Cost-effectiveness of Scaling Up Voluntary Counselling and Testing in West-Java, Indonesia

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ABSTRAK

Tujuan: *untuk mengevaluasi efektivitas biaya (cost-effectiveness) perluasan layanan (scaling-up) VCT berbasis masyarakat di Jawa Barat.* ***Metode:*** *Asian epidemic modelling (AEM) dan resource need model (RNM) digunakan untuk menghitung biaya-biaya tambahan untuk setiap infeksi HIV yang dihindari dan setiap disability-adjusted life years (DALYs) yang diselamatkan. Data demografi, perilaku dan biaya hasil pantauan lokal yang berhubungan dengan epidemic digunakan sebagai input pada model.* ***Hasil:*** *memperluas cakupan layanan VCT berbasis masyarakat di Jawa Barat akan mengurangi prevalensi di keseluruhan populasi sebesar 36% pada tahun 2030 dan dengan biaya US$ 248 per infeksi HIV yang terhindari dan US$ 9.17 per DALY yang diselamatkan. Perkiraan efektivitas biaya yang paling sensitif adalah terhadap dampak VCT pada penggunaan kondom dan jumlah populasi klien pekerja seks wanita (WTS), dan dampaknya secara keseluruhan kuat. Total biaya untuk scaling-up VCT berbasis masyarakat berkisar antara US$ 1,3 dan 3,8 juta per tahun dan memerlukan sejumlah klinik VCT terintegrasi di puskesmas untuk meningkatkan dari 6 klinik di 2010 menjadi 594 klinik di tahun 2030.* ***Kesimpulan:*** *scaling up VCT berbasis masyarakat merupakan intervensi efektif dan hemat biaya. Namun, untuk memprioritaskan VCT dalam pengendalian HIV/AIDS di Jawa Barat, masalah ketersediaan anggaran dan kapasitas organisasi harus diatasi.*

Kata kunci: *infeksi HIV, konseling & tes suka rela, analisis efektivitas biaya, pengambilan keputusan.*

ABSTRACT

Aim: *to evaluate the costs-effectiveness of scaling up community-based VCT in West-Java.* ***Methods:*** *the Asian epidemic model (AEM) and resource needs model (RNM) were used to calculate incremental costs per HIV infection averted and per disability-adjusted life years saved (DALYs). Locally monitored demographic, epidemiological behavior and cost data were used as model input.* ***Results:*** *scaling up community-based VCT in West-Java will reduce the overall population prevalence by 36% in 2030 and costs US$248 per HIV infection averted and US$9.17 per DALY saved. Cost-effectiveness estimation were most sensitive to the impact of VCT on condom use and to the population size of clients of female sex workers (FSWs), but were overall robust. The total costs for scaling up community-based VCT range between US$1.3 and 3.8 million per year and require the number of VCT integrated clinics at public community health centers to increase from 73 in 2010 to 594 in 2030.* ***Conclusion:*** *scaling up community-based VCT seems both an effective and cost-effective intervention. However, in order to prioritize VCT in HIV/AIDS control in West-Java, issues of budget availability and organizational capacity should be addressed.*

Key words: *HIV infections, voluntary counselling and testing, cost-effectiveness analysis, decision maker.*

INTRODUCTION

In most Asian countries national HIV epidemics are stabilizing, but Indonesia's is growing.[1] The epidemic is concentrated among risk groups, such as injecting drug users (IDUs) and female sex workers (FSWs), except in Papua province, where it is generalized.[2] In 2009, the prevalence of people living with HIV/AIDS (PLWHA) was estimated at 353,173 (0.3%) and long-term projections vary between 500,000-1,000,000 in 2015. Importantly, these projections indicate a shift of the epidemic towards the general population.[3,4]

