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PRIORITY·SETTING
in HIV/AIDS
CONTROL

the use of multi criteria
decision analysis in
Indonesia and South Africa

Colofon

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PRIORITY SETTING in HIV/AIDS CONTROL

the use of multi criteria decision analysis

in Indonesia and South Africa

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Doctoral Thesis

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CHAPTER 1

General introduction



This thesis focuses on priority setting in HIV/AIDS control in Indonesia and South Africa. As the majority of the research in this thesis is conducted in Indonesia, this chapter starts with a detailed description of the HIV/AIDS situation in Indonesia, followed by a shorter description of the South African setting.

HIV/AIDS control in Indonesia

Indonesia's HIV/AIDS epidemic

Indonesia is among the few countries in the world not on track for controlling its HIV epidemic [1]. The country faces a concentrated epidemic (with exception of Papua) with an estimated 640,000 people living with HIV/AIDS (PLWHA) in 2013 [2]. This number will increase to 1.5 million in 2020 unless the right actions are taken (Figure 1). The estimated HIV prevalence is high among people who inject drugs (PWID) (36.4%), female sex workers (FSW) (7.2%) and men having sex with men (MSM) (8.5%). In the general population the HIV prevalence remains low (0.3%) but is expected to increase coming years due to sexual transmission from clients of sex workers, PWID and MSM to their sexual partners and their children. Although in terms of absolute numbers the disease burden is relatively small compared to other affected countries in the world, HIV/AIDS is a pressing public health problem for Indonesia.

Indonesia's HIV/AIDS response

The HIV/AIDS response in Indonesia is coordinated by multi-sectorial AIDS commissions which are established at all (national, provincial and district) levels of the decentralized government system. The most recent national HIV/AIDS strategy (2015-2019) outlines four components: 1) HIV prevention 2) quality treatment care and support services 3) mitigation of the impact of the epidemic, and 4) creation of an enabling environment that promotes an effective response to HIV and AIDS at all levels, empowers civil society to have a meaningful role and reduces stigma and discrimination [3]. In addition, the strategy includes three programs that are in the course of implementation:

- The Prevention of sexual transmission (PMTS) program, supported by the Global Fund, focuses on the prevention of sexual transmission. Since 2009, PMTS has mainly focussed on sex worker settings and was expanded in 2013 to high-risk men and MSM in high burden districts.
- The Strategic use of antiretrovirals for treatment and prevention (SUFA) program, promoted by the World Health Organization (WHO), aims to quickly accelerate HIV testing and antiretroviral treatment (ART) across the country and was an initiative by the Minister of Health after the release of the UNAIDS Global Report 2012 that warned Indonesia that it is not on track for controlling its HIV epidemic. Early 2013, Indonesia expanded its treatment guidelines to achieve early testing and treatment, which is strongly recommended by WHO with the knowledge that treatment works as prevention [4]. The new Indonesian guidelines advice to treat all people with CD4 cell counts of ≤ 350 cells/ μ L and all risk populations

Figure 1. Projection of the Indonesian HIV epidemic until 2025

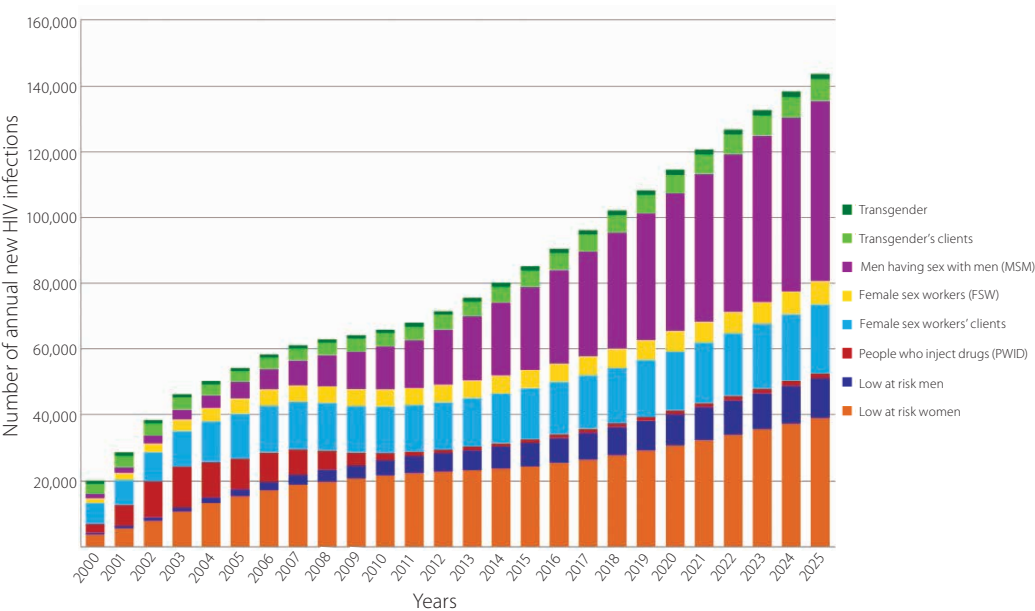
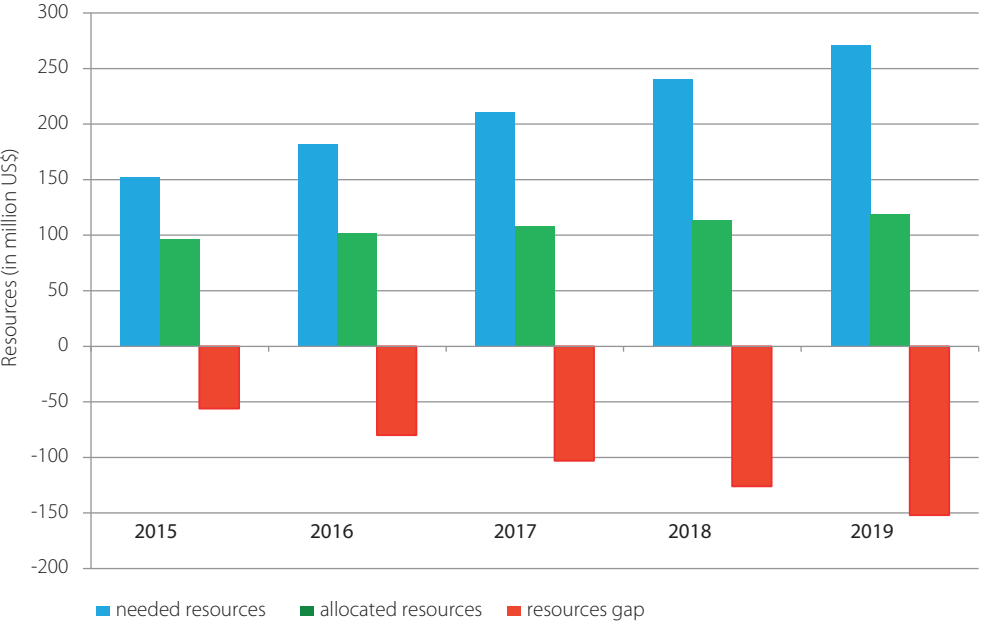


Figure 2. Resource gaps for HIV control in Indonesia 2015-2019 [3]



(MSM, PWID, FSWs, prisoners, pregnant women and TB/HIV patients and sero-discordant couples) regardless of their CD4 cell count. The scale up of the SUFA program is implemented gradually with 13 selected priority districts in 2013 and 37 in 2014 and 76 in 2015.

- The Continuum of care program (*Layanan Komprehensif Berkesinambungan (LKB)*), initiated by Ministry of Health, is a continuum of care program at district level that aims to integrate government institutions, health services and community organizations to cooperate in the delivery of HIV/AIDS care. In the selected LKB districts one district hospital is cooperating with five selected primary health clinics (i.e. *Puskesmas*) to deliver testing and treatment services close to the community. At this moment LKB is rolled out in 13 districts in 2013 and will be scaled up to 41 in 2014 and 75 in 2015.

While in the past years Indonesia has successfully scaled-up interventions for PWID, resulting in a declining HIV/AIDS epidemic in this group (Figure 1), coverage remains low for interventions like condom distribution, school-based education, mitigation and antiretroviral treatment (ART). In 2013, 18% of those in need (29,960 out of 170,000 HIV infected people) were actually receiving ART and 8-23% of the HIV positive pregnant women received the WHO recommended regimen for prevention of mother to child transmission (PMTCT) [2]. Indonesia is also not on track for 6 of the 10 UNGASS (The Global AIDS reporting response progress reporting) goals, including targets to eliminate stigma and discrimination against PLWHA through promotion of laws and policies and elimination of gender inequalities, gender based violence and increase capacity of women to protect themselves from HIV [5]. Especially stigma related to HIV/AIDS is prominent in Indonesia's society and in particular among health care workers [6–8] and HIV-infected people [9,10].

Indonesia's need for priority setting in HIV/AIDS control

In this context Indonesia faces an urgent need to prioritize resources to control its epidemic. The total funding needed in 2013 was projected to be USD 107 million whereas only USD 84 million was available. Resource gaps are expected to further expand (Figure 2) with acceleration of the HIV/AIDS response according to the new National Strategy and Action Plan 2015-2019 (assuming that prevention programs will cover 70% of the key populations and 70% of those eligible are on ART). Moreover, foreign donors (Global Fund and Australian, UK and US governments) still contribute for 43% of the funding and this is expected to decrease. As a response, Indonesia is now finding ways to increase resource allocation for HIV by district governments [3].

HIV/AIDS control in South Africa

South Africa is home to the largest HIV-infected population worldwide, with 6.3 million people living with HIV/AIDS in 2013 [11]. The country has a generalized epidemic, with an HIV/AIDS prevalence rate of 19.2% among adults 15-49 years.

The country also has the largest antiretroviral therapy (ART) program worldwide: with domestic investments amounting to US\$1.9 billion in 2011 [12], it provided treatment to about 80% (2.0 million people) of all eligible people in 2012 [11]. South Africa is quickly scaling up ART and with the guidelines state that all those with CD4 cell counts of ≤ 350 cells/ μ L, with a Tuberculosis (TB) co-infection, and HIV-infected pregnant women irrespective of CD4 are eligible [13]. Nevertheless, a significant treatment gap of about half a million people remains between those who receive treatment and those in need according to the eligibility criteria [11].

Despite these achievements, the present HIV programme is not optimal in three important areas. First, there are concerns about whether the current treatment strategy is most efficient. Research suggests that alternative policies such as universal testing and immediate treatment of all HIV-infected patients (UTT) [14] and targeting specific risk groups [15,16], would be more efficient than the present programme. Second, concerns exist regarding the equity of the distribution of ART across population groups – recent reviews show that e.g. men and children have less access to treatment than women [17,18]. Third, there are concerns about the programme feasibility given the severely limited capacity of the health system. In 2011, 3.4 million people were eligible for treatment in South Africa, and despite the achievement in scaling up the treatment programme, yet only 52% of them received it [8].

The “treatment gap” is related to funding constraints, but also due to staff shortages [19], and it will increase with more people surviving on treatment [19,20]. National health authorities acknowledge these concerns [21] but have not yet developed and implemented treatment guidelines that address these. This results in ad-hoc priority setting practices (where some clinicians treat patients on a first-come first-serve basis while others give preference to the most severely ill) and waiting lists in parts of the country [22].

Available methods to guide priority setting in health

Over the years various methods have been developed to inform policy makers and thereby supporting priority setting of resources in many disease areas including HIV/AIDS. In the 1980's, economists introduced the use of cost-effectiveness analysis (CEA) to prioritize between health interventions. Based on welfare theory, the underlying notion is that interventions should not only have established effectiveness, but should also be worth its costs [23]. For a certain budget, population health would then be maximized by choosing interventions that show best value for money ('are most cost-effective'). The World Bank promoted the concept in low and middle income countries (LMICs) in 1993 [24] and the World Health Organization has followed up on this and made such information available at the regional level through the WHO-CHOICE project, for example for tuberculosis and HIV/AIDS control [25–27].

