.7%) were from high-income countries, 15 (20.0%) from upper middle-income countries, seven (9.3%) from lower middle-income countries, and three (4.0%) from low-income countries. There were statistically significant differences (p<0.0001) between the median lifetime cost for managing HIV in a high-income country was $377,820; IQR:260,176 - 541,430), upper middle-income country ($10,558; IQR:8,011 - 16,944), and low middle-income country ($3,693; IQR: 3,344.50 - 10,859). There were only three studies from low-income countries; all were from sub-Saharan Africa ($2978,[14] $11,177[15] and $5221[16]). There were statistically significant differences between the cost in high-income countries compared with all other country income levels (p<0.0001); but not between upper middle-income countries compared with lower middle-income countries (p=0.053) and low-income countries (p=0.214); nor with lower-middle income compared with low-income countries (p=0.73). The wide variations of lifetime costs may be explained by the differences in a country's health systems including the cost of ART, which makes up a large proportion

of a patient's lifetime cost[3]. Even within the same income-country level, we can see that ART can differ greatly. For example, in the high-income country level, ART can range from 53.6%[17] – 81.3%[18] of a lifetime cost. We did not find any statistically significant increase in costs over the years for high-income countries ($1,836/year, p=0.77), middle-income countries ($3,489/year, p=0.091) or low-income countries ($2,359/year, p=0.171).

Lifetime costs according to study perspective (Figure 3)

Supplementary Table 1 summarizes the lifetime costs, study perspective, income-country category and costs items for the included studies. Of 65 studies which explicitly stated their study perspective, 45 (69.2%) took a healthcare provider perspective, eight (12.3%) took a modified societal perspective, and 12 (18.5%) took a societal perspective. The median lifetime cost was $189,230 (IQR:14,794 - 424,069) for studies using a health provider perspective, $12,694 (IQR 8,217-196,746) for modified societal, $508,804 (IQR:174,781-812,418) for societal and $318,644 (IQR:5,221-453,779) for unknown perspective. There were a statistically significant difference between studies adoping a healthcare provider perspective compared with societal (p=0.036) but not modified societal (p=0.056). There was also a difference between modified societal compared with societal (p=0.017). When we examined the cost items included within each study perspective, we found that they varied significantly (Supplementary Table 1). For example, we expect those who use a societal perspective to include productivity loss but only 50% (6/12) of these studies explicitly mentioned collecting costs related to productivity loss. It is also noteworthy that many studies did not completely report all cost items included in their analysis.

Decision models used to estimate lifetime costs (Figure 4)

Supplementary Table 2 presents a summary of methodologies of the included studies by costing and modelling approaches, decision model types, sensitivity analyses and whether CD4 status was accounted for. Of 75 studies, 64 (85%) used Markov models; among these 64 studies, 32 (50%) state-transition cohort models, 31 (48%) microsimulation models, and 1 (1.6%) dynamic Markov model. Of 31 microsimulation models, 18 used the Cost-Effectiveness of Preventing AIDS Complications (CEPAC) model, and four the Anti-Retroviral Analysis by Monte Carlo Individual Simulation (ARAMIS) model. Of the remaining 11 studies, two were discrete event simulation (DES) models, one an econometric model, one a decision tree, four mathematical simulation models, and three studies were unclear on which models they used.

The median lifetime costs for people living with HIV differed according to the decision model: $283,905 (IQR:10,558-453,779) for microsimulation models, $190,225 (IQR:13,588-429,772) for Markov cohort, and $321,340 (IQR: 102,336 – 761,714) for other model types. There were no statistically significant differences between studies using Markov cohort compared with microsimulation models (p=0.773) or other (p=0.510); and microsimulation models compared with other (p=0.244). Table 1 further disaggregates the lifetime costs according to the country income level and model used. The choice to use cohort or microsimulation models did not significantly change lifetime costs across all country income levels.

Future comorbidity associated with HIV

Whilst many studies acknowledged that HIV-related chronic comorbidities may arise, very few studies actually accounted for comorbidity associated with HIV, particularly those associated with an ageing population. From a health system planning perspective, it is not only the direct costs of the disease that are considered, but also the costs of comorbidities and even unrelated future medical costs that may be incurred by not dying from HIV, and living longer. Several studies considered the link between HIV and cardiovascular disease within their lifetime cost[19-21] however, each performed different calculations. One incorporated the costs of a 1.5- to 2-fold increased relative risk of cardiovascular disease compared with the general population in their model.[19] Another used the Framingham equation to predict coronary heart disease and stroke, and accounted for this within 'care of chronic disease' costs.[20] Finally, one calculated a monthly weighted mean cost of acute myocardial infarction (40%) and hypokinetic cardiomyopathy (60%) based on 'expert opinion'.[21] Another approach included the cost of medications for comorbidity[22] where 15% of the total lifetime costs were related to chronic disease medications, opportunistic infection prophylaxis, and treatment medications.

Lifetime costs according to patient subpopulation

Only three of 75 studies reported lifetime costs by subpopulation. This approach was taken by Brogan et al.,[23] who identified key cost differences between heterosexuals, men who have sex with men (MSM), and people who inject drugs (PWID).[23] The lifetime costs (USD 2019) were $461,952, $575,972, and $635,663, respectively, with the most costly group being people who inject drugs. Ong et al,[24] identified cost differences between heterosexuals, MSM and PWID, but found different results to Brogan et al.[23] The lifetime costs were $267,448 for heterosexuals, $279,947 for MSM, and $180,225 for PWID,[24] with

the most costly group being MSM. Populations vulnerable to HIV acquisition can also be stratified by skin colour, ethnicity, and gender. Ethnic minority populations are more likely to have delayed diagnosis, and are less likely to engage with treatment services.[25, 26] Schackman et al,[22] provides estimates from 15 subpopulations: MSM, male and female PWID, male and female heterosexuals, and ethnic groups of White, Black or Hispanic.[22] By disaggregating the data, Schackman highlighted the discrepancies in lifetime costs between subpopulations, with the greatest difference seen in Hispanic MSM with a lifetime cost ($394,395) greater than double that of Black female PWID ($193,412).[22]

DISCUSSION

This systematic review reported lifetime costs from 75 studies across the world for managing HIV according to country income level, study perspective, and decision model; using studies published between 1999 and 2019. Though there is a need for locally derived lifetime cost estimates, our data could be used as approximations of possible ranges of costs to assist governments with budgetary planning when no local estimates exist. Given significant variations noted in the literature, we recommend a standardised methodology for measuring lifetime HIV costs to improve comparability in future studies. We noted key knowledge gaps within the literature on costs disaggregated by subpopulation and the inclusion of comorbidity associated with an ageing population of people living with HIV.

In a infection such as HIV, which disproportionately affects certain subpopulations, it is important to consider the heterogeneity of economic impacts which result within these subpopulations. By performing subgroup analyses on populations defined by transmission risk, gender, and ethnicity, it highlights the large variation of lifetime costs in these key populations. Minority groups often experience structural and social barriers to timely access to medical care and ART.[25] And so, these vulnerable populations are more likely to be diagnosed at a more advanced disease stage, which is associated with higher healthcare utilisation and thus, higher lifetime costs.[26] Combined with the cost of an extended lifespan, managing HIV could be more expensive for high-risk individuals.[26] These racial and ethnic differences not only affect disease morbidity and mortality, but also health service utilisation.[25] It is important to capture these differences through subgroup analyses. We recommend that future studies disaggregate their lifetime estimates by key group within their

study population. These subgroup analyses enable decision-makers to identify the groups for which treatment is costly, and helps prioritize prevention efforts and reduce health inequities. Although there may be differences in cost according to subpopulation, we must also account for the benefit of downstream transmissions averted by a person having an undetectable viral load within that subpopulation.