Indonesia's national response focuses on a wide range of services, mainly for most-at-risk populations: e.g. harm reduction programs, condom distribution, and voluntary counseling and testing (VCT).[3] Unfortunately, coverage of VCT remains low, approximately 30% among most-at-risk populations in 2009.[3] As a result, HIV patients present themselves at hospitals and at a very late stage, reflected in extremely low median CD4 cell counts (33/ml among IDUs and 84/ml among non-IDUs).[5] VCT functions as an entry point for care and counselors aim to reduce the risk behavior of tested individuals by providing information about routes of HIV transmission and about prevention methods.[6] Because VCT is able to prevent the spread of HIV, it is a key component in Indonesia's HIV/AIDS control. Based on WHO guidelines, VCT services in Indonesia consist of HIV rapid testing combined with pre- and post-test counseling. In line with the WHO/UNAIDS goals for universal access to VCT in 2010, the National AIDS Commission (NAC) proposes in their National Strategy 2010-2014 to scale up VCT to 80% among most-at-risk groups in 2014.[3,7]

To date, VCT is mainly delivered at hospitals, but several researchers stress the need for a community-based approach to promote early detection and treatment and to reduce case loads at hospitals.[8,9] Moreover, Siregar et al.[8] showed that in Indonesia community health centers provide VCT at significantly lower costs than hospitals. However, the total costs and health effects of scaling up VCT at community level are not yet clear. The rise in costs caused by the increasing number of people covered might be largely offset by a decrease in unit costs of VCT. In addition, the cost-effectiveness of VCT is largely unknown.

The Indonesian government substantially increased economic efforts to combat the HIV epidemic: the allocation from the national budget rose from US$11 to 73 million between 2006 and 2009.[3] This is encouraging, but it will not be enough to implement every intervention for every target group at full scale, emphasizing the urgent need for setting priorities for HIV/AIDS interventions.[10] Cost-effectiveness is proposed as a leading criterion in setting such priorities, but evidence on the cost-effectiveness of HIV/AIDS interventions is largely unavailable in Indonesia.[10] In addition, international literature is difficult to generalize and focuses mainly on Africa.[11]

Against this background, our study aims to evaluate the costs, effects, and cost-effectiveness of scaling up community-based VCT in West-Java in order to support the national strategy as well as policy makers in setting priorities for HIV/AIDS interventions. Our study is an integrated component of a broader project on the economic analysis of HIV/AIDS control in Bandung, West-Java that also includes cost[12] and cost-effectiveness studies on methadone maintenance treatment (MMT).[13]

METHODS

Study Setting

Our area of analysis is the province of West Java, with 40 million inhabitants and a high HIV prevalence in most-at-risk populations: 42.8% in IDUs, 11.6% in direct FSWs, and 3.3% in indirect FSW (direct FSWs are those working in brothels and indirect FSWs are those working in bars and hotels), and 2.0% in men having sex with men (MSM), according to most recent estimates in 2007. In 2010, West-Java reported a prevalence of 2,168 HIV infections and 3,512 AIDS cases,[14] although mathematical models (Asian Epidemic Model for West-Java) had projected 35,294 and 3,856, respectively. At time of research in West-Java, 167 VCT clinics are integrated in hospitals, public and private community health centers, and prisons. Between April 2006 and November 2009 these clinics provided VCT services to 27,807 people. However, in 2009 overall coverage was only 30% among the majority of most-at-risk populations and 2% among clients of FSWs (**Table 1**).[3,7] Because many stakeholders agreed upon a strategy of scaling up community-based

Table 1. VCT coverage and population size covered per risk population for West-Java province, based on national strategy 2010-2014[7]