Yet, CEA falls short as clearly more criteria than cost-effectiveness play a role in decision making, like ethical (e.g. giving priority to the worst of populations in society) and feasibility (e.g. political acceptability and health care workers capacity) considerations [28–35]. This led

Table 1. Performance matrix used in multi criteria decision analysis [36]

OPTIONS	COST-EFFECTIVENESS	SEVERITY OF DISEASE	DISEASE OF POOR	AGE
Antiretroviral treatment in HIV/AIDS	US\$ 200 per DALY	✓	15 years and older
Treatment of childhood pneumonia	US\$ 20 per DALY	✓	0-14 years
Inpatient care for acute schizophrenia	US\$ 2000 per DALY	..		15 years and older
Plastering for simple fractures	US\$ 50 per DALY	..		all

Note: A tick indicates the presence of a feature. Severity of disease is shown of a four-scale, with more dots indicating a more severe disease

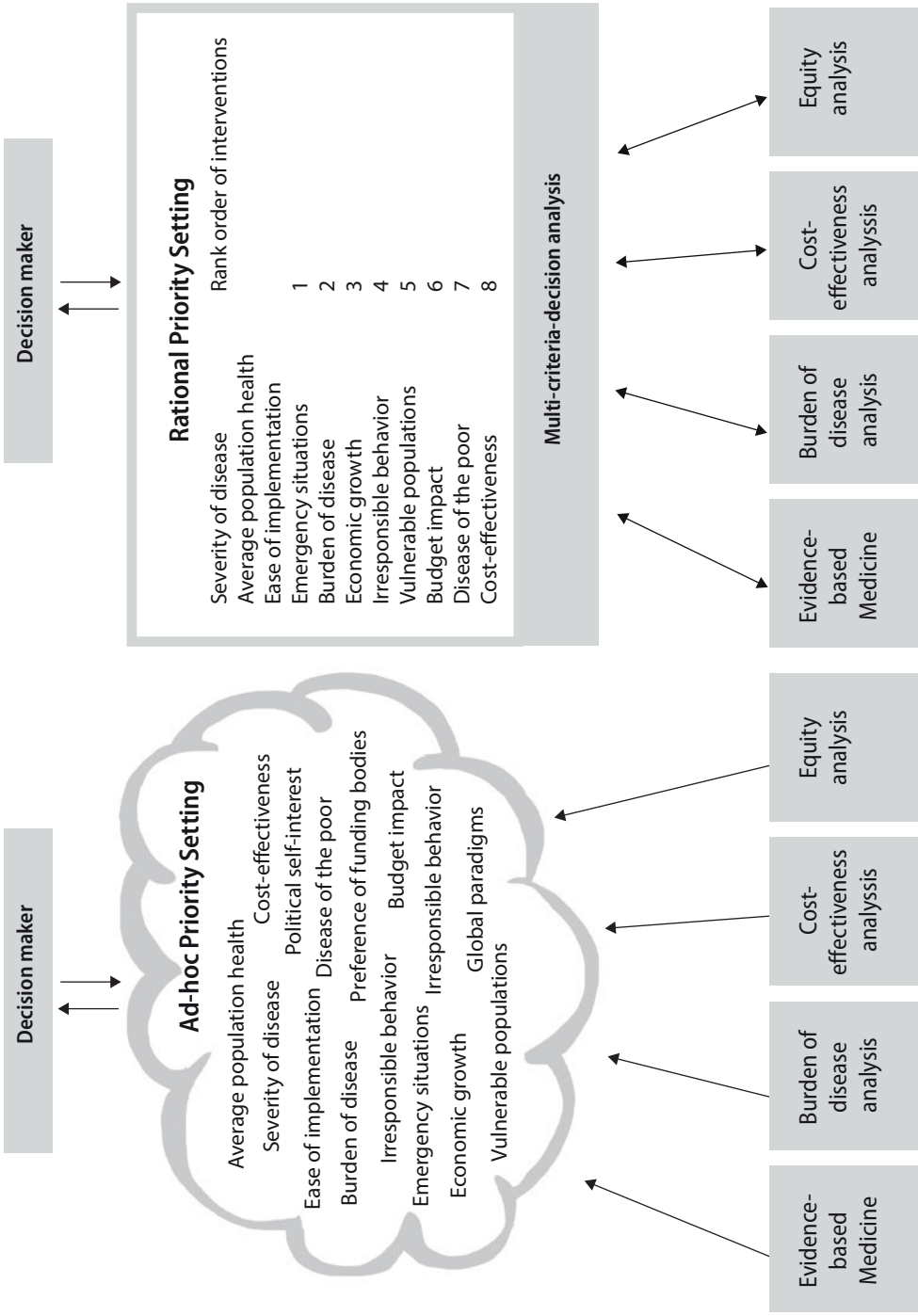
DALY = disability adjusted life year

to the development of multi criteria decision analysis (MCDA), a method that advances from CEA by incorporating multiple criteria in priority setting [36] (Figure 3). Based on multi attribute theory, MCDA refers to a set of approaches that provide a systematic process for incorporating multiple criteria in decision making and making transparent the impact (also called 'performance') of interventions on these criteria [29,36–38]. Table 1 presents an example of the performance matrix used in MCDA to present the performance of different interventions on the criteria selected for priority setting.

While some types of MCDA involve sophisticated algorithms to calculate the optimal choice and for example assign weights to criteria (to indicate its relative importance), others simply aim to provide some structure to the deliberative process of policy makers discussing priorities [29,39–54]. In Ghana, MCDA guided the Ministry of Health in prioritizing national health care interventions and in Nepal it showed that a lung health program should be a priority, ranking 13th out of 34 interventions [51,53]. In HIV/AIDS control, it is applied in Thailand to inform policy makers for the priority setting of HIV/AIDS interventions [42]. In these settings, MCDA successfully contributed to more transparent and accountable policy making and its application is expected to further expand in the coming years [29,55,56].

Only a few applications of MCDA have explicitly taken into account the view of stakeholders by asking them to indicate the relative importance of criteria or to respond to the performance matrix results during a deliberative process [42,57]. Decisions are often made without adequate involvement of stakeholders and especially the public is often not engaged in the decision-making

Figure 3. Multi criteria decision analysis to achieve rational priority setting [36]



process [58,59]. However, inclusion of the views of relevant stakeholders is important to ensure fair priority setting processes [60] and to hold institutions accountable for their decisions [58,59]. The Accountability for Reasonableness (AFR) framework outlines four conditions (relevance, publicity, appeal and enforcement) for such a fair priority setting process [60]. It is a leading conceptual framework for the ethics of health care priority setting and based on justice theories of democratic deliberation it aims to strengthen the legitimacy of priority setting decisions [61–68]. The framework reasons that it is impossible to achieve consensus on the outcomes of a decision making process, but when the process is fair the outcomes (i.e. decisions) are legitimate and are more likely to be accepted by stakeholders.

In HIV/AIDS control, there has been an increase in interest for the use of multiple criteria and fair processes for priority setting of interventions. In 2012, the World Health Organization developed guidelines for the strategic use of ART (SUFA) and recommended countries to consider the cost-effectiveness, equity and feasibility of ART program options [69]. These guidelines also recommend the application of MCDA and AFR frameworks for priority setting however the integrated approach has not yet been tested. Other available tools for HIV/AIDS control are less comprehensive and do not recommend to use of multiple criteria and fair processes for priority setting [70–75].

Without any guidance, priority setting processes tend to be not systematic and not evidence-informed and without inclusion of all relevant stakeholders. This may lead to ad-hoc and historically based decisions [36,76–80]. Especially in LMICs priority setting is complex due to limited evidence available to inform decisions, fragile institutional capacity and the dominant influence of policy makers opinion's and international donor agencies [64,81–83].

Rationale for this thesis

The research community and WHO have called for the use of multiple criteria and fair processes in HIV/AIDS control [28,69], and we more specifically in the context of Indonesia and South Africa [84,85]. At this moment, it unclear how countries are currently setting priorities in HIV/AIDS control, which criteria are considered important among stakeholders and how interventions perform on various criteria for priority setting. Moreover, it is unknown how the use of multiple criteria and fair processes can be implemented in a countries' health system. While the focus of this thesis is on Indonesia, we also conducted two studies on South Africa.

Research questions

The main research question of this thesis is:

How can priority setting in HIV/AIDS control in Indonesia and South Africa be improved with use of multiple criteria and fair processes?

The sub-questions of this thesis are:

■ **Sub-question 1:**

What is the current priority setting process in HIV/AIDS control in Indonesia?

■ **Sub-question 2:**

Which criteria are important for priority setting in HIV/AIDS control?

■ **Sub-question 3:**

What is the performance of HIV/AIDS interventions on criteria for priority setting?

■ **Sub-question 4:**

Can the integrated MCDA-AFR approach be used to support strategic planning processes in HIV/AIDS control?

Study setting

This thesis mainly focuses on Indonesia, the largest archipelago in the world with an estimated 13,466 islands and home to more than 250 million people [86]. While reading this thesis it is important to realize that this country is extremely diverse in its culture and development and it may be inappropriate to talk about one Indonesia. The country became independent in 1945 after 300 years of colonization by the Dutch. Although Indonesia is now rapidly developing and is projected to be the seventh largest economy globally in 2030 the gap between the rich and poor is tremendous and still approximately 29 million people (11.4%) were living under the poverty line of one dollar a day in 2013 [87]. Indonesia is also home to the largest Muslim population worldwide – 87.2% of the people was following Islam, 9.9% Christianity, 1.7% Hinduism, 0.7% Buddhism and 0.5% other religions in 2010 [88]. Democracy was introduced two decades ago in 1998 after 40 years of dictatorship by president Suharto. Corruption is prominent in Indonesia indicated by a score of 32 out of 100 points for transparency (with 0 meaning highly corrupt and 100 very clean) and a low rank on the world corruption list (114 out of 175) [89]. In July 2014, Joko Widodo was elected as the new president for Indonesia, with 53% of the votes while his opponent Prabowo received 48%. While Joko Widodo openly fights for increased transparency and accountability in Indonesia's government system while Prabowo did not advocate for this in his presidential campaign [90–92].

Our research took place in West Java province, located at Indonesia's most developed and densely populated island Java and is home to approximately 46 million people [93]. The province has a concentrated epidemic comparable to the national picture and one of the highest HIV/AIDS burdens. West Java had an estimated 59,000 PLWHA in 2013 while only about 15,000 were registered in the health care system based on the latest government reports in 2014 [94].

Thesis outline

This thesis is organized into four sections. Each section responds to one of the four sub-questions.

Table 2: Outline of the thesis

General introduction Chapter 1			
■ Sub-question 1 What is the current priority setting process in HIV/AIDS control in Indonesia? Chapter 2	■ Sub-question 2 Which criteria are important for priority setting in HIV/AIDS control? Chapters 3-4	■ Sub-question 3 What is the performance of HIV/AIDS interventions on criteria for priority setting? Chapters 5-7	■ Sub-question 4 Can the integrated MCDA-AFR approach be used to support strategic planning processes in HIV/AIDS control? Chapters 8-9
General discussion Chapter 10			

Current practices in priority setting in HIV/AIDS control

In **Chapter 2** we respond to the first sub-question and evaluate the current HIV/AIDS priority setting processes in Indonesia by assessing the development of the 5 year HIV/AIDS strategic plan for West Java province (2008-2013) and Bandung city (2007-2011) against the four conditions of the AFR framework (relevance, publicity, appeal and enforcement). We reviewed documents and held qualitative interviews with key stakeholders.

Criteria for HIV/AIDS priority setting

Chapter 3 and **Chapter 4** respond to the second sub-question. In **Chapter 3** we present a conceptual map of relevant criteria for priority setting of health interventions, based on literature reviews and categorized according to the World Health Organization’s Health Systems Performance and Health Systems Building Blocks frameworks. In **Chapter 4** we analyze the importance of criteria for priority setting in HIV/AIDS control in Indonesia by surveying the opinion of four stakeholder groups: people living with HIV/AIDS, health care workers, the general population and policy makers.