There is increasing discussion that medical advancements that can prolong life should be considered when estimating the lifetime cost of a disease.[27] With HIV now regarded as a chronic disease, there are additional HIV-related comorbidity that come with ageing that might significantly affect the lifetime cost calculations for people living with HIV. Most studies we reviewed did not include this in their estimation. Further, it may be important to consider a broad societal perspective when estimating the lifetime cost of a chronic infection such as HIV. For a person living with HIV, there could be significant indirect costs--opportunity and productivity costs--that may have a large impact on both the individual and society.[25] With the inclusion of the cost of managing HIV-related comorbidity—particularly with an ageing population of people living with HIV, a more accurate and realistic estimation of lifetime cost of HIV will result.[5] This will have important implications not only for individuals but also for the healthcare systems, in relation to resource utilization, allocation and cost expenditure.[26]

Even though the majority of studies adopted a healthcare provider perspective, we found that the cost items included were inconsistently measured. This matters for health system planning and for comparability of total costs between different settings. There was also an issue with transparency as it was often unclear as to which cost items were included, and how they were calculated. Thus, we recommend that a standardised checklist of cost items from a broad societal perspective be adopted for future studies, with clear disclosure on cost items included and how they were derived. HIV costing guidelines has already been developed by UNAIDS[28], and the Global Health Cost Consortium provides guidance for estimating the unit costs of a health intervention,[29] but there is no consensus on how to estimate the lifetime costs for managing HIV. Having a standardized methodology would ensure consistency within the literature, and ensure accurate and realistic lifetime costs for HIV disease globally.

Since HIV is a complex disease which requires lifelong management, it is important to use a decision model that captures the key relevant events in a patients' lifetime. The dominant decision model used was a Markov cohort model (32 of 75 studies) that classified health states based on CD4 count status which seems appropriate, as long as readers are aware of the assumption of the memoryless property of Markov models.[30] The second most predominant type of model (31 of 75 studies) was the microsimulation models (most commonly the CEPAC model) which can account for the history of a simulated individual. Although choosing a Markov cohort model or microsimulation approach have different strengths and limitations,[31] interestingly, we did not find significant differences in the estimation of lifetime costs according to the decision model used; but estimates using microsimulation models had less variation compared with cohort models. We found one study which used a decision tree model.[32] Over the course of a lifetime, a person experiences numerous clinical conditions that may recur, as well as be uncertain in nature; so a decision tree might not be the right tool for interventions to treat for such conditions because of the complexity and inconvenience of representing all probable sequences of events over the entire course of a person's lifetime (or alternative time horizon).

To our knowledge, this is the first attempt to provide an overview of the large number of studies reporting lifetime cost for people living with HIV. This allowed us to understand the strengths and limitations in the literature and to provide direction for future studies, for example, the need for disaggregated data by subpopulation. Our study should be read in light of some limitations. First, there is the potential for publication bias as we could not access any unpublished data from pharmaceutical companies which were submitted to funding bodies that could contain economic models estimating lifetime costs. It is unclear the impact this would have on our findings. Second, there was large heterogeneity in the methods used for estimating lifetime costs, precluding the use of meta-analysis methods. Thus, we present the data using descriptive statistics instead. Third, the models included in our review do not take into account the treatment costs of secondary transmission averted by treating the index case – they only examine the lifetime cost of managing HIV in the index case. Therefore, although the cost of managing HIV may be relatively expensive compared to non-communicable diseases, there is an added benefit of averting secondary transmissions when an index patient has undetectable HIV viral load; this is not presently captured within the metric of lifetime HIV costs. This additional benefit should be accounted for in economic evaluations of HIV programs.

CONCLUSION

We found variations in the estimation of lifetime costs of managing HIV, which could be accounted for partly by country-income level, study perspective, and variations in cost-items included. Although decision models have different strengths and limitations, lifetime costs were not sensitive to the decision model used. There was a paucity of studies that disaggregated lifetime costs by subpopulation and inconsistencies in the inclusion of comorbidity for the aging HIV population. There is a need for a standardised methodology to allow comparability of lifetime costs of HIV globally. We recommend future studies disaggregate data by subpopulation and suggest the inclusion of non-HIV-related costs associated with ageing and comorbidity (at least as a sensitivity analysis), to determine a more accurate cost of managing HIV.

AUTHORSHIP

JJO designed the research study. JJO, HT, KS and ML performed the research and analysed the data. HT, KS, ML, EC, CF, FTP, JJO wrote the paper.

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Table 1 Lifetime costs for people living with HIV by country income level and models used

Country income level	Model used	Number of studies	Median (2019 USD)	IQR (2019 USD)	Min (2019 USD)	Max (2019 USD)
High-income	Cohort	22	355,577	182,661-502,763	109,586	927,428
	Micro-simulation	19	383,168	318,023-500,311	11,807	671,301
	Others	9	467,148	227,220-623,668	141,148	968,025
Upper middle-income	Cohort	5	13,236	9,140-13,941	8,462	191,221
	Micro-simulation	7	10,588	8,011-16,944	5,576	337,112
	Others	3	2,219		2,211	69,786
Lower middle-income	Cohort	3	4,494		3,644	10,859
	Micro-simulation	4	3,519		1,414	13,582
Low-income	Cohort	2			5,221	11,177
	Micro-simulation	1	2,978			