Most-at-risk populations (size in West-Java province in 2009)§	2009		2010		2011		2012		2013		2014	
	Coverage (%)	Population covered	Coverage (%)	Population covered	Coverage (%)	Population covered	Coverage (%)	Population covered	Coverage (%)	Population covered	Coverage (%)	Population covered
IDUs (9,596)	37.02	3,551	44.0	4,313	64.0	6,403	68.0	6,940	72.0	7,496	80.0	8,490
FSWs (37,422)	33.42	12,498	48.0	18,337	56.0	21,798	64.0	25,387	68.0	27,472	72.0	29,614
Higher risk MSM (15,117)	22.82	3,447	22.8	3,521	36.0	5,674	48.0	7,718	56.0	9,184	64.0	10,700
Transgender (1,769)	85.62	1,514	85.6	1,538	85.6	1,560	85.6	1,581	85.6	1,602	85.6	1,622
Clients of FSWs (204,200)	2.2#	4,492	15.0	31,293	23.0	48,971	30.0	65,159	35.0	77,540	40.0	90,334
Prisoners (20,199)	11.4#	2,304	48.0	9,851	64.0	13,318	68.0	14,344	72.0	15,389	80.0	17,303
Partners IDUs (5,829)	0.0#	0,0	2.0	119	4.0	243	8.0	496	12.0	759	20.0	1,289
Total (294,132)	9.5	27,806	23.0	68,972	32.0	97,967	38.9	121,625	43.8	139,442	49.1	159,352

IDUs = injecting drug users, FSWs = female sex workers, MSM = men having sex with men.
# VCT coverage data for West-Java province not available and therefore based on national data (outside Papua province), as reported in National Strategy 2010-2014[10]
Note: population size increases over the years by overall West-Java population growth. § population size in 2009 was based on adaptation of size in 2006 by population growth.

VCT services, advocacy and capacity building has recently begun to successfully integrate more VCT clinics in existing public community health centers (i.e. *Puskesmas*).[7] So far, these clinics provide VCT services to 30 people per year, but have the capacity to test and counsel 300 people per year, as estimated by the Ministry of Health (MoH).[15]

Scaling up Community-based VCT versus Current Practice

We compare the costs and effects of scaling up community-based VCT versus a base case of current practice, over the years 2010-2030, from a government perspective. We calculated incremental cost-effectiveness ratios (ICER) per HIV infection averted and disability adjusted live years (DALYs). The base case and scaling up strategy were defined as follows:

Current practice (base case). In this situation, VCT services target only most-at-risk populations: indirect and direct FSWs, IDUs, higher risk MSM, transgenders, clients of FSWs, prisoners, and partners of IDUs. We assumed that VCT coverage among risk populations in 2009 remains stable until 2030 (**Table 1**) and that 60% of the people targeted receive VCT at hospitals, 20% at private community health centers, 10% at public community health centers, and 10% at prisons, reflecting current practice.[16] Unit costs of VCT per client depend on where the client is tested and counseled (i.e. health centers, hospitals, or prisons).

Scaling up VCT at the community level. In this situation, VCT will be scaled up at public community health centers according to the National Strategy 2010-2014, as specific targets for West-Java province are not available.[7,17] "Community level" is defined as providing services at close distance to the living area of the target group, in public community health centers (i.e. *Puskesmas*) in both urban and rural areas. Coverage among most-at-risk populations will increase from approximately 30% in 2009 to 80% in 2014 and will remain stable until 2030 (**Table 1**). We assumed that hospitals will no longer offer VCT services, that the number of people tested and counseled at private community health centers and prisons remains stable, and that the additional people covered receive VCT at public community health centers. In this situation, 85.4% of the targeted people receive VCT at public community health centers, 3.2% at private community health centers, 11.4% at prisons and 0% at hospitals. The most-at-risk populations targeted, the VCT unit costs, and the capacity of public community health centers are similar as the defined base case.

Study Model

We projected costs and effects using a combined Asian epidemic model (AEM)[18,19] and Resource needs model (RNM).[20] Both models are widely published and are the primary and only source of data on the HIV/AIDS epidemic for the Ministry of Health in Indonesia.[4,7] A detailed description of the models and the data sources used can be found in the online Appendix (www.niche1.nl/publications).