Performance of HIV/AIDS interventions

In **Chapter 5-7** we respond to sub-question 3 and present studies that provide information on the performance of HIV/AIDS interventions on various criteria (unit cost, cost-effectiveness and equity). In **Chapter 5** we evaluate the unit costs of hospital based ART provision for HIV/AIDS patients in Indonesia. The chapter outlines a cost profile differentiated by initiation of treatment at different CD4 cell count levels; time on treatment; cost components (e.g., drug and personnel costs) for HIV/AIDS care and opportunistic infections (OIs); and finally patient costs of seeking and undergoing care. In **Chapter 6** we evaluate the cost-effectiveness of scaling up community-based VCT up from 30% to 80% between 2010-2014. We use the Asian epidemic model (AEM) and resource needs model (RNM) to calculate the incremental costs per HIV infection averted and per disability-adjusted life years saved (DALYs). In **Chapter 7** we evaluate the equity in utilization of ART in South Africa for different equity criteria (i.e. sex, age, severity of disease, area of living, socio-economic status, marital status, ethnicity, religion and/or sexual orientation). We conduct a systematic review to determine the current quantitative evidence-base.

Implementation of the use of multiple criteria and fair processes

In **Chapter 8** and **Chapter 9** we respond to sub-question 4. In **Chapter 8** we outline an alternative approach for HIV/AIDS priority setting by integration of multi criteria decision analysis (MCDA) and the Accountability for Reasonableness (AFR) framework. **Chapter 9** presents the first implementation of the integrated MCDA-AFR approach during the development of the 5 years (2014- 2018) strategic plan for HIV/AIDS control in West Java province in Indonesia.

General discussion

Last, in **Chapter 10** we discuss the findings for each sub-question and respond to the main research question on how priority setting in HIV/AIDS control can be improved by using multiple criteria and fair process. Furthermore, the limitations of this thesis and the need for future research will be addressed. ■

References

1. UNAIDS (2014) The Gap Report. Geneva. Available: http://www.unaids.org/en/media/unaids/content-assets/documents/unaidspublication/2014/UNAIDS_Gap_report_en.pdf. Accessed September 2014.
2. AIDSdatahub (2014) Indonesia country profile. Available: <http://www.aidsdatahub.org/en/country-profiles/indonesia>. Accessed March 2014.
3. Indonesian National AIDS Commission (2014) Indonesia National Strategy for HIV 2015-2019 (draft). Jakarta. Indonesian National AIDS Commission.
4. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, et al. (2011) Prevention of HIV-1 infection with early antiretroviral therapy. *The New England journal of medicine* 365: 493–505.
5. Indonesian National AIDS Commission (2012) UN-GASS. Republic of Indonesia Country Report on the Follow up to the 35 Declaration of Commitment on HIV/AIDS. Reporting Period 2010–2011. Jakarta: Indonesian National AIDS commission.
6. Waluyo A, Culbert GJ, Levy J, Norr KF (2014) Understanding HIV-related Stigma Among Indonesian Nurses. *J Assoc Nurses AIDS Care*.
7. Damar AP, du Plessis G (2010) Coping versus grieving in a “death-accepting” society: AIDS-bereaved women living with HIV in Indonesia. *J Asian Afr Stud* 45: 424–431.
8. Wisaksana R, Alisjahbana B, van Crevel R, Kesumah N, Sudjana P, et al. (2009) Challenges in delivering HIV-care in Indonesia: experience from a referral hospital. *Acta medica Indones* 41 Suppl 1: 45–51.
9. Sasaki Y, Arifin A, Ali M, Kakimoto K (2011) Willingness to undergo HIV testing among factory workers in Surabaya, Indonesia. *AIDS care* 23: 1305–1313.
10. Mahendradhata Y, Ahmad RA, Lefèvre P, Boelaert M, Van der Stuyt P (2008) Barriers for introducing HIV testing among tuberculosis patients in Jogjakarta, Indonesia: a qualitative study. *BMC public health* 8: 385.
11. UNAIDS (2013) Global report: UNAIDS global report on the global AIDS epidemic 2013. Geneva.
12. UNAIDS (2012) UNAIDS: World AIDS Day Report - Results 2012. Geneva; 2012. Available: http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/JC2434_WorldAIDSday_results_en.pdf. Accessed July 2015.
13. Department of Health Republic of South Africa (2013): The South African Antiretroviral Treatment Guidelines 2013. South Africa. Available: <http://www.sahivsoc.org/upload/documents/2013%20ART%20Guidelines-Short%20Combined%20FINAL%20draft%20guidelines%2014%20March%202>. Accessed July 2015
14. Hontelez JCLM, Bärnighausen T, Bakker R, Baltussen R, Tanser F, Hallett TB, Newell ML, De Vlas SJ (forthcoming). Expanded access to antiretroviral therapy leads to elimination of HIV in South Africa, even without universal test and treat. *PLoS Med*.
15. Delva W, Eaton JW, Meng F, Fraser C, White RG (2012) HIV treatment as prevention: optimising the impact of expanded HIV treatment programmes. *PLoS medicine* 9: e1001258.
16. Hallett TB, Baeten JM, Heffron R, Barnabas R, de Bruyn G (2011) Optimal uses of antiretrovirals for prevention in HIV-1 serodiscordant heterosexual couples in South Africa: a modelling study. *PLoS medicine* 8: e1001123.
17. Johnson LF (2012). Access to antiretroviral treatment in South Africa, 2004–2011. *South African J HIV Med* 13(1):22–27.
18. Tromp N, Michels C, Mikkelsen E, Hontelez J, Baltussen R (2014) Equity in utilization of antiretroviral therapy for HIV-infected people in South Africa: a systematic review. *Int J Equity in Health* 13: 60.
19. Bärnighausen T, Bloom DE, Humair S (2007) Human resources for treating HIV/AIDS: needs, capacities, and gaps. *AIDS patient care and STDs* 21: 799–812.
20. Hontelez JA, Newell M-L, Bland RM, Munnelly K, Lessells RJ, et al. (2012) Human resources needs for universal access to antiretroviral therapy in South Africa: a time and motion study. *Human resources for health* 10: 39.
21. SANAC: South Africa National AIDS Council. National Strategic Plan 2012 – 2016. South Africa; 2011. [<http://www.doh.gov.za/docs/stratdocs/2012/NSP-full.pdf>] (n.d.).
22. Kimmel AD, Daniels N, Betancourt TS, Wood R, Prosser LA (2012) Decision maker priorities for providing antiretroviral therapy in HIV-infected South Africans: a qualitative assessment. *AIDS care* 24: 778–792.

23. Drummond, McGuire (1997) *Methods for the economic evaluation of health care programmes*. 2nd editio. Oxford: Oxford University Press.
24. The World Bank (1993) *The World Bank World Development Report 1993: investing in Health*. New York: Oxford University Press.
25. Hogan DR, Baltussen R, Hayashi C, Lauer JA, Salomon JA (2005) Cost effectiveness analysis of strategies to combat HIV/AIDS in developing countries. *BMJ (Clinical research ed)* 331: 1431–1437.
26. Baltussen R, Floyd K DC (2005) Achieving the millennium goals for health: Cost effectiveness analysis of strategies for tuberculosis control in developing countries. *BMJ* 2005 333: 1364–1370.
27. WHO-CHOICE project (2003) *Making choices in health: WHO guide to cost-effectiveness analysis*. Geneva: World Health Organization. Available: www.who.int/choice/en.
28. Cleary SM, Mooney GH, McIntyre DE (2010) Claims on health care: a decision-making framework for equity, with application to treatment for HIV/AIDS in South Africa. *Health Policy and Plan* 26: 464–470.
29. Devlin N, Sussex J (2011) *Incorporating multiple criteria in HTA: methods and processes*. London: Office of Health Economics.
30. Gericke CA, Kurowski C, Ranson MK, Mills A (2005) Intervention complexity--a conceptual framework to inform priority-setting in health. *Bulletin of the World Health Organization* 83: 285–293.
31. Goddard M, Hauck K, Smith PC (2006) Priority setting in health - a political economy perspective. *Health Econ, Policy Law* 1: 79–90.
32. Golan O, Hansen P, Kaplan G, Tal O (2011) Health technology prioritization: Which criteria for prioritizing new technologies and what are their relative weights? *Health Policy* 102: 126–135.
33. Guindo LA, Wagner M, Baltussen R, Rindress D, van Til J, et al. (2012) From efficacy to equity: Literature review of decision criteria for resource allocation and healthcare decisionmaking. *Cost Eff Resour Alloc* 10: 9.
34. Johri M, Norheim OF (2012) Can cost-effectiveness analysis integrate concerns for equity? Systematic review. *Int J Technol Assess Health Care* 28: 125–132.
35. Tanios N, Wagner M, Tony M, Baltussen R, van Til J (2013) Which criteria are considered in healthcare decisions? Insights from an international survey of policy and clinical decision makers. *Int J Technol Assess Health Care* 29: 456–465.
36. Baltussen R, Niessen L (2006) Priority setting of health interventions: the need for multi-criteria decision analysis. *Cost Eff Resour Alloc* 4: 14.
37. Dodgson JS, Spackman M, Pearman A, Phillips LD (2009) *Multi-Criteria Analysis: A Manual*. London: Department for Communities and Local Government.
38. Dolan JG (2010) Multi-criteria clinical decision support: a primer on the use of multiple criteria decision making methods to promote evidence-based, patient-centered healthcare. *Patient* 3: 229–248.
39. Hummel JM, Boomkamp ISM, Steuten LMG, Verkerke BGJ, IJzerman MJ (2012) Predicting the health economic performance of new non-fusion surgery in adolescent idiopathic scoliosis. *Journal of orthopaedic research: official publication of the Orthopaedic Research Society* 30: 1453–1458.
40. Miot J, Wagner M, Khoury H, Rindress D, Goetghebuer MM (2012) Field testing of a multicriteria decision analysis (MCDA) framework for coverage of a screening test for cervical cancer in South Africa. *Cost Eff Resour Alloc* 10: 2.
41. Youngkong S, Baltussen R, Tantivess S, Mohara A, Teerawattananon Y (2012) Multi-criteria decision analysis for including health interventions in the universal health coverage benefit package in Thailand. *Value in Health* 15 (6): 961–970.
42. Youngkong S, Teerawattananon Y, Tantivess S, Baltussen R (2012) Multi-criteria decision analysis for setting priorities on HIV/AIDS interventions in Thailand. *Health Res Policy Syst* 10: 6.
43. Defechereux T, Paolucci F, Mirelman A, Youngkong S, Botten G, et al. (2012) Health care priority setting in Norway a multicriteria decision analysis. *BMC health services research* 12: 39.
44. Hongoh V, Hoen AG, Aenishaenslin C, Waaub J-P, Bélanger D, et al (2011) Spatially explicit multi-criteria decision analysis for managing vector-borne diseases. *Int J Health Geogr* 10: 70.
45. Tony M, Wagner M, Khoury H, Rindress D, Papastavros T, et al. (2011) Bridging health technology assessment (HTA) with multicriteria decision analyses (MCDA): field testing of the EVIDEM framework for