FIGURE LEGENDS

Figure 1. PRISMA Flow Chart

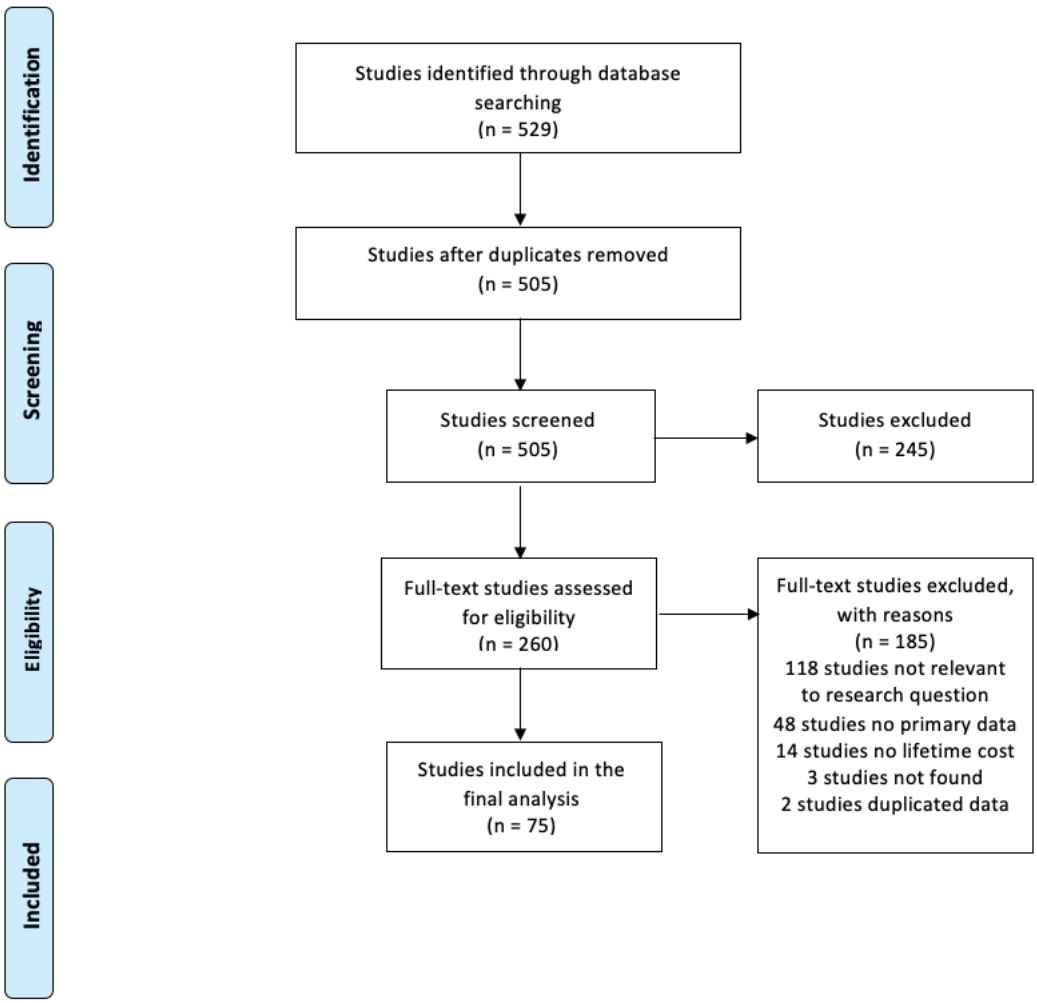


Figure 2. Lifetime cost of managing HIV according to country income level

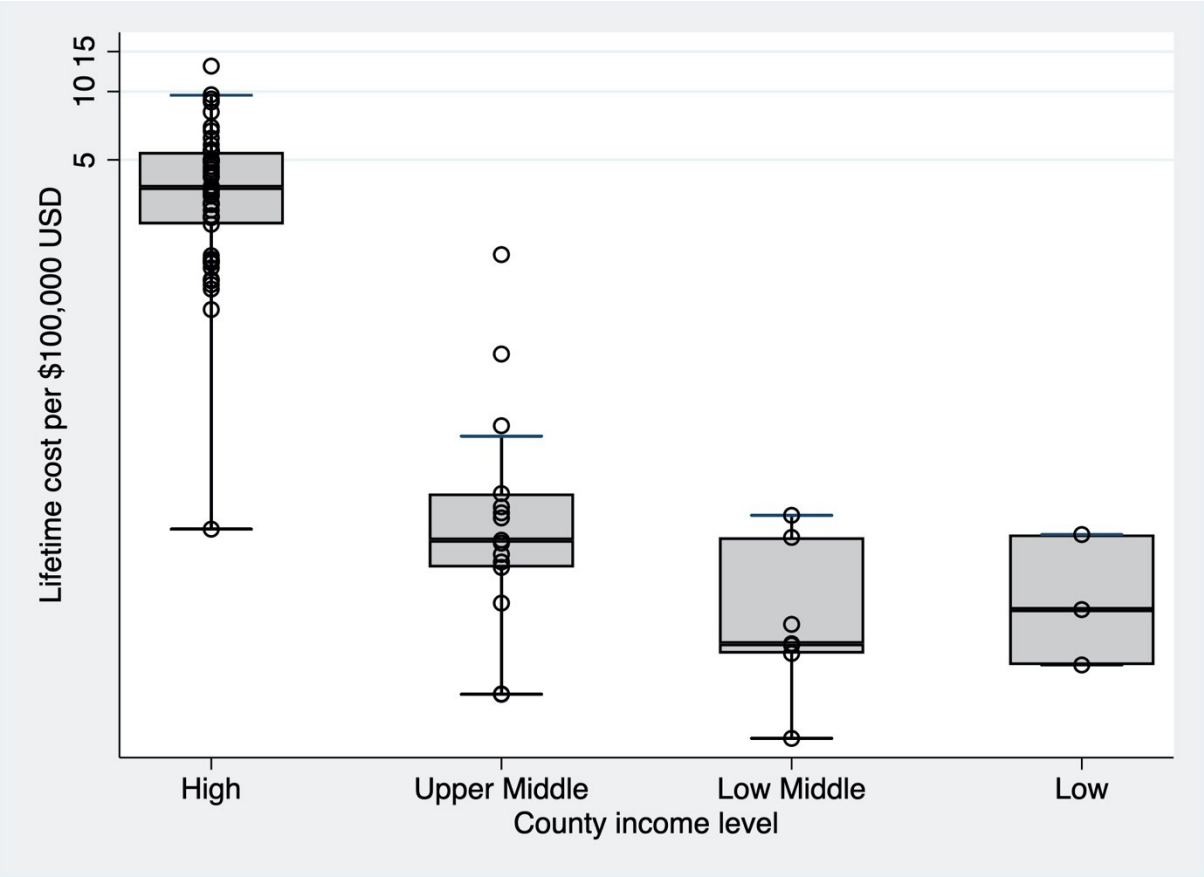


Figure 3. Box plot of the lifetime cost (log-scale) of managing HIV according to study perspective