Because of model limitations we only modeled the impact of a reduction of condom use in contacts between direct and indirect FSWs and their clients, IDUs and FSWs and their spouses or regular partners, and between MSM and their male partners. In our sensitivity analysis we anticipated on the over- or underestimation of the effectiveness of VCT, as the impact matrix does not capture studies from Indonesia on the impact of VCT. However, in the literature we found one qualitative study on the impact of VCT on 40 IDUs in Bali that reported that of those who tested positive, 50% reported decreased risky drug use and 37.5% decreased risky sex. The individuals with negative test results showed the same changes.[21] In addition, we assumed equal impact of VCT over risk groups, as we found no evidence for differences in the literature.[22] The costs of VCT coverage were included for all most-at-risk populations.

Estimate of DALYs Saved

AEM output (number of new HIV infections, AIDS cases, and deaths of men and women) was used to estimate DALYs for both the base case and the strategy of scaling up VCT, based on the following Global Burden of Disease formulas:[23]

$$\mathbf{DALY = YLL + YLD}$$

Years of lives lost (YLL) due to AIDS related death:

$$YLLs\,|r,K,\beta| \quad \frac{KCe^{ra}}{(r\,|\,\beta)^2}\;[e^{(r|\beta KL|a|)}]\,[r\,|\,\beta][L\,|\,a]\;\;1|$$

$$- e^{(r(\beta|a|)}|- (r+\beta)\,a - 1|) + \frac{1\quad K}{r}(1\text{-}e^{rL})$$

K=age weighting modulation factor; *C*=constant; *r*=discount rate; *a*=age of death; *β*=parameter from age weighting function; *L*=standard expectation of life at age.

Years lived in disability (YLD) (separated for disease stages of HIV-infection and AIDS):

$$YLDs\,|r,K,\beta| \quad D\,|\,\frac{KCe^{ra}}{(r\,|\,\beta)^2}\;[e^{\,(r|\beta KL|a|)}]\,[r\,|\,\beta][L\,|\,a]\;\;1|$$

$$-\,e^{\,(r|\beta|a|)}|\,-\,(r+\beta)\,a\,-\,1|)+\frac{1\;\;K}{r}(1\text{-}e^{rL})$$

K=age weighting modulation factor; *C*=constant; *r*=discount rate; *a*=age of onset of disability; *β*=parameter from age weighting function; *L*=duration of disability; *D*=disability weight.

For men and women disability weights were 0.136 for HIV infection (0.123 until 15 years old) and 0.505 for AIDS, the average duration in the HIV and AIDS states were 7.49 and 3.0 years respectively,[2,23] the discount rate was 0.03, and no age-weighting was applied. The average age of infection was estimated using the Asian Epidemic Model. The mortality and AIDS disability that will take place after 2030 (and relate to HIV infections that occurred between 2010-2030) were included in the DALY estimates.

Estimate of Costs

Siregar et al estimated the costs of VCT in different delivery settings (public and private community health centers, hospitals, and prisons) in Bandung, West-Java (**Table 2**).[8] Health care costs were estimated on the basis of data on service utilization retrieved from clinic records and unit costs, including all resources consumed and valued using a micro-costing approach. All costs were measured in rupiah, and converted to US$ using the 2008 exchange rate. Based on a MoH workshop with HIV/AIDS experts in West-Java, the health care costs for public community health centers were adjusted from 28 to 300 people per year to reflect normal capacity.[15] In all settings the VCT service is in line with the standard VCT delivery procedure instructed by the MoH: VCT includes a separate room for counseling and well-trained counselors. Differences among clinics in capital personnel training and workshop costs are explained by differences in training quality and number of staff trained. Differences in recurrent personnel costs are caused by differences in number of admin staff, salary and time spend per VCT service. We assumed that only private community health centers have outreach teams. Additional costs for scaling up services were not included as the unit costs include capital costs reflecting costs for new buildings and training costs for new VCT counselors.