- coverage decisions by a public payer in Canada. *BMC Health Serv Res* 11: 329.
46. Goetghebeur MM, Wagner M, Khoury H, Levitt RJ, Erickson LJ, et al. Bridging health technology assessment (HTA) and efficient health care decision making with multicriteria decision analysis (MCDA): applying the EVIDEM framework to medicines appraisal. *Med Decis Making* 32: 376–388.
 47. Diaby V, Lachaine J (2011) An application of a proposed framework for formulary listing in low-income countries: the case of Côte d'Ivoire. *Appl Health Econ Health Policy* 9: 389–402.
 48. Cunich M, Salkeld G, Dowie J, Henderson J, Bayram C, et al. (2011) Integrating evidence and individual preferences using a web-based multi-criteria decision analytic tool: an application to prostate cancer screening. *Patient* 4: 153–162.
 49. Husereau D, Boucher M, Noorani H (2010) Priority setting for health technology assessment at CADTH. *Int J Technol Assess Health Care* 26: 341–347.
 50. Goetghebeur MM, Wagner M, Khoury H, Rindress D, Grégoire J-P, et al. (2010) Combining multicriteria decision analysis, ethics and health technology assessment: applying the EVIDEM decision-making framework to growth hormone for Turner syndrome patients. *Cost Eff Resour Alloc* 8: 4.
 51. Jehu-Appiah C, Baltussen R, Acquah C, Aikins M, d'Almeida SA, et al. (2008) Balancing equity and efficiency in health priorities in Ghana: the use of multicriteria decision analysis. *Value in Health* 11: 1081–1087.
 52. Baltussen R, Stolk E, Chisholm D, Aikins M (2006) Towards a multi-criteria approach for priority setting: an application to Ghana. *Health Econ* 15: 689–696.
 53. Baltussen R, ten Asbroek AHA, Koolman X, Shrestha N, Bhattarai P, et al. (2007) Priority setting using multiple criteria: should a lung health programme be implemented in Nepal? *Health Policy Plan* 22: 178–185.
 54. Goetghebeur MM, Wagner M, Khoury H, Levitt RJ, Erickson LJ, et al. (2008) Evidence and Value: Impact on DEcisionMaking--the EVIDEM framework and potential applications. *BMC Health Serv Res* 8: 270.
 55. Diaby V, Campbell K, Goeree R (2013) Multi-criteria decision analysis (MCDA) in health care: A bibliometric analysis. *Oper Res Heal Care* 2: 20–24.
 56. Marsh K, Lanitis T, Neasham D, Orfanos P, Caro J (2014) Assessing the value of healthcare interventions using multi-criteria decision analysis: a review of the literature. *Pharmacoeconomics* 32: 345–365.
 57. Youngkong S, Baltussen R, Tantivess S, Mohara A, Teerawattananon Y Multicriteria decision analysis for including health interventions in the universal health coverage benefit package in Thailand. *Value in health* 15: 961–970.
 58. Bolsewicz Alderman K, Hipgrave D, Jimenez-Soto E (2013) Public engagement in health priority setting in low- and middle-income countries: current trends and considerations for policy. *PLoS Med* 10: e1001495.
 59. Bruni RA, Laupacis A, Martin DK (2008) Public engagement in setting priorities in health care. *CMAJ* 179: 15–18.
 60. Daniels N (2008) *Just Health: Meeting Health Needs Fairly*: Cambridge University Press.
 61. Klein R (2000) Setting priorities: What is holding us back - inadequate information or inadequate institutions? In: *The Global Challenge Health Care Rationing*. Coulter, Angela; Ham, Chris. Open University Press.
 62. Daniels N, Sabin J (2000) *Setting limits fairly: Can we learn to share medical resources?* Oxford: Oxford University Press.
 63. Byskov J, Bloch P, Blystad A, Hurtig A-K, Fylkesnes K, et al. (2009) Accountable priority setting for trust in health systems--the need for research into a new approach for strengthening sustainable health action in developing countries. *Health Res Policy Syst* 7: 23.
 64. Kapiriri L, Norheim OF, Martin DK (2007) Priority setting at the micro-, meso- and macro-levels in Canada, Norway and Uganda. *Health Policy* 82: 78–94.
 65. Greenberg D, Siebzechner MI, Pliskin JS (2009) The process of updating the National List of Health Services in Israel: is it legitimate? Is it fair? *Int J Technol Health Care* 25: 255–261.
 66. Maluka S, Kamuzora P, San Sebastián M, Byskov J, Olsen ØE, et al. (2010) Decentralized health care priority-setting in Tanzania: evaluating against the accountability for reasonableness framework. *Soc Sci Med* 71: 751–759.
 67. Mori AT, Kaale EA (2012) Priority setting for the im-

- plementation of artemisinin-based combination therapy policy in Tanzania: evaluation against the accountability for reasonableness framework. *Implement Sci* 7: 18.
68. Tuba M, Sandoy IF, Bloch P, Byskov J (2010) Fairness and legitimacy of decisions during delivery of malaria services and ITN interventions in Zambia. *Malar J* 9: 309.
69. World Health Organization (2012) WHO Consultation on the Strategic Use of Antiretrovirals (SUFA). 2nd Expert Panel towards Programmatic Guidance. Geneva.
70. Peersman G, Ferguson L, Torres MA, Smith S, Gruskin S (2009) Increasing civil society participation in the national HIV response: the role of UNGASS reporting. *J Acquir Immune Defic Syndr* 52 Suppl 2: S97–S103.
71. Rutherford GW, McFarland W, Spindler H, White K, Patel S V, et al. (2010) Public health triangulation: approach and application to synthesizing data to understand national and local HIV epidemics. *BMC public health* 10: 447.
72. Azim T, Saidel TJ, Brown T (2010) Essential elements of strategic information systems to guide focused HIV responses in south and south-east Asia. *AIDS* 24 Suppl 3: S54–S61.
73. Willard N, Chutuaue K, Stines S, Ellen JM (2012) Bridging the gap between individual-level risk for HIV and structural determinants: using root cause analysis in strategic planning. *J Prev Interv Community* 40: 103–117.
74. Forsythe S, Stover J, Bollinger L (2009) The past, present and future of HIV, AIDS and resource allocation. *BMC Public Health* 9 Suppl 1: S4.
75. Lasry A, Richter A, Lutscher F (2009) Recommendations for increasing the use of HIV/AIDS resource allocation models. *BMC Public Health* 9 Suppl 1: S8.
76. Kenny N, Joffres C (2008) An ethical analysis of international health priority-setting. *Health Care Anal* 16: 145–160.
77. Sabik LM, Lie RK (2008) Priority setting in health care: Lessons from the experiences of eight countries. *Int J Equity Health* 7: 4.
78. Stafinski T, Menon D, Philippon DJ, McCabe C (2011) Health technology funding decision-making processes around the world: the same, yet different. *PharmacoEconomics* 29: 475–495.
79. Vuorenkoski L, Toiviainen H, Hemminki E (2008) Decision-making in priority setting for medicines—a review of empirical studies. *Health Policy* 86: 1–9.
80. Youngkong S, Kapiiriri L, Baltussen R (2009) Setting priorities for health interventions in developing countries: a review of empirical studies. *Trop Med Int Health* 14: 930–939.
81. Glassman A, Chalkidou K, Giedion U, Teerawattananon Y, Tunis S, et al. (2012) Priority-Setting Institutions in Health. *Global Heart* 7: 13–34.
82. Chalkidou K, Marten R, Cutler D, Culyer T, Smith R, et al. (2013) Health technology assessment in universal health coverage. *Lancet* 382: e48–e49.
83. Oliver K, Innvar S, Lorenc T, Woodman J, Thomas J (2014) A systematic review of barriers to and facilitators of the use of evidence by policymakers. *BMC health services research* 14: 2.
84. Siregar AYM, Komarudin D, Wisaksana R, van Crevel R, Baltussen R (2011) Costs and outcomes of VCT delivery models in the context of scaling up services in Indonesia. *Trop Med Int Health* 16: 193–199.
85. Baltussen R, Mikkelsen E, Tromp N, Hurtig A, Byskov J, et al. (2013) Balancing efficiency, equity and feasibility of HIV treatment in South Africa -- development of programmatic guidance. *Cost Eff Resour Alloc* 11: 26.
86. US census (2014). Available: <http://www.census.gov/popclock/>. Accessed 17 September 2014.
87. UNDP 2014 - United Nations Development Programme Indonesia. Annual Report 2012/2013. Available: http://www.id.undp.org/content/dam/indonesia/docs/AR2013/AR%20UNDP%202012-2013_high-res.pdf Accessed September 2014.
88. Badan Pusat Statistik (BPS) (2014) Central Bureau Statistics Indonesia. Available: <http://www.bps.go.id> Accessed 17 September 2014.
89. Transparency International (2013) Indonesia corruption index. Available: <http://www.transparency.org/country/#IDN>. Accessed 17 September 2014.
90. The Jakarta Post (4 Jul 2014) Editorial: Endorsing Jokowi. The Jakarta Post. Available: <http://www.thejakartapost.com/news/2014/07/04/editorial-endorsing-jokowi.html>. Accessed 17 September 2014.
91. Vaessen S (9 Jul 2014) Indonesia presidential poll: Moment of truth. Aljazeera. Available: <http://blogs.aljazeera.com/blog/asia/indonesia-presidential-poll-moment-truth>. Accessed 17 September 2014.

92. Lamb K (6 Jul 2014) Indonesian voters waver between hope and return to old order. The Guardian. Available: <http://www.theguardian.com/world/2014/jul/06/indonesian-presidential-elections-voters-new-hope-old-order>. Accessed 17 September 2014.
93. West Java AIDS Commission (2013) West Java Asian Epidemic Model estimations. West Java AIDS Commission: Bandung.
94. Ministry of Health (2014) Monitoring HIV epidemic up to June 2014. Available: Spiritia <http://www.spiritia.or.id/Stats/StatCurr.php?lang=id>. Accessed 17 September 2014.

- **Sub-question 1**
What is the current priority setting process in HIV/AIDS control in Indonesia?

CHAPTER 2

Priority setting in HIV/AIDS control in West Java Indonesia: an evaluation based on the accountability for reasonableness framework

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Priority setting in HIV/AIDS control in West Java Indonesia: an evaluation based on the accountability for reasonableness framework

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Abstract

Background: Indonesia has insufficient resources to adequately respond to the HIV/AIDS epidemic, and thus faces a great challenge in prioritizing interventions. In many countries, such priority setting processes are typically ad-hoc and not transparent leading to unfair decisions. Here we evaluated the priority setting process in HIV/AIDS control in West Java province against the four conditions of the Accountability for Reasonableness (AFR) framework: relevance, publicity, appeals & revision, and enforcement.

Methods: We reviewed government documents, and conducted semi-structured qualitative interviews based on the AFR framework with 22 participants of the 5-year HIV/AIDS strategy development for 2008–2013 (West Java province) and 2007–2011 (Bandung).

Results: We found that criteria for priority setting were used implicitly and that the strategies included a wide range of interventions. Many stakeholders were involved in the process but their contribution could be improved and particularly the public and people living with HIV/AIDS could be better engaged. The use of appeal and publicity mechanisms could be more transparent and formally stated. Public regulations are not yet installed to ensure fair priority setting.

Conclusions: To increase fairness in HIV/AIDS priority setting, West Java should make improvements on all four conditions of the AFR framework.

Background

In Indonesia, the available budget for HIV/AIDS control is far below the resources needed to control the epidemic; thus, priority setting is required. In 2010, only US\$ 69 million was spent on HIV/AIDS control, while US\$ 152 million was needed to effectively control the epidemic [1,2]. In 2012, an estimated 610,000 people in Indonesia were living with HIV/AIDS (PLWHA) (0.4% of the population age 15+), with the epidemic mostly concentrated in high-risk groups, i.e. people who inject drugs (PWID), female sex workers (FSW), and men having sex with men (MSM) — except in the Papua province where the epidemic is generalized [3]. Recently, the epidemic has started shifting further towards the general population, indicating that it is not yet controlled, and challenging the government to carefully deliberate over choosing the right HIV/AIDS interventions [3].

Priority setting in HIV/AIDS control in Indonesia has not been previously investigated. Indonesia's HIV/AIDS responses focus on a wide range of activities (e.g. harm reduction interventions, voluntary counselling and testing, and antiretroviral treatment services) that are offered mainly for the most-at-risk populations, while mass media campaigns and out-of-school HIV education are introduced on a small scale for low-at-risk populations [1,2]. For most interventions, coverage remains low—e.g. 18% for anti-retroviral treatment (ART) in 2012 [1]. Policy makers face difficult dilemmas and conflicting values in priority setting of all possible HIV/AIDS interventions. For example, they must decide whether to prioritize interventions that are highly effective at reducing the spread of HIV, like distribution of clean needles and condoms for high-at-risk groups, knowing that these are less politically and culturally accepted. Alternatively, they can invest in prevention of mother-to-child transmission (PMTCT) interventions, which will lead to a smaller reduction of the spread of HIV/AIDS but will be politically more accepted because they prevent HIV infection among children.