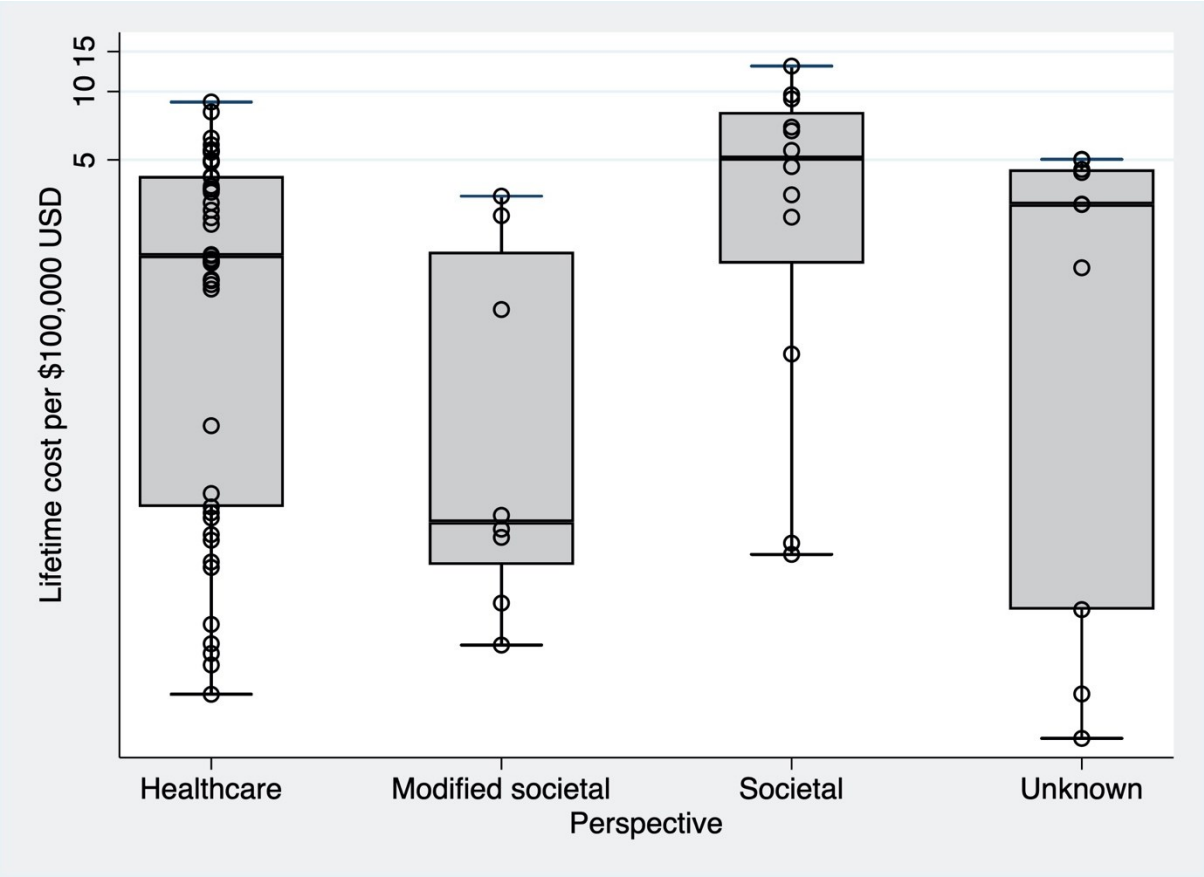
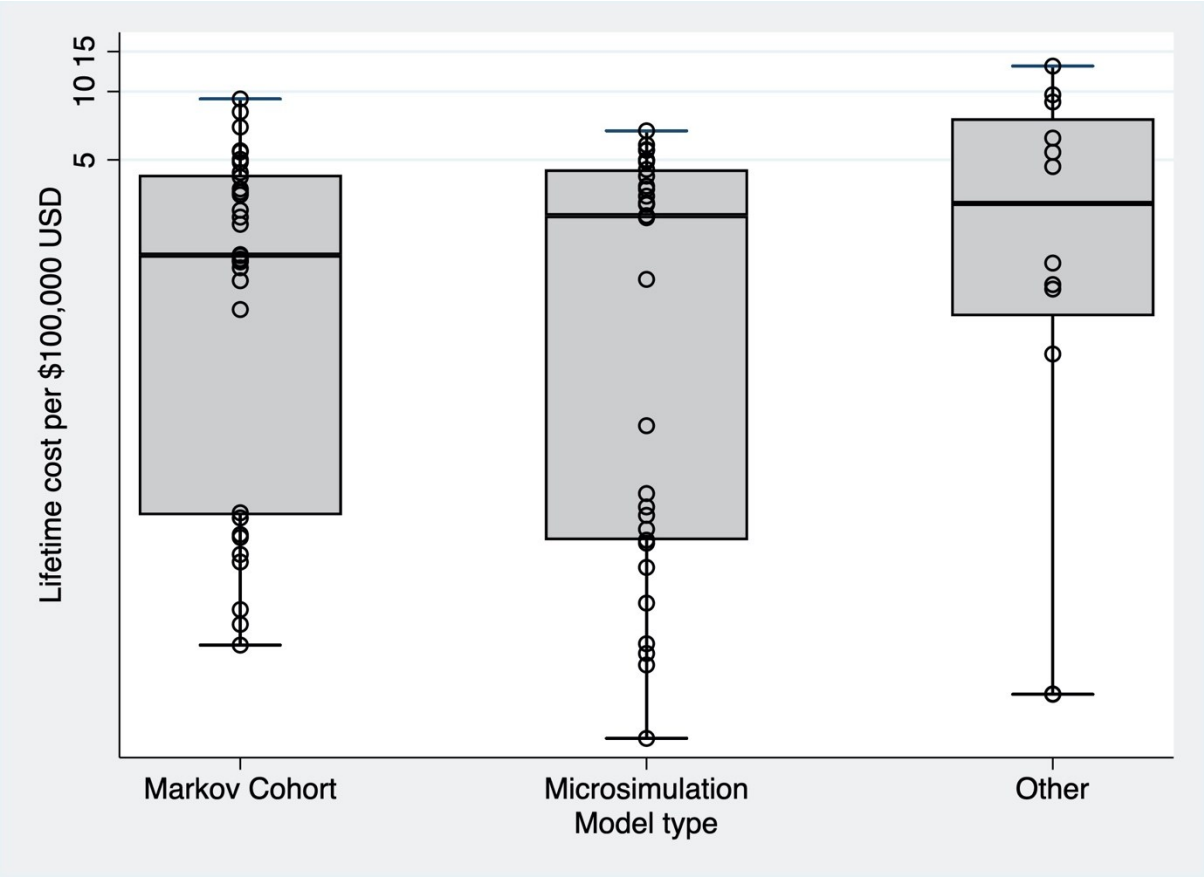


Figure 4. Box plot of the lifetime cost of managing HIV according to decision model



Appendix 1. Search Strategy

1. PubMed

Set	Search	Results
#1	((("hiv"[MeSH Terms] OR "hiv"[All Fields]) AND "cost*"[All Fields]) AND "econ*"[All Fields]) AND ("lifetime"[All Fields] OR "lifetimes"[All Fields])	335
#2	#1 with Filters: from 1999 – 2019	277
#3	#2 with Filters: Humans, from 1999 – 2019	260
#4	#3 with Filters: Humans, English, from 1999 – 2019	259

2. EconLit

Set	Search	Results
#1	HIV AND cost* AND econ* AND lifetime with Filters: from 1999 – 2019	6

3. Web of Science: Core Collection

Set	Search	Results
#1	(HIV AND cost* AND econ* AND lifetime) Timespan: 1999-2019	114

4. Embase via Ovid

Set	Search	Results
#1	(HIV and cost* and econ* and lifetime).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	183
#2	limit #2 to (human and english language and yr="1999 - 2019")	146

5. Global Health Cost Consortium [9]

Set	Search	Results
#1	Disease – HIV, Intervention Class – Treatment and Care, Intervention – Adult ART, Unit of Measurement – All	4

Supplementary Table 1. Lifetime cost estimates and cost items included.