Table 2. Annual costs of delivering VCT service for different clinic settings (US$, 2008 exchange rate)[8]

Type of cost/clinic setting	Public community health center†	Private community health center	Hospital	Prison
Capital costs (annualized)				
Personnel training, & workshops	207 (4.6§)	4,220 (10.0)	145 (0.5)	4,194 (32.4)
Building/space	181 (4.0)	266 (0.6)	657 (2.3)	1,624 (12.5)
Equipment	297 (6.6)	351 (0.8)	657 (2.3)	30 (0.2)
Subtotal	685	4,837	1,459	5,848
Capital cost per VCT	2	6	3	10
Recurrent costs				
Personnel	615 (13.8)	21,051 (50.0)	21,633 (74.9)	2,116 (16.4)
Supplies	2,297 (51.4)	10,007 (23.8)	2,591 (9.0)	539 (4.2)
Outreach team activities	-	6,186 (14.7)	-	-
Laboratory	874 (19.5)	- ¥	3,255 (11.2)	4,439 (34.3)
Subtotal	3,787	37,244	27,479	7,093
Recurrent cost per VCT	12	48	65	12
Total annual cost	4,472	42,080	28,938	12,941
Clinic capacity (number of VCTs per year)	300	784	421	574
Unit cost per VCT	14.91	53.37	68.74	22.55

† Adapted to 300 patients per year
§ Percentage of total costs
¥ Not costed separately, but included in the capital and recurrent cost items

Sensitivity Analyses

We examined the robustness of baseline incremental cost-effectiveness ratios to parameter variations in a one-way sensitivity analysis. For the impact of VCT on the reduction in non-condom use the uncertainty ranges as provided by the GOALS matrix were used. We varied coverage assumptions in the strategy of scaling up VCT and all costs components using a -/+ 25% approach. Other parameters, like AEM fitting variables, years of projection, clinic capacity, and most importantly epidemiological and behavioral variables were varied according to known uncertainty or a -/+25% approach. All uncertainty ranges are presented between brackets in an additional table in the online Appendix (www.niche1.nl/publications).

RESULTS

Between 2010 and 2014, scaling up VCT will increase condom use for direct FSWs from 62% to 69%, for indirect FSWs from 60% to 67%, for MSM from 45% to 55%, for sexual contact between IDUs and FSWs from 54% to 62%, and for sexual contact between IDUs and spouses from 34% to 46%. Compared with the base case, scaling up VCT will decrease the overall HIV prevalence by 36%, from 0.44% to 0.28%, in West-Java in 2030. This reduction varies between most-at-risk populations: a decrease from 42.9% to 41.2% for IDUs, 34.0% to 21.7% for FSWs, and 15.7% to 9.8% for MSM. Up to 2030, scaling up VCT will avert more than 94,000 HIV infections (**Figure 1**), 41,000 AIDS cases and 26,000 deaths, and this corresponds to more than 2.5 million DALYs averted in West-Java.

Unit costs of VCT delivery settings range between US$14.91 at public community health centers and $68.74 at hospitals (**Table 2**). Over the period 2010-2030, scaling up VCT at the community level will cost US$60 million, compared to US$37 million if current practice is maintained. Scaling up VCT will cost US$1.3 million in 2010, US$3.0 million in 2015, and US$3.8 million in 2030. The number of clinics integrated at public community health centers would need to increase from from 73 in 2010 to 594 in 2030 in order to provide VCT services to more than 180,000 thousand people in West-Java in 2030.

Scaling up VCT (compared to the base case) costs US$248 per HIV infection averted and US$9.17 per DALY averted. As presented in **Figure 2**, ICER estimates were most sensitive to the impact of VCT on condom use, population size of clients of FSWs, HIV prevalence in the general population, population size of FSWs, and condom use between FSWs and clients. Costs per HIV infections averted range between US$104 and US$1,758 and cost per DALY saved range between US$5 and US$65.