Priority setting is also made difficult — particularly in less developed countries — by wide gaps between available and needed resources, insufficient data to inform decisions, and frequently weak decision bodies [4]. As a result, priority setting decisions are often history-based and ad-hoc, and strongly influenced by policy makers' opinions, preferences of international funding agencies, lobbying, and political pressure [5]. Generally, they are dominated by concerns of effectiveness and efficiency at maximizing population health, while also involving other factors, like equity and feasibility of implementation are becoming more prominent [6,7]. Without consensus on which values should guide priority setting, the focus is placed on analysing the *process* of priority setting, assuming that the right process will produce fair and legitimate outcomes.

The ethical framework “accountability for reasonableness” (AFR) was introduced to define a fair priority setting process; it is theoretically grounded in justice theories that emphasize democratic deliberation [8–11]. According to AFR, a fair priority setting process should meet four

conditions: relevance, publicity, appeals & revision, and enforcement (definitions are presented in Table 1). Since its introduction, AFR has been successfully used to evaluate priority setting processes in several countries [4,12–15]. However, it is not yet applied in Asia and differences in countries’ political system and cultures will likely effect priority setting processes and the outcomes of an AFR evaluation. The use of the framework seems appropriate for the Indonesian setting as the country has a democratic political system and thereby aims to fulfil the underlying principles of AFR. More specifically, formal government regulations state that decision-making processes should incorporate the views of different stakeholders and be informed by scientific evidence [16,17]. As in the AFR framework the conditions are loosely defined (e.g. mechanisms for appeals & revision are not specifically outlined) it allows context specific interpretations and makes it appropriate for use in various settings, also beyond Indonesia.

Table 1. The four conditions of the AFR framework [8]

THE FOUR CONDITIONS OF THE AFR FRAMEWORK	
Relevance	The rationales for priority setting decisions must be based on reasons that stakeholders agree are relevant in the context.
Publicity	Priority setting decisions and their rationales must be publicly accessible, and leaders must take action to ‘push’ the message out to all segments of the public.
Appeals & revision	There must be a mechanism for challenge, including the opportunity for revising decisions in light of considerations that stakeholders may raise.
Enforcement	There is voluntary or public regulation to ensure that the first three conditions are met.

The present study evaluates the HIV/AIDS priority setting process at the decentralized level in West Java province of Indonesia with regard to the four conditions of the AFR framework. For other low-income settings beyond Indonesia the results of this evaluation may give insights in whether their priority setting processes are fair and could provide lessons for improvement.

Methods

The study setting

Our study area was West Java province, home to 40 million inhabitants, with an estimated 58,834 PLWHA in 2013 [18]. Like elsewhere in Indonesia, the epidemic is concentrated in high-risk groups (estimated HIV prevalence in 2013: PWID 23.2%; FSWs 6.4%; MSM 8.4%) but has started shifting towards the general population (estimated HIV prevalence in 2013: 0.18%) [18]. West Java has established a range of HIV/AIDS activities, including harm reduction interventions for PWID, methadone maintenance treatment clinics in six cities, voluntary counselling and testing and ART at hospital and community clinics, condom distribution and school-based education interventions in Bandung city. However, coverage of these interventions

remains low according to the latest data available, at around 30% in 2009 [19]. With 3 million inhabitants, Bandung is West Java's capital and is the centre for HIV/AIDS control. It houses West Java's largest public referral and teaching hospital, Hasan Sadikin, and has HIV/AIDS in- and outpatient services.

The study design and data collection

We reviewed national and local AIDS strategies, guidance documents for strategic planning, UNGASS reports, and local monitoring and evaluation data [1,20–22]. We further conducted semi-structured qualitative interviews with twenty-two stakeholders involved in the five-year HIV/AIDS strategic planning at the West Java province level (2009–2013) and the Bandung city level (2007–2011). The respondents were selected from a list of participants by purposive sampling. For the province and city level we interviewed respectively three and two representatives from the AIDS commission secretariat, three and four from the government health office, one and two from the local planning board, and five and two from non-governmental organizations (NGOs) and HIV clinics.

Interview questions were based on the four conditions of the AFR framework, and previous AFR studies were used for input [4,13]. For the *relevance* condition, we asked questions about the involvement and dominance of stakeholders, about which criteria and data were used for decisions. For the *publicity* and *appeals & revision* conditions, we asked how consensus was reached among stakeholders, and which mechanisms were installed to ensure publicity of decisions and the ability to appeal decisions. For the *enforcement* condition, we asked about quality of leadership and whether decisions were implemented. Daniels defines enforcement as “there is voluntary or public regulation to ensure that the first three conditions are met”, and we further operationalize this condition by additionally asking questions about ‘leadership’ and ‘implementation of decisions’. Leadership is essential in facilitating explicit priority setting [23] and could be important to ensure that a priority setting process meets the first three conditions. Implementation of decisions is important as it indicates whether stakeholders indeed follow up on the outcomes of decisions making processes. Both items were also put forward as elements of fairness in other settings and it is recommended to use the AFR framework with flexibility [24]. All interviews lasted one to two hours and were carried out in April and May of 2011. We interviewed respondents until saturation was reached, meaning that the respondents in successive interviews gave no new insights on for example criteria used for priority setting.

Data analysis

Interviews were recorded and transcribed. One researcher (RP) coded the transcriptions on the basis of the interview questions, using Nvivo version 8.0. During the coding a wider list of codes was established to find more specific information, for example for type of appeals & revision mechanisms three codes were used: ‘formal mechanisms’ ‘informal mechanism’ ‘after decision taken mechanisms’. A second researcher (NT) went through all the coded transcrip-

tions to check the coding and any disagreement between the two researchers was resolved through discussion until reaching consensus. Next, the two researchers summarized together the answers per respondent in a matrix. All findings were summarized in this paper. We then consulted the AIDS commissions to give feedback on our results, and minor adaptations were made based on their comments.

Ethical clearance

This research was approved by the Bandung citizens ethical committee and the Padjadajaran University Medical Faculty ethical committee. Respondents were sent an invitation letter, and all participants gave their consent. Respondents were told that our study aims to evaluate the decision making process in HIV/AIDS control in West Java and they could stop the interview at any time. The interviews were recorded with informal consent of the respondents, and a souvenir was given as a reward. Anonymity of the respondents was maintained during data coding and respondent categories (e.g. NGOs) were used during data analysis. In data storage anonymity was not maintained.

Results

Here we first describe HIV/AIDS priority setting in West Java province. Secondly, we evaluate this process against the four conditions of the AFR framework. All findings were similar for Bandung city and West Java province unless otherwise stated.

Priority setting process in West Java province

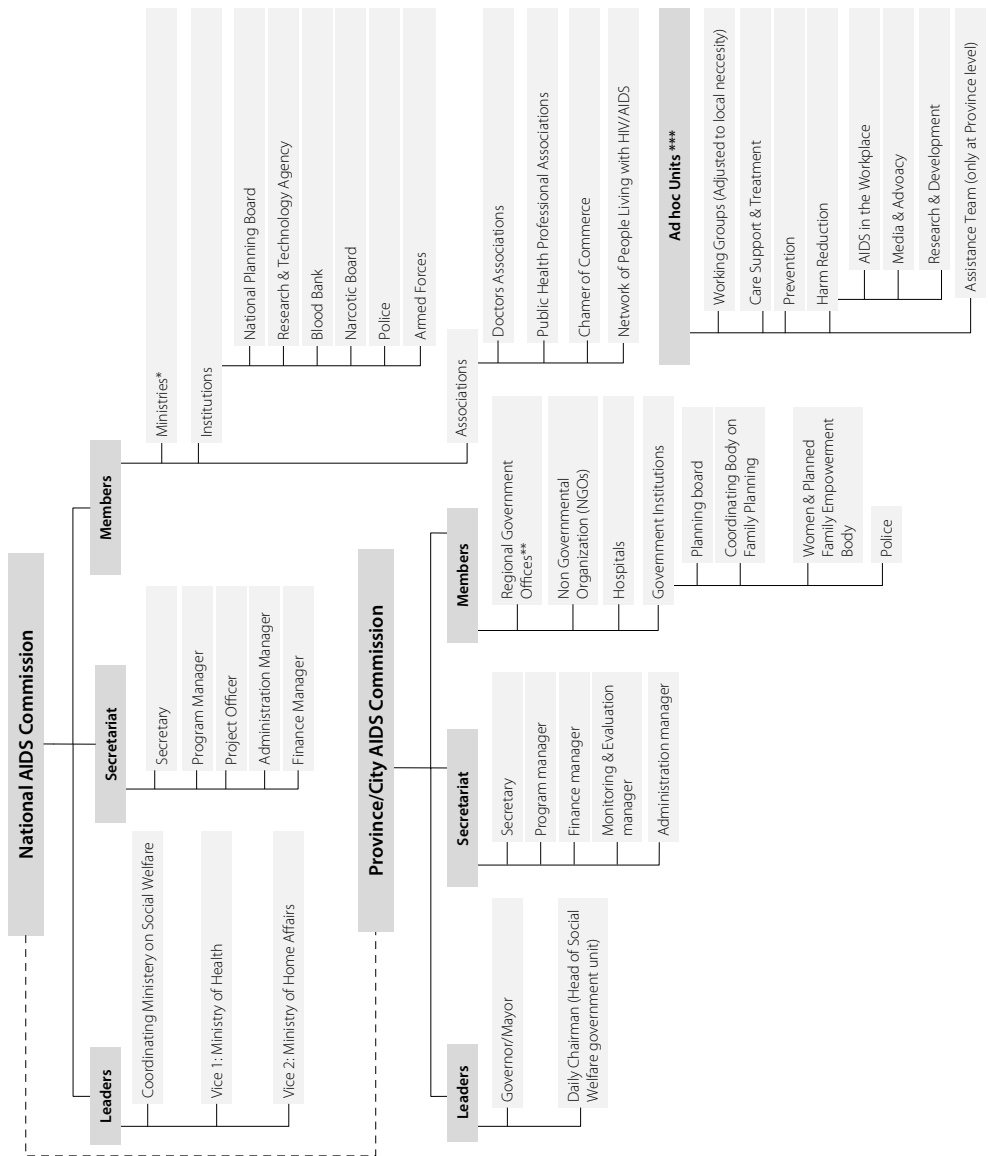
AIDS commissions

Indonesia has established AIDS commissions on a national level, in all 33 provinces, and in 172 out of 477 cities and districts. We found that these commissions had a multi-sectorial design, and the daily board comprised representatives of various government offices (e.g. health, education, social, tourism, law, and religious affairs), non-governmental organizations, and health care facilities (Figure 1). They primarily aimed to coordinate activities and provide technical support for all involved parties, but some also ran their own interventions, i.e. condom distribution and health promotion. In Indonesia's decentralized system, the provincial health government offices were responsible for the infrastructure of HIV/AIDS clinics, and aimed to provide the district government offices with technical assistance and financial support for HIV/AIDS services. The district level health government offices ran all HIV/AIDS services, apart from ART distribution, which was implemented by the provincial health office.

Strategic planning

The latest National AIDS commission strategy (2010–2014) aimed to guide strategic planning of the local AIDS commissions, and divided actions into four programs: prevention; care, support, and treatment; impact mitigation; and policy and program management and devel-

Figure 1. Organizational structure of national and local AIDS commissions



* List of involved Ministries: Ministry of Law & Human Rights, Ministry of Cultural & Tourism, Ministry of Education, Ministry of Youth & Sport, Ministry of Research & Technology, Ministry of Social Affairs, Ministry of Religion, Ministry of Communication & Informatics, Ministry of Manpower & Transmigration, Ministry of Transportation, Ministry of Women Empowerment, Ministry of National Planning & Development; ** List of involved government offices: Health Office, Social Office, Manpower & Transmigration Office, Education Office, Law & Human Rights Office, Tourism Office, Communication & Informatics Office, Youth & Sport Office, Religion Office; *** Consists of AIDS Commission members and other HIV/AIDS experts from government institutions, universities, NGOs and most at risk populations

opment. The West Java and Bandung strategic plans contained a wide range of activities (including the AIDS commission's coordination and technical assistance activities) without specific coverage targets. The West Java strategy presented in addition a task division of activities among implementing institutions. Afterwards, yearly plans were developed for HIV/AIDS control activities in West Java and Bandung, as well as for the AIDS commission's technical assistance activities, both based on meetings with AIDS commission members from government offices, NGOs and HIV clinics.