Study (Author, year)	Lifetime cost ($USD 2019)	Country	ART	Other drugs	Labs	Inpatient visits	Outpatient visits	ED visits	Treating AE/AIDS/OI	Treating non-AIDS	Death/end-of-life care	Overhead	Equipment	Transport	Productivity Loss
Healthcare provider perspective															
Pinkerton et al, 1999[33]	899761	US (HIC)	Y		Y	Y			Y						
Johri et al, 2002[34]	148792	US (HIC)	Y		Y	Y	Y	Y	Y		Y				
Liu et al, 2002[35]	141148	US (HIC)	Y		Y										Y[1]
Duggan et al, 2005[36]	175531	US (HIC)	Y			Y	Y								
Hornberger et al, 2005[17]	177571	Italy (HIC)	Y (54-64%)		Y	Y	Y		Y						
Badri et al, 2006[37]	8011	South Africa (UMIC)	Y	Y	Y	Y	Y		Y			Y	Y		
Cleary et al, 2006[38]	8462	South Africa (UMIC)	Y		Y	Y	Y		Y		Y	Y			
Simpson et al, 2008[39]	360391.5	US (HIC)	Y		Y		Y		Y						
Simpson et al, 2009[40]	179728.5	US (HIC)	Y	Y		Y	Y		Y	Y					
Kuhne et al, 2010[41]	371563.5	US (HIC)	Y		Y	Y			Y	Y	Y				
Moreno et al, 2010[42]	419658.5	Spain (HIC)	Y		Y		Y		Y		Y				
Broder et al, 2011[43]	323650.5	US (HIC)	Y		Y		Y		Y	Y					
Chawana et al, 2011[44]	13941	South Africa (UMIC)	Y		Y	Y	Y		Y						

Chaudhary et al, 2011[45] *methods taken from Tilden et al[46]	146769	Australia (HIC)	Y		y				Y	Y					
Lorenzana et al, 2012[47]	33711.5	South Africa (UMIC)	Y		Y	Y	Y								
Mauskopf et al, 2012[48]	487815	Canada (HIC)	Y (75%)	Y (1%)	Y	Y (19%)	Y (5%)	Y							
Sloan et al, 2012[49]	499082	France (HIC)	Y (76%)		Y	Y (8%)	Y (4%)	Y (12%)	Y	Y					
Bayoumi et al, 2013[50]	260175.5	US, Canada, UK (HIC)	Y	Y					Y						
Farnham et al, 2013[51]	372472	US (HIC)	Y	Y	Y	Y	Y	Y	Y	Y					
Foglia et al, 2013[52]	300072	Italy (HIC)	Y	Y	Y	Y	Y		Y	Y					
Juday et al, 2013[53]	813031.5	US (HIC)	Y		Y		Y		Y						
Leisegang et al, 2013[54]	13235.5	South Africa (UMIC)	Y		Y		Y								
Simpson et al, 2013[18]	540222	US (HIC)	Y (80-81%)	Y (1%)			Y (11-12%)		Y (3%)	Y (4%)					
Walensky and Sax et al, 2013[55]	383168	US (HIC)	Y		Y										
Brogan et al, 2014[56]	541430	Canada (HIC)	Y (76%)	Y (1%)	Y	Y (17%)	Y (6%)	Y							
Hyle et al, 2014[14]	2977.5	Sub-Saharan Africa (LIC)	Y		Y				Y						
Owiti et al, 2014[57]	4494	Kenya (LMIC)	Y												
Ciaranello et al, 2015[58]	16944	South Africa (UMIC)	Y	Y	Y	Y	Y		Y	Y					
Peng et al, 2015[59]	623667.5	US (HIC)	Y (88%)		Y (8-9%)		Y		Y (3%)	Y					
Pialoux et al, 2015[60]	554572.5	France (HIC)	Y (83%)		Y (1-2%)				Y (1%)		Y (1-2%)				
Schackman et al, 2015[22]	424069	US (HIC)	Y (60%)	Y (15%)	Y	Y	Y	Y							
Mann et al, 2016[32]	2211	South Africa (UMIC)	Y			Y			Y		Y	Y	Y		

Sweet et al, 2016[61]	582460.5	US (HIC)	Y	Y	Y	Y	Y	Y	Y						
Taychakhoonavudh et al, 2016[62]	191221	Thailand (UMIC)													
Kowalska et al, 2017[63]	182661	Poland (HIC)	Y						Y	Y					
Moreno et al, 2017[20]	278080.5	Spain (HIC)	Y		Y				Y	Y					
Paltiel et al, 2017[64]	14794	South Africa (UMIC)	Y												
Freedberg et al, 2018[65]	3693	India (LMIC)	Y		Y	Y	Y								
Gray et al, 2018[66]	234392	Australia (HIC)	Y												
Uthman et al, 2018[15]	11176.5	Sub-Saharan Africa (LIC)				Y	Y		Y						
Zheng et al, 2018[67]	3344.5	India (LMIC)	Y			Y	Y								
Brogan et al, 2019[23]	548807.5	UK (HIC)	Y	Y	Y	Y	Y	Y							
Dugdale et al, 2019[68]	10558	South Africa (UMIC)	Y												
Ong et al, 2019[24]	189229.5	UK (HIC)	Y			Y	Y								
Millham et al, 2020[69]	490462.5	US (HIC)	Y												
Modified societal perspective															
Freedberg et al, 2001[70]	109586	US (HIC)	Y		Y			Y							
Yazdanpanah et al, 2002[71]	346057.5	France (HIC)	Y		Y					Y	Y				
Wolf et al, 2007[72]	11806.5	Eastern Caribbean States (HIC)	Y			Y		Y							

Bendavid et al, 2008[73]	5576	South Africa (UMIC)	Y		Y	Y					Y				
Bender et al, 2010[74]	3643.5	India (LMIC)	Y		Y	Y		Y							
Sax et al, 2010[75]	283905	US (HIC)	Y			Y	Y		Y		Y				
Walensky and Ross et al, 2013[76]	13581.5	South Africa, India (LMIC)	Y	Y	Y	Y	Y			Y	Y		Y		
VanDeusen et al, 2015[77]	10859	Ghana (LMIC)	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	
Societal perspective															
Goldie et al, 2003[78]	350762	US (HIC)	Y	Y	Y		Y		Y	Y	Y		Y		
Hutchinson et al, 2006[25]	1294344	US (HIC)	Y	Y	Y	Y	Y	Y	Y						Y
Schackman et al, 2007[79]	550459	US (HIC)	Y												
Bendavid et al, 2009[80]	9139.5	South Africa (UMIC)	Y		Y	Y	Y								
Brogan et al, 2010[81]	697408	US (HIC)	Y (58-59%)	Y (9%)		Y (18-19%)	Y (11%)	Y	Y		Y (3%)				Y
Mauskopf et al, 2010[82]	671301	US (HIC)	Y (55%)	Y (10%)		Y	Y	Y			Y (3%)				
Bendavid et al, 2011[83]	10242	South Africa (UMIC)	Y		Y	Y	Y		Y						
Brogan et al, 2011[84]	927428	US (HIC)	Y (65-66%)	Y (8-9%)	Y	Y	Y	Y	Y (0.2-0.3%)						
Ouellet et al, 2015[85]	968025	Canada (HIC)	Y		Y	Y	Y	Y				Y			Y
Reyes-Urueña et al, 2018[86]	467148	Spain (HIC)	Y		Y		Y	Y							Y

Tremblay et al, 2018[87]	69785.5	Russia (UMIC)	Y (74-85%)		Y	Y	Y		Y (1-2%)	Y	Y (1%)				Y (5-9%)
Adamson et al, 2019[88]	279777	US (HIC)	Y	Y	Y		Y		Y		Y	Y	Y		Y
Unknown perspective															
Mauskopf et al, 2005[89]	167329	US (HIC)	Y		Y										
Schackman et al, 2006[8]	500310.5	US (HIC)	Y		Y	Y	Y		Y		Y				
Freedberg et al, 2007[90]	1414	India (LMIC)	Y	Y	Y	Y	Y		Y		Y				
Moeremans et al, 2010[91]	439884.5	UK, Belgium, Italy, Sweden (HIC)	Y		Y	Y	Y		Y						
Sempa et al, 2012[16]	5221	Uganda (LIC)	Y	Y	Y	Y			Y			Y			
Estill et al, 2015[92]	2219	South Africa (UMIC)	Y (63-71%)		Y										
Nakagawa et al, 2015[3]	318,023	UK (HIC)	Y (68%)		Y (4%)	Y	Y		Y						
Restelli et al, 2017[21]	453779	Italy (HIC)	Y		Y		Y		Y	Y	Y				
Rampaul et al, 2018[93]	319,264	(HIC)													
Ward et al, 2018[94]	502763	UK (HIC)	Y						Y						

The percentages represent the proportion of lifetime cost attributed to that cost item. These must be read with caution as the percentage will depend on what cost items are included in the study – i.e. the difference between studies may be due to methodological fabrication.