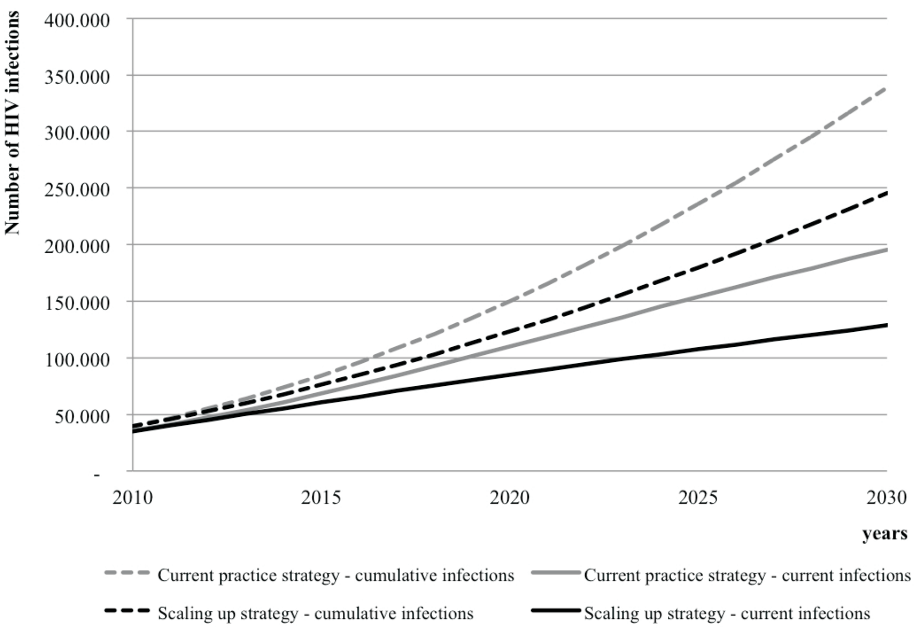

Figure 1. Impact of scaling up VCT on cumulative and current number of HIV infections in West-Java

DISCUSSION

Our estimates show that implementation of the national strategy of scaling up community-based VCT to 80% of the most-at-risk populations in West-Java could reduce the overall population prevalence by 36% in 2030 (from 0.44% to 0.28%) and could avert a substantial amount of HIV-related morbidity and death. This strategy costs US$248 per HIV infection averted and US$9.17 per DALY saved. According to international thresholds put forward by WHO[24], this intervention seems very cost-effective as it falls within the one-time per capita gross domestic product (i.e. US$2,963 in 2010).[25] Although our estimates are sensitive to parameter changes in the model, they do not exceed the threshold mentioned and therefore conclusions can be considered robust. Because the nature of the HIV epidemic is similar across Indonesia, with the exception of Papua province, study results can be generalized with caution.

Although scaling up community-based VCT is very effective and cost-effective it raises concerns: West-Java province will need between US$1.3 to US$3.8 million per year to spend on VCT; in 2010 the national HIV/AIDS expenditure for all programs in all 33 provinces together was US$50.8 million and 61% was financed by international sources.[3] However, the prioritization of VCT over other interventions could partially address this concern. Scaling up community-based VCT requires a substantial rise in the number of public community health centers that deliver VCT (from 73 in 2010 to almost 600 in 2030) and it is not certain whether this is feasible, although first steps in this process have already been taken successfully.[7] Because of these budget and organizational constraints, cost-effectiveness alone should not guide priority setting in HIV/AIDS control in West-Java.[26]

Scaling up VCT is more cost-effective than MMT in West-Java. Wammes et al estimated that scaling up MMT to 20% in West-Java costs $269 per DALY saved.[13] Unfortunately, we cannot compare these results to the cost-effectiveness of other HIV/AIDS interventions in Indonesia due to a lack of data. Compared to other countries our estimates are in the same order of magnitude. In India and Kenya, VCT costs, respectively, US$665 and US$249 per HIV infection averted. In Peru, VCT costs US$116 per DALY saved.[27-29]

This study has a number of limitations. First, the AEM and RNM were not originally developed to conduct cost-effectiveness analysis and could not precisely reflect VCT in West-Java as some risk populations were not included. In addition,