The West Java provincial and district AIDS commissions received technical assistance for strategic planning from higher level that consisted of training in the Asian Epidemic Model and Resource Needs Model tools. The development of the five-year strategy was led by the staff of the AIDS commissions and the total process took two years in West Java province and eight months in Bandung city.

Budget flows for HIV/AIDS control

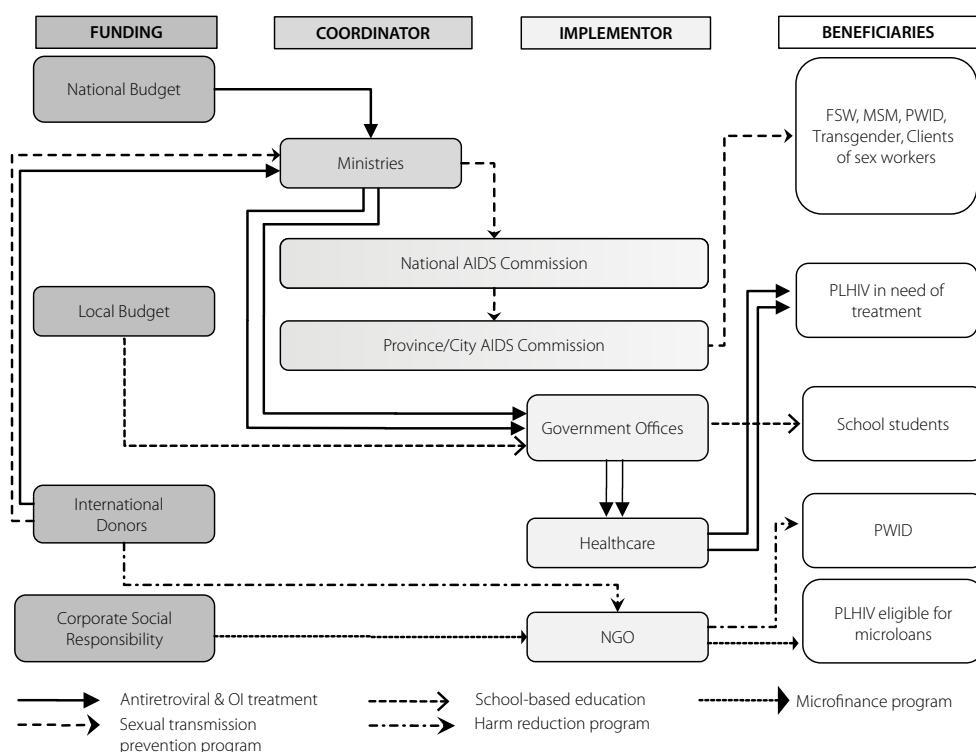
In 2010, donors funded 59.8% of the HIV/AIDS programs in Indonesia [1]. The National AIDS commission received funding from the national budget (Anggaran Pendapatan dan Belanja Nasional (ABPN)) and from international donors (e.g. Global Fund and AusAid) for their coordination activities and to fund provincial AIDS commissions. The provincial and district AIDS commissions received funding for coordination activities and interventions from the local budget (Anggaran Pendapatan dan Belanja Daerah (APBD)), the national AIDS commission and from international donors; they also channelled funds to local governments and NGOs on the basis of received proposals. National and international donors funded NGOs and health care facilities. To receive funding directly from the local government budget for the activities in the yearly strategic plan, all government institutions had to write proposals each year in January for the year after. The funding, available one and a half year later, was influenced by the local planning board (BAPPEDA), the mayor/governor, and the *Musrenbang*. The latter is an annual event where citizens meet government offices and the planning board to discuss issues faced by their communities. Together, they decided on the general priorities for improvement within government sectors and not on specific funding for certain HIV/AIDS interventions [25]. Figure 2 presents an overview of the different flows of funding for HIV/AIDS interventions in West Java.

Evaluation against the AFR framework

Relevance condition

A wide range of stakeholders was involved in strategic meetings; however for all respondents raised concerns about their HIV/AIDS expertise and contributions, due to frequent staff rotations, replacements, or low-attendance of meetings. Respondents recommended more involvement of religious leaders, the House of Representatives, and the governor. At the province level, respondents from NGOs expressed concerns over not being invited to all meetings.

Figure 2. Funding flows for different HIV/AIDS interventions in West Java province



FSW = female sex workers, MSM = men having sex with men, PWID = people who inject drugs, PLHIV = people living with HIV, NGO = non-governmental organization, OI = opportunistic infection

The public was not explicitly involved in the priority setting process, but a respondent from the health government office at Bandung city level said that they were represented by the NGOs as they stand close to the community. A few PLWHA were involved directly as they represented NGOs that advocate for key affected populations like PWID or transgender.

"The AIDS commission actually consists of all government offices, but not all come for the planning. In particular, the tourism government office rarely comes, is not really experienced, and doesn't know what the role their office plays in HIV/AIDS control, and this creates confusion. However, tourism should be involved, because it regulates the places where the indirect female sex workers work, i.e. massage, karaoke, billiards, and sauna places." – AIDS commission secretariat member

Most respondents were confident that their party (i.e. NGOs, governments, and health facilities) had the most influence in discussions during meetings. The government respondents said that they were most dominant in discussions because they run the health care system and coordinate HIV/AIDS surveillance, while respondents from NGOs and health care providers said that

they had more power due to their field experience with high-risk groups and HIV/AIDS patients. The most frequently mentioned reasons for including a intervention in the strategic plan were 1) it being in line with the national strategy, 2) its impact on reducing the spread of the HIV epidemic, 3) its past effectiveness, and 4) cultural, political, and religious factors (Table 2). Participants advocated for their own interventions because they believed that these interventions would work or would ensure receipt of funding from the local budget or international donors. At the city level, some interventions were prioritized for specific government offices (e.g. tourism and religion office) to improve their capacity to contribute to HIV/AIDS control.

"In the past, we encouraged establishment of condom ATMs that provide free condoms in public places, but this did not go well because religious groups interpreted this differently. Therefore, we need to think of other ways to provide free condoms. The same also applies to clean needles for PWID. Maybe a condom ATM is possible in a different culture, but not here." – Staff member of government health office

Reasons for setting priorities were implicitly used during discussions and were not stated in the strategic plan. Data used included the number of HIV/AIDS cases per risk group as reported by the Ministry of Health, and the prevalence trends in these groups based on the Asian Epidemic Model projections. The budget impact of interventions was used to estimate the resources needed for HIV/AIDS control and not to prioritize interventions. In the discussions, participants were instructed to not be limited by budget limitations, but to propose all interventions that should be in the strategic plan.

"We explain that the focus of programs is also shifting to the general population, by presenting data on the stabilizing HIV prevalence in PWID" – Provincial AIDS commissions secretariat member

Publicity condition

In Bandung, the five-year strategic document was well distributed among stakeholders. Although the document was not directly published to the public, socialization meetings were held that were mainly attended by AIDS commission members but also a few sub-district leaders and health care providers. In these meetings the process of strategic planning and the results were presented and division of tasks for implementation of interventions was discussed. Some respondents from NGOs stated that they were not aware of the yearly operational plans. At the province level, those involved in the meetings received the strategic document, but further dissemination to other stakeholders (e.g. local AIDS commissions) was limited.

Publication of the document was postponed for one year due to a change in format required by the local planning board to implement interventions at different government offices. The government offices seemed to have more complete information on the plans than the NGOs, as some stated they were absent from follow-up meetings. At the province level, the strategic plan was published to the public through discussions on radio and television, and a

Table 2. Implicit criteria used for priority setting in HIV/AIDS control in West Java

CRITERIA	EXAMPLE OF INTERVENTION/SITUATION
Bandung and West Java province level	
1 Current HIV/AIDS epidemic	HIV prevalence is stabilizing in PWID and rising in FSW and MSM
2 Guidelines from provincial and national AIDS commissions	Predetermined intervention focus on 4 areas: prevention; care, support, & treatment; impact mitigation; and policy and program management development
3 Previous experiences of interventions' effectiveness	Proposal for new funding to upscale microcredit loans for PLHIV
4 Mix of local political, cultural, and religious values	Sensitivity of condom distribution interventions
West Java province	
1 Feasibility related to current health care infrastructure	ART at community health centres is only partly established
2 Feasibility of reaching target groups	Clients of FSW are more difficult to reach than FSW/PWID; interventions are started in families already familiar with HIV/AIDS
3 Likelihood of receiving local government budget funding	Preference for distribution of materials and products (e.g. condoms and ARVs)
4 Current intervention coverage	Children living with HIV/AIDS have low coverage
5 Interventions enacted in the past	Socialization among policemen has been done and is no longer relevant
6 Focus on high risk groups	Establishing PWID-friendly health services at public community health clinics (<i>Puskesmas</i>)
7 Interventions applicable in all cities in province	HIV-AIDS transmission through sexual transmission prevention program (<i>PMTs</i>) funded by the Global Fund through National AIDS commissions
8 Draft already made by AIDS commission	Predetermined intervention focuses on 4 areas: prevention; care, support, & treatment; mitigation; and advocacy
9 Advocacy for own interventions	The prison staff advocates for interventions in prison; NGOs for premarital counselling
Bandung level	
1 Likelihood of donor funding	ARV distribution is funded by Global Fund
2 Non-existent interventions	Interventions to socialize the general population
3 Interventions for government offices with the least capacity for HIV/AIDS control	Tourism office should be involved due to sex tourism but is not yet active in HIV/AIDS control and capacity should be improved
4 Urgent situations	Rising number of HIV/AIDS orphans

PWID = people who inject drugs, FSW = female sex workers, MSM = men having sex with men, PLHIV,

ART = antiretroviral treatment, ARV = antiretrovirals, NGOs = non governmental organizations

press conference, but mostly examples of interventions were discussed and not the decision making process and rationales for decisions. The public could access the strategic plan document by request at the AIDS commissions' office. One expert was concerned about whether the public was indeed aware of the interventions and the reasons for prioritization. At both levels, the reasons for intervention prioritization were not published to stakeholders; however, some instances included underlying data to illustrate the reasons for setting priorities. Publicity was also influenced by the sensitivity of interventions due to local political, cultural, and social values. For example, the condom and MSM interventions are considered sensitive and a challenge to the AIDS commission regarding open implementation.

"The strategic document is not open regarding the details; we have to be cautious." – Staff member of government health office

Appeals & revision condition

During strategic planning, there were no formal (i.e. registered) mechanisms to deal with disagreements related to priority-setting decisions. Participants at both city and province levels explained that there were enough opportunities to make appeals during meetings. Albeit, respondents from NGOs and health care institutions expressed concerns on whether appeals during meetings were taken into account, and stressed the importance of lobbying for interventions. Respondents from NGOs and HIV clinics were not involved in all meetings and described their desire for better opportunities to make appeal. Respondents said that consensus was easily reached in meetings and voting was rarely used.

"Our complaint is that after the strategic planning meetings, our group was not invited again to see the new revised document and we didn't get any information on the result of the meeting. So we do not know what is going on and can therefore not comment on activities and plans" – NGO worker

"In the meeting, there is some discussion but there is no conflict at all. It is very easy to reach consensus. It is usually difficult to reach a consensus with the religious office, for example about condom distribution, but in Bandung city they did not make any appeal. They didn't say anything, the condom plan was there but they didn't disapprove it." – Bandung AIDS commission secretariat member

"The public can make an appeal to the government about HIV/AIDS activities, but it is a dream. If you have comments or suggestions, you can send them through the House of Representatives and then they will discuss it internally. And then they will invite the Ministry of Health. But it will take a lot of time, and there are a lot of delays. Another option is to have demonstrations." – NGO worker

After the final document was signed by the mayor or governor a formal appeal mechanism through the House of Representatives could be used by all stakeholders (including the public), but the respondents considered this process to be time consuming.