[1] This study reports using the employer's perspective – cost items: direct expenses on health insurance premium, life insurance premium, short-term disability benefits, long-term disability benefits, hiring/training expenses, and indirect costs resulting from reduced or lost productivity at work.

Supplementary Table 2. Summary of included studies' methodology, decision model, sensitivity analyses, and whether the model accounted for CD4

#	Study	Cost Methodology	Model	Microsimulation	Cohort	Sensitivity Analyses	Accounted for CD4
1.	Adamson et al, 2019[88]	Micro costing using ingredients-based approach at the clinic level. Health care costs were used from published data	Markov (health states -memoryless)		☑	One-way, Scenario, & Probabilistic	Y
2.	Badri et al, 2006[37]	Micro costing using step down accounting methods	Monte Carlo simulated Markov state-transition model	☑		One-way & Probabilistic	Y
3.	Bayoumi et al, 2013[50]	Mixed costing Cost based on data from Dept of Veterans Affairs	Markov cohort simulation model (monthly intervals)		☑	one-way & Probabilistic	Y
4.	Bendavid et al, 2011[83]	Micro costing using published data	State Transition Simulation	☑		Several One-way, Multivariate & Probabilistic	Y
5.	Bendavid et al, 2009[80]	Micro costing using published data	Mathematical Simulation Model (1-month increments)		☑	One-way, Multi-way & Probabilistic	Y

6.	Bendavid et al, 2008[73]	Micro costing using published data	Markov Microsimulation	☑		One-way, Multivariate	Y
7.	Bender et al, 2010[74]	Micro costing using published data	State Transition Simulation		☑	One-way, Multivariate	Y
8.	Broder et al, 2011[43]	Micro costing using published data	Markov Microsimulation	☑		One-way & Probabilistic	Y
9.	Brogan et al, 2010[81]	Micro costing using published data	Markov (3-month transition)		☑	One-way, Multivariate & Probabilistic	Y
10.	Brogan et al, 2014[56]	Micro costing using published data	Markov (3-month cycle period)		☑	One-way & Probabilistic	Y
11.	Brogan et al, 2011[84]	Micro costing using published data	Markov model (1-year cycle period)		☑	One-way & Probabilistic	Y
12.	Brogan et al, 2019[23]	Micro costing using published data	Markov model on Microsoft Excel (3-month health state transition)		☑	One-way	Y
13.	Chawana et al, 2011[44]	Micro costing average inpatient & outpatient cost using published data	Markov (1-year cycle period)		☑	One-way	N

14.	Ciaranello et al, 2015[58]	Micro costing using published data	CEPAC - Monte Carlo State-Transition	☑		One-way, Multivariate	Y
15.	Cleary et al, 2006[38]	Mixed	Transition State Markov		☑	Multivariate & Probabilistic	Y
16.	Dugdale et al, 2019[68]	Micro costing using published data	CEPAC - Monte Carlo State-Transition	☑		One-way, Multivariate	Y
17.	Duggan et al, 2005[36]	Claims and eligibility data from random 24% of Medicaid recipients from California	Simple Time Series Model (econometric model)	-	-	-	Y
18.	Estill et al, 2015[92]	Micro costing but source of data is unclear	Mathematical Simulation Model	-	-	One-way	N
19.	Farnham et al, 2013[51]	Micro costing Data extracted from hospital and clinic records. HIV-related costs derived from Gebo et al supplemented with data from Schackman et al	PATH - Monte Carlo Health-State Transition Simulation	☑		One-way	N

20.	Foglia et al, 2013[52]	Micro costing Actual resource consumption recorded in Lombardy Region databank. Cost of AIDS event from DRG reimbursement.	Markov Microsimulation Model	☑		Probabilistic	Y
21.	Freedberg et al, 2018[65]	Micro costing using published data	CEPAC I- Monte Carlo State-Transition	☑		One-way, Multivariate	Y
22.	Freedberg et al, 2001[70]	Macro costing using data from the AIDS Cost and Services Utilization Survey, Payment Office at Boston Medical Center, Boston, and the 1998 Red Book (prophylaxis & annual cost of ART regimes)	Computer Simulation Model of HIV, Monte Carlo Simulation		☑	One-way	Y
23.	Freedberg et al, 2007[90]	Micro costing Resource utilisation from YRG CARE cohort + Publications	CEPAC I-Monte Carlo State-Transition	☑		One-way	Y
24.	Goldie et al, 2003[78]	Micro costing using published data	Computer Simulation Model of HIV, Monte Carlo Simulation	☑		One-way	Y

25.	Gray et al, 2018[66]	Micro costing using data from Australian HIV Observational Database (AHOD) Temporary Residents Access Study (ATRAS)	Risk Equation Model	-		One-way	Y
26.	Hornberger et al, 2005[17]	Macro Costing using Expert Panel, Published Studies, Cost Of Treating AIDS Defining Illness using DRGS	Markov		☑	One-way	Y
27.	Hutchinson et al, 2006[25]	Micro costing using published data	Incidence-based cost-of-illness analysis	-	-	One-way	Y
28.	Hyle et al, 2014[14]	Micro costing using Published Data	CEPAC I-Monte Carlo State-Transition	☑		One-way, Probabilistic	Y
29.	Juday et al, 2013[53]	Micro costing Product Acquisition Cost based on 30-day Whole-Sale Acquisition Cost	Markov Model (12-week Cycles)		☑	One-way, Multivariate & Probabilistic	Y
30.	Kuhne et al, 2010[41]	Micro costing using published data	ARAMIS Model - Microsimulation. Markov State Transition Diagram	☑		One-way	Y

31.	Lorenzana et al, 2012[47]	Micro costing using South African Cohort and published data	CEPAC I-Monte Carlo State-Transition (Monthly Transition)	☑		One-way, Multivariate	Y
32.	Mauskopf et al, 2010[82]	Micro costing using published and unpublished Studies using US database	Markov Model- Monte Carlo Simulation	☑		One-way & Probabilistic	Y
33.	Mann et al, 2016[32]	Micro costing using Sentinel Active Surveillance Activity, combine with population data	Decision tree model	-	-	One-way & Probabilistic	N
34.	Mauskopf et al, 2012[48]	Micro costing using Resource Use Study & unit drug cost from Ontario Ministry of Health. Input cost based on hospital days from 48 weeks of DUET 1 and 2 trials	Markov (3-month hypothetical cycle)		☑	One-way, Multivariate & Probabilistic	Y