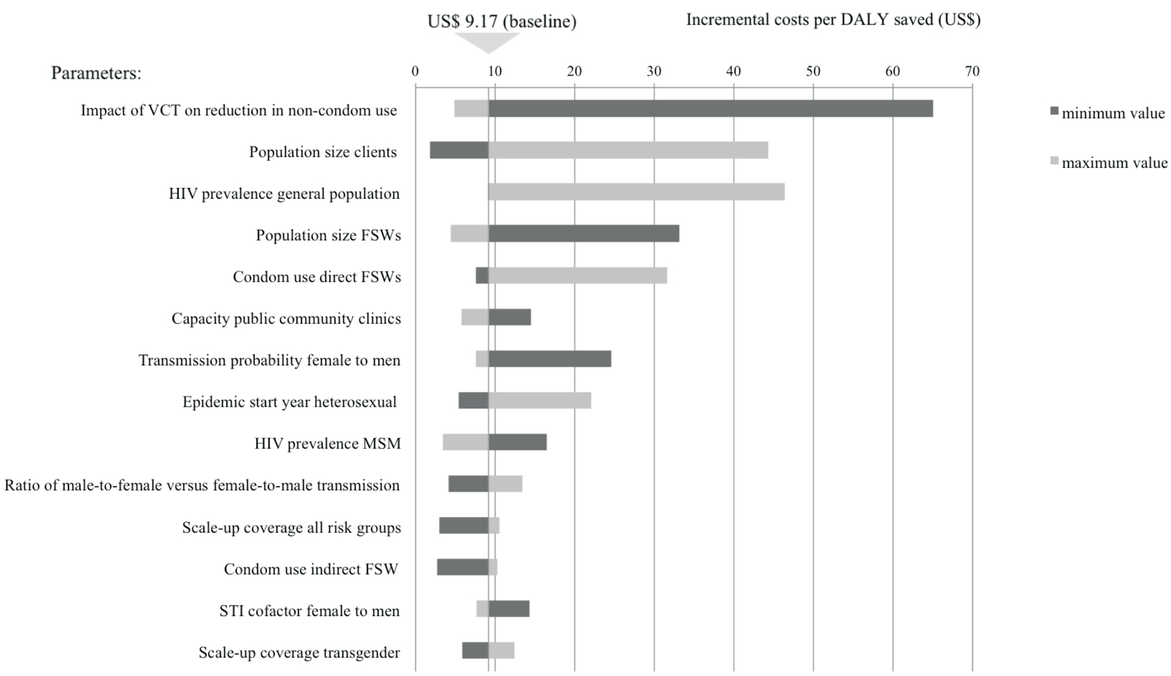

Figure 2. Results of one-way sensitivity analysis of incremental costs per DALY saved

the effectiveness data in the impact matrix (i.e. the impact of VCT on condom use) was not based on Indonesian evidence and the exclusion of some populations caused an underestimation of the effectiveness. However, our effectiveness assumption was validated by the literature and sensitivity analysis showed that conclusions are robust. Second, VCT was evaluated as a single intervention and the impact of increased need for antiretroviral treatment (ART) on budget and health effects was not included. We excluded ART because its implementation is a separate decision for the government; if we included it then the overall intervention would probably be even more cost- effective, as ART can reduce HIV transmission and therefore has large population effects. In addition, we analyzed costs from a governmental perspective and did not include patient costs, although a recent study in three settings in Indonesia showed a substantial financial burden of HIV/AIDS care for patients.[30] Third, economies of scale, cost inflation, indirect costs (productivity loss due to disability and early death), and interactions between interventions were not taken into account, because accurate data was not available. Fourth, scaling up VCT could face feasibility constraints, e.g. a lack of VCT counselors and political and cultural support, but this can be partially resolved by training community workers and by advocacy for prioritizing HIV/AIDS services. Fifth, we assume that high coverage of risk groups can be achieved although it is difficult to reach out to these populations. However, we see this assumption as a limitation of cost-effectiveness analysis in general.

CONCLUSION

Scaling up community-based VCT seems an effective and cost-effective intervention. However, in order to prioritize VCT in HIV/AIDS control in West-Java, issues of budget availability and organizational capacity should be addressed.

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