Enforcement condition

There was no formal regulation to ensure that the first three AFR conditions were met. The national AIDS commission recommends to follow the national guideline for strategic planning in Indonesia, which recommends a participatory and bottom-up process. Respondents expressed concerns about leadership, as the AIDS commission had to coordinate all parties and as well run their own interventions. Respondents stated that the Bandung mayor was more committed to HIV/AIDS control than the governor from West Java, because the former allocated a substantial budget (1 billion IDR or US\$ 104,177) to the Bandung AIDS commission for 2011.

"The mayor of Bandung is the head of the AIDS commission and since he is very concerned with HIV/AIDS, he allocated one billion Indonesian Rupiah (US\$ 100.000) to the Bandung AIDS commission in 2010. This money was used to improve the capacity of government offices to start creating HIV/AIDS programs." – Bandung AIDS commission secretariat member

The secretariat of the AIDS commissions described coordination challenges due to the number of parties involved, their lack of commitment, and the inefficient annual funding procedure for interventions in the government offices. Figure 2 show the complexity of funding flows of different HIV interventions in West Java. The strategic plans, including task divisions, were only guidelines and government offices and NGOs were not obligated to implement the interventions. Furthermore, it was expressed that additional priority setting processes were required, as the budget received by the government offices from the local budget was insufficient for all proposed activities. In 2012, a provincial local HIV/AIDS regulation was launched that enables enforcement of decisions made by provincial stakeholders in all districts [26] (Governor West Java 2012). For example, if the provincial health office aims to scale up testing services in the province, they can instruct the districts to install testing facilities in all community clinics.

Discussion

Here we evaluated the priority setting process for HIV/AIDS control at the decentralized level in West Java, using the AFR framework. Our results show that structures are in place for most AFR conditions, but improvements are needed to ensure fair priority setting.

In evaluating relevance, we found that AIDS commissions in Indonesia involved multi-sectorial stakeholders. Indonesia performs better on this condition compared to other countries that have only limited stakeholder involvement in decision making [4,12–14]. However, governmental institutions might not be as legitimate as possible, as the quality of stakeholder involvement especially the public and PLWHA seems to be limited. At this moment the public's values are not reflected and the views of PLWHA mainly through NGO representatives. For public involvement various methods exist although the effectiveness has hardly been eval-

uated [27–29]. Therefore, we recommend investigating the appropriateness of public engagement mechanisms in the context of Indonesia including the existing *Musrenbang* mechanism. Sometimes involved stakeholders (from governments, NGOs and HIV clinics) lacked commitment and HIV expertise, partly due to the frequent staff rotations in Indonesia, and the dominant role of donors in HIV/AIDS control [30]. Moreover, HIV/AIDS could be a low priority for policy makers due to the low burden compared to other diseases [31]. Also for PLWHA, although they seemed to be involved through the NGOs, the quality should be further investigated and ensured in planning processes as stakeholder understanding, acceptance, and satisfaction are important for successful priority setting [32]. Ideally, all relevant stakeholders should be involved in all steps of the process; however, this is challenging due to the high number of parties related to HIV/AIDS control and most efficient ways should be determined.

Intervention inclusion in the strategic plan was based on many different reasons, which were not explicitly explained, reducing the transparency of strategic decisions. Daniels states that criteria that fair-minded people agree with are relevant for priority setting [8]. However, as this is difficult to operationalize we propose to use the WHO health systems framework as a conceptual underlying framework for selection of criteria for priority setting which was put forward by Tromp & Baltussen [33]. Based on the framework, the criteria ‘reducing the impact of the epidemic’, ‘past effectiveness’, and ‘cultural, political, and religious barriers’ used implicitly in West Java seem to be valid reasons for priority setting. It is debatable whether ‘alignment with national/provincial strategy’ should be used, as policy making should be context-based and higher-level policies could be incompatible with the situation at the local level. However, in the context of Indonesia’s political system and culture, it might be inappropriate to ignore higher-level instructions and it would be not feasible on the short term to start provincial programs instead of aligning with the national programs and related policies [34,35]. For all criteria, improved use of (scientific) evidence could help systematically compare interventions for priority setting, which should be guided by more evidence than only the HIV prevalence in risk groups. The strategic document scarcely prioritizes interventions, but primarily functions as a guideline presenting all possible activities. The Indonesian culture has a strong community system, and therefore it is an important norm to take care of everyone [35]. However, the small budget necessitates priority setting rather than trying to do everything for everybody [36].

In evaluating publicity, we found that despite dissemination meetings and media exposure, respondents were not aware of all decisions and the reasons. Explanation of strategic decisions is difficult and should be done using easily understandable language. In West Java, especially for the public, the current strategic plans seem difficult to understand as it contains technical HIV/AIDS and law terminology. Sparse publication of reasons is seen in all countries that have conducted AFR evaluations [4,12,13,15,37] and we recommend to develop a formal publicity plan in West Java to effectively inform all stakeholders. Finding more effective methods for communicating policy decisions for HIV/AIDS control in Indonesia to different types of stake-

holders could help improve the transparency of the process. It should be evaluated whether the current publication mechanisms to the public through sub-district leaders (already involved in HIV interventions) is effective and potentially can be expended to all leaders. As social media is extensively used in Indonesia and is a low cost communication channel this might be an efficient way to inform the public and we recommend investigating its potential. The Citizens AIDS (Warga Peduli AIDS) intervention of the city AIDS commission establishes organizations comprised of local sub-district leaders, which could potentially inform the public about strategic decisions; however this may require substantial resources [38]. Lack of openness on sensitive issues, like condom distribution and MSM interventions, reduces policy making transparency; however, this is difficult to change due to Indonesia's cultural values [35]. Still, options for improved transparency regarding sensitive interventions should be investigated. Furthermore, delays in strategy development should be prevented, as they prevent timely informing of stakeholders.

Our evaluation of appeals & revision revealed that, although no formal mechanisms are installed in the strategic planning, respondents feel that they can appeal and reach consensus through discussions during the process. This is in line with the five principles of Pancasila (Indonesia's state principles introduced by president Sukarno in 1945) that name democracy as a core value, and state that disagreements should be resolved through discussions, with a voting procedure considered a last option [39]. The general formal process through the House of Representatives seems to be insufficient, as it is time-consuming and not specifically for HIV/AIDS policies. Some respondents said that the dominant use of lobbying harms the transparency of the decisions. Therefore, the use of appeals & revision mechanisms should be more transparent and formally reported and we recommend holding a survey among stakeholders to propose the most appropriate mechanism in the context of Indonesia. Still it is difficult to judge whether selected mechanisms by stakeholders will also be the most appropriate ones to contribute to fair priority setting. Although stakeholders might perceive giving opinions during meetings a proper mechanism, dominance in discussions is excessive in Indonesia which affects opportunities for appeals and the fairness of the priority setting process. In countries that have undergone AFR evaluation, formal appeals & revisions mechanisms are seen in high-income countries (Norway, Canada) but not in low- and middle-income countries (Tanzania, Uganda, Thailand), with the exception of Israel, which also has no formal mechanism [4,12–15,37].

Our evaluation of enforcement revealed that, formal regulations for ensuring fairness of decision making were apparent, as observed in other AFR-evaluated countries [4,12–15,37]. Therefore, we recommend that the National AIDS commission develops guidelines for HIV strategic planning in Indonesia that incorporate the four conditions of AFR and that the local AIDS commissions will be trained to use these. With regard to implementation, we found that the HIV/AIDS control funding system is fragmented and that the preference of individual institu-

tions determines the intervention implementation and the actual priority setting. Ideally, all funding should be pooled and assigned by one decision body. However, this would require a total reorganization of Indonesia's HIV/AIDS control, and necessitate the agreement of international donors to not earmark funding for specific HIV/AIDS interventions. As an alternative, we recommend openness regarding the available local government budget for HIV/AIDS activities and the commitment of every local government department to execute activities. With regard to leadership, our investigation revealed more effective organization of HIV/AIDS control at the Bandung level than at the provincial level. This could be related to greater commitment and leadership of Bandung's mayor compared to West Java's governor. The importance of leadership in priority setting has been proven in a hospital setting, but has not yet been investigated on provincial or national government levels [40].

To our knowledge, extensive evaluations of priority setting processes within and outside the HIV/AIDS field in settings outside of West Java province have not yet been done. The deficits identified in the four AFR conditions are not limited to HIV/AIDS control but may represent a structural problem of accountability in government institutions in Indonesia [34]. Many districts have not yet developed the capacity to plan and manage their health budgets, to identify local health needs with use of available knowledge and to set targets and monitor progress [17].

Also for settings outside Indonesia implementation of the AFR framework will be instrumental to improve priority-setting processes. It will empower institutions to systematically and continuously evaluate the quality of the process against the four AFR conditions. The framework will help to identify all relevant stakeholders and criteria for priority setting, to increase the uptake of evidence in decision-making and to identify and implement formal mechanisms for appeal and publicity. Implementation of the framework may also lead to better health outcomes as with better use of evidence the interventions with highest health impact might get priority.

Although our findings of the Indonesian case should be generalised with caution, it provides lessons for the pitfalls that institutions in other settings may encounter and should overcome during implementation of the AFR framework. An essential component of any successful implementation of AFR is leadership and this should be ensured. Embedding of the priority setting process in a government regulation may improve commitment and participation of institutions. All relevant stakeholders should participate in the process and effective and context based mechanisms should be used to involve the public and PLWHA. Dominance in discussions should be solved with culturally accepted measures. To optimise the democratic learning process we recommend that the same person who represents an institution participates in all meetings.

We learned from the West Java case that formal appeal mechanisms should be installed that are considered effective by the stakeholders. Also, no technical terminology should be used so that the public and PLWHA have opportunity to appeal. Stakeholders should be involved

that have power to allocate resources to the prioritized interventions. Ideally, resources should be pooled as a fragmented system increases the risk that high priority interventions are not funded. To improve understanding and acceptance of the framework local government capacity should be established to facilitate priority setting processes. The government could be supported by local universities for education on the framework and facilitation of the process.

To further improve fairness and legitimacy in strategic planning, we recommend the use of an integrated multi-criteria decision analysis (MCDA) and AFR approach recently put forward by Baltussen *et al.* [41]. Both methods have been successfully applied in various countries but have potentially more impact in complementing each other settings [4,12–15,37,42–44]. This method starts a (long term) democratic learning process and includes all relevant stakeholders, identifies a comprehensive set of rational criteria for priority setting, uses evidence to compare the performance of all interventions on those criteria and lets the stakeholders define appropriate mechanisms for publicity and appeals & revision. The method has not been tested in the context of Indonesia and this is a topic for further study.

Study limitations

From our present study results, we can identify a few risks for biases. Our respondents were selected through purposive sampling, which might have caused recall bias. We also did not interview the public directly, which limited our ability to verify whether they think the strategies are well published and whether they had adequate ability to appeal. Some respondents could have given politically correct answers; however, we received many critical opinions of the process, indicating that they felt free to respond honestly. The meetings took place a few years before the interviews, which could have caused recall bias.