35.	Mauskopf et al, 2005[89]	Micro costing using average wholesale prices from Drug Topics Red Book 2002	Markov (6-month cycle)		☑	One-way	Y
36.	Millham et al, 2020[69]	Micro costing using published data	CEPAC - Monte Carlo State-Transition	☑		One-way, Multivariate & Probabilistic	Y
37.	Nakagawa et al, 2015[3]	Micro costing using published data	HIV Synthesis Progression Model: individual-based stochastic computer simulation model (3 monthly time step)	☑		One-way, Multivariate	Y
38.	Moreno et al, 2017[20]	Micro costing using published data	Monte Carlo Individual Simulation (ARAMIS)	☑		One-way	Y
39.	Ong et al, 2019[24]	Micro costing using the British National Formulary list price for each ARV, non-ARV costs from figures provided through Dept of Health	Two cost estimation approaches (models) using the HIV and AIDS Reporting System (HARS)		☑	One-way	Y
40.	Ouellet et al, 2015[85]	Micro costing using CHUM HIV cohort database	Inventory of all costs consumed during the course of HIV	-	-	One-way	N

41.	Owiti et al, 2014[57]	Micro costing using data from Mbagathi District Hospital (Mbagathi) and Moi Teaching and Referral Hospital (Moi) in Kenya.	Markov		☑	-	Unclear
42.	Paltiel et al, 2017[64]	Macro costing using published data	CEPAC - Monte Carlo State-Transition	☑		One-way, Multivariate & Probabilistic	Y
43.	Pinkerton et al, 1999[33]	unclear Data from publications	Unclear - a previously developed economic model of HIV/AIDS-related medical care costs	-	-	-	Y
44.	Reyes-Urueña et al, 2018[86]	Micro costing Inventory of all health care inputs consumed during HIV disease was created	Unclear	-	-	One-way	Y

45.	Rampaul et al, 2018[93]	Unclear how cost data collected - Used data from the South Carolina Department of Health and Environmental Control electronic HIV/Acquired Immunodeficiency Syndrome Reporting System	Previously Validated Simulation Model (by John Snow Institute) & Draft Cost Analysis Model	☑		-	Y
46.	Schackman et al, 2006[8]	Estimated medical services utilisation data from cross-sectional data collected by the HIV Research Network (HIVRN). & published data	CEPAC - Monte Carlo State-Transition	☑		One-way	Y
47.	Schackman et al, 2015[22]	Mixed costing using data from HIV Research Network	CEPAC - Monte Carlo State-Transition & Multivariable Poisson regression model	☑		One-way	Y

48.	Sempa et al, 2012[16]	Micro costing using published data	Decision Analytic Model, Markov		☑	One-way	Y
49.	Sloan et al, 2012[49]	Mixed costing using data from a clinical database	CEPAC - Monte Carlo State-Transition	☑		One-way	Y
50.	Yazdanpanah et al, 2002[71]	Micro costing using a clinical database from Northern France	Computer Based Simulation Model	☑		One-way, Multivariate	Y
51.	Sweet et al, 2016[61]	Micro costing using published data	A Comprehensive Computer-Based Microsimulation Model	☑		One-way	Y
52.	Uthman et al, 2018[15]	Micro costing using published data	Markov		☑	One-way & Probabilistic	Y
53.	VanDeusen et al, 2015[77]	Micro costing using data from a retrospective review of 817 medical records at two hospitals in Ghana and published literature	State-Transition Model		☑	One-way	Y
54.	Walensky and Ross et al, 2013[76]	Micro costing using published data	CEPAC - Monte Carlo State-Transition	☑		One-way	Y
55.	Walensky et al, 2013[55]	Micro costing using published data	CEPAC - Monte Carlo State-Transition (US Model)	☑		One-way, Multivariate	Y

56.	Wolf et al, 2007[72]	Model-based analysis incorporating data from different sites in the Caribbean, including OECS countries, Barbados, and Jamaica.	CEPAC I- Monte Carlo State-Transition	☑		One-way	Y
57.	Leisegang et al, 2013[54]	Micro costing using electronic database and published data	Markov		☑	Multivariate & Probabilistic	Y
58	Liu et al, 2002[35]	Micro costing using published data	Cost Simulation Model	-	-	One-way & Probabilistic	Y
59.	Johri et al, 2002[34]	Micro costing using published data	CEPAC - Monte Carlo State-Transition	☑		One-way	Y
60.	Kowalska et al, 2017[63]	Micro costing using published data	Markov		☑	One-way, Multivariate & Probabilistic	N
61.	Peng et al, 2015[59]	Micro costing using published data	Discrete-Event Simulation	-	-	One-way & Probabilistic	N
62.	Pialoux et al, 2015[60]	Micro costing using published data	Markov (ARAMIS-DTG Model)	☑		One-way	Y
63.	Restelli et al, 2017[21]	Micro costing using published data	ARAMIS-DTG model - Monte Carlo Individual Simulation Model	☑		One-way	N

64.	Sax et al, 2010[75]	Micro costing using published data	CEPAC - Monte Carlo State-Transition	☑		One-way	N
65.	Schackman et al, 2007[79]	Unclear	CEPAC - Monte Carlo State-Transition	☑		One-way	N
66.	Simpson et al, 2013[18]	Micro costing using published data	Discrete Event Simulation (DES)	-	-	One-way & Probabilistic	Y
67.	Taychakhoonavudh et al, 2016[62]	Micro costing using the LASA study and published data	Markov		☑	One-way	N
68.	Tilden et al, 2010[46]* **Lifetime cost was taken from Chaudhary et al, 2011*[45]	Unclear	Markov		☑	-	N
69.	Tremblay et al, 2018[87]	Micro costing using published data	Dynamic Markov Model	-	-	One-way & Probabilistic	N
70.	Ward et al, 2018[94]	Micro costing using published data	Hybrid Decision Tree & Markov Model		☑	-	N
71.	Zheng et al, 2018[67]	Micro costing using published data	CEPAC I- Monte Carlo State-Transition	☑		Multivariate & Probabilistic	N
72.	Moeremans et al, 2010[91]	Micro costing using published data	Markov		☑	One-way & Probabilistic	Y
73.	Moreno et al, 2010[42]	Micro costing using published data	Markov- Cohort		☑	One-way & Probabilistic	Y

74.	Simpson et al, 2009[95]	Micro costing using published data	Markov		☑	Multivariate	Y
75.	Simpson et al, 2008[39]	Micro costing using published data	Markov		☑	Probabilistic	Y

Supplementary Table 3. Quality of the study assessed using the criteria from the methods section of the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist[10]

#	Study	Methods										
		Target population and subgroups	Setting and location	Study perspective	Time horizon	Discount rate	Estimating resources and costs	Currency, price date, and conversion	Choice of model	Assumptions	Analytical methods	Final Score /10
1.	Adamson et al, 2019[88]	1	1	1	1	1	1	1	1	1	0	9
2.	Badri et al, 2006[37]	1	1	1	1	1	1	1	1	1	0	9
3.	Bayoumi et al, 2013[50]	1	1	1	0	1	1	0	1	1	1	8
4.	Bendavid et al, 2011[83]	1	1	1	1	1	1	1	1	1	0	9
5.	Bendavid et al, 2009[80]	1	1	1	1	1	1	1	1	0	0	8
6.	Bendavid et al, 2008[73]	1	1	1	1	1	1	1	0	1	0	8
7.	Bender et al, 2010[74]	1	1	1	1	1	1	1	1	1	0	9
8.	Broder et al, 2011[43]	1	1	1	1	1	1	1	1	1	0	9
9.	Brogan et al, 2010[81]	1	1	1	1	1	1	1	1	1	0	9
10.	Brogan et al, 2014[56]	1	1	1	1	1	1	1	1	1	1	10
11.	Brogan et al, 2011[84]	1	1	1	1	1	1	1	1	1	0	9
12.	Brogan et al, 2019[23]	1	1	1	1	1	1	1	1	0	1	9
13.	Chawana et al, 2011[44]	1	1	1	1	1	1	0	1	1	0	8
14.	Ciaranello et al, 2015[58]	1	1	1	1	1	1	1	1	0	0	8
15.	Cleary et al, 2006[38]	1	1	1	1	1	1	1	1	0	0	8
16.	Dugdale et al, 2019[68]	1	1	1	1	1	1	1	1	1	1	10
17.	Duggan et al, 2005[36]	1	1	1	1	0	1	0	1	1	0	7
18.	Estill et al, 2015[92]	1	1	1	1	1	1	1	1	0	0	8
19.	Farnham et al, 2013[51]	1	1	1	1	1	1	1	1	1	1	10
20.	Foglia et al, 2013[52]	1	1	1	1	1	1	0	1	0	0	7
21.	Freedberg et al, 2018[65]	1	1	1	1	1	1	1	1	1	0	9
22.	Freedberg et al, 2001[70]	1	1	1	1	1	1	1	1	1	0	9
23.	Freedberg et al, 2007[90]	1	1	1	1	1	1	1	1	1	0	9
24.	Goldie et al, 2003[78]	1	0	1	1	1	1	0	1	1	1	8
25.	Gray et al, 2018[66]	1	1	1	1	1	1	0	1	1	0	8
26.	Hornberger et al, 2005[17]	1	1	1	1	1	1	1	1	1	0	9

27.	Hutchinson et al, 2006[25]	1	1	1	1	1	1	1	0	1	1	9
28.	Hyle et al, 2014[14]	1	1	1	1	1	1	1	1	1	0	9
29.	Juday et al, 2013[53]	1	1	1	1	1	1	1	1	1	0	9
30.	Kuhne et al, 2010[41]	1	1	1	1	1	1	1	1	1	1	10
31.	Lorenzana et al, 2012[47]	1	1	1	1	1	1	1	1	1	1	10
32.	Mauskopf et al, 2010[82]	1	1	1	1	1	1	1	1	1	0	9
33.	Mann et al, 2016[32]	1	1	1	1	1	1	1	1	1	0	9
34.	Mauskopf et al, 2012[48]	1	1	1	1	1	1	1	1	1	0	9
35.	Mauskopf et al, 2005[89]	1	1	0	1	1	1	1	1	1	0	8
36.	Millham et al, 2020[69]	1	1	1	1	1	1	1	1	1	0	9
37.	Nakagawa et al, 2015[3]	1	1	0	1	1	1	1	1	1	1	9
38.	Moreno et al, 2017[20]	1	1	1	1	1	1	1	1	0	1	9
39.	Ong et al, 2019[24]	1	1	1	1	1	1	1	1	1	1	10
40.	Ouellet et al, 2015[85]	1	1	1	1	1	1	1	1	0	0	8
41.	Owiti et al, 2014[57]	1	1	1	0	1	1	0	1	0	0	6
42.	Paltiel et al, 2017[64]	1	1	1	0	1	1	1	1	0	0	7
43.	Pinkerton et al, 1999[33]	0	1	0	1	1	1	1	0	1	0	6
44.	Reyes-Urueña et al, 2018[86]	1	1	1	1	1	1	1	0	0	0	7
45.	Rampaul et al, 2018[93]	1	1	0	1	1	1	1	1	1	0	8
46.	Schackman et al, 2006[8]	1	1	0	1	1	1	1	1	1	1	9
47.	Schackman et al, 2015[22]	1	1	1	1	1	1	1	1	1	1	10
48.	Sempa et al, 2012[16]	1	1	0	1	1	1	1	1	1	0	8
49.	Sloan et al, 2012[49]	1	1	1	1	1	1	1	1	1	1	10
50.	Yazdanpanah et al, 2002[71]	1	1	0	0	1	1	1	1	1	0	7
51.	Sweet et al, 2016[61]	1	1	1	1	1	1	1	1	1	0	9
52.	Uthman et al, 2018[15]	1	1	1	1	1	1	1	1	0	0	8
53.	VanDeusen et al, 2015[77]	1	1	1	1	1	1	0	1	0	0	7
54.	Walensky and Ross et al, 2013[76]	1	1	1	1	0	1	1	1	0	0	7
55.	Walensky et al, 2013[55]	1	1	1	1	1	1	1	1	1	1	10
56.	Wolf et al, 2007[72]	1	1	1	1	1	1	1	1	1	0	9
57.	Leisegang et al, 2013[54]	1	1	1	1	1	1	1	1	1	0	9
58	Liu et al, 2002[35]	1	1	1	1	1	1	1	1	1	1	10
59.	Johri et al, 2002[34]	1	1	1	1	1	1	1	1	1	0	9
60.	Kowalska et al, 2017[63]	1	1	1	1	1	1	0	1	1	0	8
61.	Peng et al, 2015[59]	1	1	1	1	1	1	0	1	1	0	8

62.	Pialoux et al, 2015[60]	1	1	1	1	1	1	1	1	1	0	9
63.	Restelli et al, 2017[21]	1	1	0	1	1	1	1	1	1	0	8
64.	Sax et al, 2010[75]	1	1	1	1	1	1	1	1	1	0	9
65.	Schackman et al, 2007[79]	0	1	1	1	1	1	1	1	1	0	8
66.	Simpson et al, 2013[18]	1	1	1	1	1	1	1	1	1	0	9
67.	Taychakhoonavudh et al, 2016[62]	0	1	1	1	1	1	0	1	0	0	6
68.	Tilden et al, 2010[46]* **Lifetime cost was taken from Chaudhary et al, 2011*[45]	0	1	1	1	0	1	0	1	0	0	5
69.	Tremblay et al, 2018[87]	1	1	1	1	1	1	1	1	1	0	9
70.	Ward et al, 2018[94]	1	1	0	1	1	1	1	1	0	0	7
71.	Zheng et al, 2018[67]	1	1	1	1	1	1	1	1	1	0	9
72.	Moeremans et al, 2010[91]	1	1	0	1	1	1	1	1	0	0	7
73.	Moreno et al, 2010[42]	1	1	1	1	1	1	1	1	0	0	8
74.	Simpson et al, 2009[95]	1	1	1	1	1	1	1	1	1	1	10
75.	Simpson et al, 2008[39]	1	1	1	1	1	1	1	1	1	0	9

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