Conclusions

To increase the fairness and legitimacy of HIV/AIDS priority setting, West Java should make improvements on all conditions of the AFR framework. More specifically, explicit priorities should be made among HIV/AIDS interventions, with the use of explicit criteria that are transparent for and agreed upon by all involved stakeholders. Although many stakeholders participate in the priority setting process, the quality of their involvement should be ensured, especially regarding PLWHA and the public. An improved publication strategy should be developed and implemented to inform stakeholders about decisions. The use of appeals & revision mechanisms should be more transparent and formally stated. Finally, public regulations should be developed to ensure that fair priority setting processes in HIV control will be installed. ■

References

1. Indonesian National AIDS Commission (2012) Republic of Indonesia Country Report on the Follow up to the declaration of commitment on HIV/AIDS (UNGASS). Reporting Period 2010–2011. Jakarta: Indonesian National AIDS commission.
2. Indonesian National AIDS Commission (2009) Strategy of the national action plan for HIV/AIDS 2010–2014. Jakarta. Available: <http://www.aidsindonesia.or.id/elib/home/detail/240>. Accessed 13 January 2014.
3. AIDSdatahub (2014) Indonesia Country Profile. Available: <http://www.aidsdatahub.org/en/country-profiles/indonesia>. Accessed 13 January 2014.
4. Kipiriri L, Norheim OF, Martin DK (2007) Priority setting at the micro-, meso- and macro-levels in Canada, Norway and Uganda. *Health Policy* 82: 78–94.
5. Chalkidou K, Levine R, Dillon A (2010) Helping poorer countries make locally informed health decisions. *BMJ* 341: c3651.
6. Baltussen R, Niessen L (2006) Priority setting of health interventions: the need for multi-criteria decision analysis. *Cost Eff Resour Alloc* 4: 14.
7. Guindo LA, Wagner M, Baltussen R, Rindress D, van Til J, et al. (2012) From efficacy to equity: Literature review of decision criteria for resource allocation and healthcare decisionmaking. *Cost Eff Resour Alloc* 10: 9.
8. Daniels N (2008) *Just Health: Meeting Health Needs Fairly*. Cambridge: Cambridge University Press.
9. Daniels N, Sabin J (1997) Limits to health care: fair procedures, democratic deliberation, and the legitimacy problem for insurers. *Philos Public Aff* 26: 303–350.
10. Daniels N (2002) *Setting limits fairly: Can we learn to share medical resources?* New York: Oxford University Press.
11. Daniels N, Sabin J (1998) The ethics of accountability in managed care reform. *Health Aff (Millwood)* 17: 50–64.
12. Greenberg D, Siebzeiner MI, Pliskin JS (2009) The process of updating the National List of Health Services in Israel: is it legitimate? Is it fair? *Int J Technol Assess Health Care* 25: 255–261.
13. Maluka S, Kamuzora P, San Sebastián M, Byskov J, Olsen ØE, et al. (2010) Decentralized health care priority-setting in Tanzania: evaluating against the accountability for reasonableness framework. *Soc Sci Med* 71: 751–759.
14. Mori AT, Kaale EA (2012) Priority setting for the implementation of artemisinin-based combination therapy policy in Tanzania: evaluation against the accountability for reasonableness framework. *Implement Sci* 7: 18.
15. Tuba M, Sandoy IF, Bloch P, Byskov J (2010) Fairness and legitimacy of decisions during delivery of malaria services and ITN interventions in Zambia. *Malar J* 9: 309.
16. Suzetta P (2007) *Perencanaan Pembangunan Indonesia* ("Indonesian Development Planning"). Available from : [http://ditpolkom.bappenas.go.id/basedir/Artikel/094.%20Perencanaan%20Pembangunan%20Nasional%20-%20Paskah%20Suzetta%20\(22%20Maret%202007\).pdf](http://ditpolkom.bappenas.go.id/basedir/Artikel/094.%20Perencanaan%20Pembangunan%20Nasional%20-%20Paskah%20Suzetta%20(22%20Maret%202007).pdf). Accessed 13 January 2014.
17. Overseas Development Institute (2011) *The political economy of policy-making in Indonesia. Opportunities for improving the demand and use of knowledge*. London: Overseas Development Institute. Accessed 13 January 2014.
18. West Java AIDS Commission (2013) *West Java Asian Epidemic Model estimations*. Bandung. Accessed 13 January 2014.
19. West Java AIDS commission (2013) *Local monitoring data on coverage of various HIV/AIDS programs*. Bandung. Accessed 13 January 2014.
20. Bandung AIDS commission (2007) *Strategy for HIV and AIDS Program in Bandung 2007–2011*. Bandung. Accessed 13 January 2014.
21. Indonesian National AIDS Commission (2011). *Guide on the organization and function of the local AIDS commission*. Accessed 13 January 2014.
22. West Java AIDS Commission (2009). *Strategy for HIV and AIDS Program in West Java Province 2009–2013*. Bandung. Accessed 13 January 2014.
23. Mitton C, Donaldson C (2004) Health care priority setting: principles, practice and challenges. *Cost Eff Resour Alloc* 2: 3.
24. Kipiriri L, Norheim OF, Martin DK (2009) Fairness and accountability for reasonableness. Do the views of priority setting decision makers differ across health systems and levels of decision making? *Soc Sci Med* 68: 766–773.

25. Ministry of National Development Planning (2012) Effective public spending: the case of infrastructure. Presentation on OECD global forum on development 2012. Available: <http://www.oecd.org/site/oecdgfd/49793186.pdf>. Accessed 13 January 2014.
26. Governor West Java Provincial (2012) Regulation No. 12 of 2012 on the prevention and control of human immunodeficiency Virus (HIV) and acquired immune deficiency syndrome (AIDS). 2012. Accessed 13 January 2014.
27. Abelson J, Forest P-G, Eyles J, Smith P, Martin E, et al. (2003) Deliberations about deliberative methods: issues in the design and evaluation of public participation processes. *Soc Sci Med* 57: 239–251.
28. Mitton C, Smith N, Peacock S, Evoy B, Abelson J (2009) Public participation in health care priority setting: A scoping review. *Health Policy* 91: 219–228.
29. Bolsewicz Alderman K, Hipgrave D, Jimenez-Soto E (2013) Public Engagement in Health Priority Setting in Low- and Middle-Income Countries: Current Trends and Considerations for Policy. *PLoS Med* 10.
30. Rudge JW, Phuanakoon S, Nema KH, Mounier-Jack S, Coker R (2010) Critical interactions between Global Fund-supported programmes and health systems: a case study in Papua New Guinea. *Health Policy Plan* 25 Suppl 1: i48–52.
31. World Health Organization (2012) Indonesia country profile 2012. Available: <http://www.who.int/countries/idn/en/>. Accessed 13 January 2014.
32. Sibbald SL, Singer PA, Upshur R, Martin DK (2009) Priority setting: what constitutes success? A conceptual framework for successful priority setting. *BMC Health Serv Res* 9: 43.
33. Tromp N, Baltussen R (2012) Mapping of multiple criteria for priority setting of health interventions: an aid for decision makers. *BMC Health Serv Res* 12: 454.
34. Heywood P, Harahap NP (2009) Public funding of health at the district level in Indonesia after decentralization-sources, flows and contradictions. *Health Res Policy Syst* 7: 5.
35. Hofstede G (2001) *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations*, 2nd edition. Thousand Oaks California: Sage Publications.
36. Baltussen R (2006) Priority setting of public spending in developing countries: do not try to do everything for everybody. *Health Policy* 78: 149–156.
37. Youngkong S, Baltussen R, Tantivess S, Mohara A, Teerawattananon Y (2012) Multicriteria decision analysis for including health interventions in the universal health coverage benefit package in Thailand. *Value Health* 15: 961–970.
38. Kurniawan M (2011) Active participation of 30 sub-districts "WPA" in Bandung city on HIV-AIDS response. Poster presentation ICAAP10 conference. Busan. Available: http://www.icaap10.org/program/program_08.asp?sMenu=pro8. Accessed 13 January 2014.
39. Sukarno K (1945). Lahirnya Pancasila ("the birth of Pancasila") speech. Yogyakarta.
40. Reeleder D, Goel V, Singer PA, Martin DK (2006) Leadership and priority setting: the perspective of hospital CEOs. *Health Policy* 79: 24–34.
41. Baltussen R, Mikkelsen E, Tromp N, Hurtig A, Bykov J, et al. (2013) Balancing efficiency, equity and feasibility of HIV treatment in South Africa -- development of programmatic guidance. *Cost Eff Resour Alloc* 11: 26.
42. Baltussen R, ten Asbroek AHA, Koolman X, Shrestha N, Bhattarai P, et al. (2007) Priority setting using multiple criteria: should a lung health programme be implemented in Nepal? *Health Policy Plan* 22: 178–185.
43. Jehu-Appiah C, Baltussen R, Acquah C, Aikins M, d'Almeida SA, et al. (2008) Balancing equity and efficiency in health priorities in Ghana: the use of multicriteria decision analysis. *Value Health* 11: 1081–1087.
44. Youngkong S, Teerawattananon Y, Tantivess S, Baltussen R (2012) Multi-criteria decision analysis for setting priorities on HIV/AIDS interventions in Thailand. *Health Res Policy Syst* 10: 6.

- Sub-question 2
Which criteria are important
for priority setting in
HIV/AIDS control?

CHAPTER 3

Mapping of multiple criteria for priority setting of health interventions: an aid for decision makers

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Abstract

Background: In rationing decisions in health, many criteria like costs, effectiveness, equity and feasibility concerns play a role. These criteria stem from different disciplines that all aim to inform health care rationing decisions, but a single underlying concept that incorporates all criteria does not yet exist. Therefore, we aim to develop a conceptual mapping of criteria, based on the World Health Organization's Health Systems Performance and Health Systems Building Blocks frameworks. This map can be an aid to decision makers to identify the relevant criteria for priority setting in their specific context.

Methods: We made an inventory of all possible criteria for priority setting on the basis of literature review. We categorized the criteria according to both health system frameworks that spell out a country's health system goals and input. We reason that the criteria that decision makers use in priority setting exercises are a direct manifestation of this.

Results: Our map includes thirty-one criteria that are distributed among five categories that reflect the goals of a health system (i.e. to improve level of health, fair distribution of health, responsiveness, social & financial risk protection and efficiency) and one category that reflects feasibility based on the health system building blocks (i.e. service delivery, health care workforce, information, medical products, vaccines & technologies, financing and leadership/governance).

Conclusions: This conceptual mapping of criteria, based on well-established health system frameworks, will further develop the field of priority setting by assisting decision makers in the identification of multiple criteria for selection of health interventions.

Background

Concerns on the costs, effectiveness and cost-effectiveness of health interventions have dominated the debate on health rationing in a wide range of countries since long [1–3]. More recently, the explicit use of a number of equity-related criteria have been put forward, like severity of disease, socio-economic status, or gender, reflecting the increased attention for distribution of health in a population, as summarized by Johri and Norheim [4]. Still other criteria, like ease of implementation [5] or political acceptability [6] are presently finding their way in the prioritization of health interventions.

The recognition that not a single but multiple criteria should explicitly be considered has led to the development of multi criteria decision analysis (MCDA). This method sets programme priorities by referring to a comprehensive set of explicit criteria and guides decision makers in understanding the trade-offs between values that may be conflicting. For example while mobile clinics for HIV testing may be costly and therefore inefficient, they may deserve priority because they reach out to remote areas and therefore contribute to equity in service delivery. A core component in any MCDA is the identification of criteria that decision-makers consider important in their specific contexts. As a next step, MCDA scores the performance of health interventions on these criteria [7,8].

At the same time, surprisingly little work has been done to develop a meaningful conceptual mapping of criteria that can help to identify the relevant set of criteria. A recent report that advises the UK's National Institute for Health and Clinical Excellence (NICE) for the use of MCDA reviewed the literature and one of the findings was that most applications have a fixed set of criteria and lack explanation of the rationale behind the selected criteria and the categories used. In addition, it was concluded that the applications give neither flexibility nor assistance to decision makers to select an unique set of criteria in their decision context [8]. More specifically, in 1999, Musgrove presented the 'nine criteria for public spending on health care' in a spider-web like diagram, however, without classification of criteria [9]. Baltussen and Niessen presented in 2006 the 'cloud of criteria', suggesting that criteria cannot be systematically categorized [7]. Another framework, introduced by EVIDEM in 2010, does not explain an underlying rationale for the choice of categories that are used [10,11]. Furthermore, various reviews simply list priority setting criteria [4,8,11,12]. Only the list of criteria reported in the review of Golan et al., categorizes criteria according to the principles of allocative justice for rationing health care, i.e. need, maximizing and egalitarian principles, but is therefore limited in scope [13]. Our paper aims to develop a conceptual mapping of a comprehensive set of criteria, including efficiency, equity and feasibility concerns.

Categorization of criteria is important for two main reasons. Firstly, for decision makers, the grouping of a large and diffuse set of criteria into categories may ease their interpretation and facilitate decision-making. Second, such a categorization may be an aid to well-define

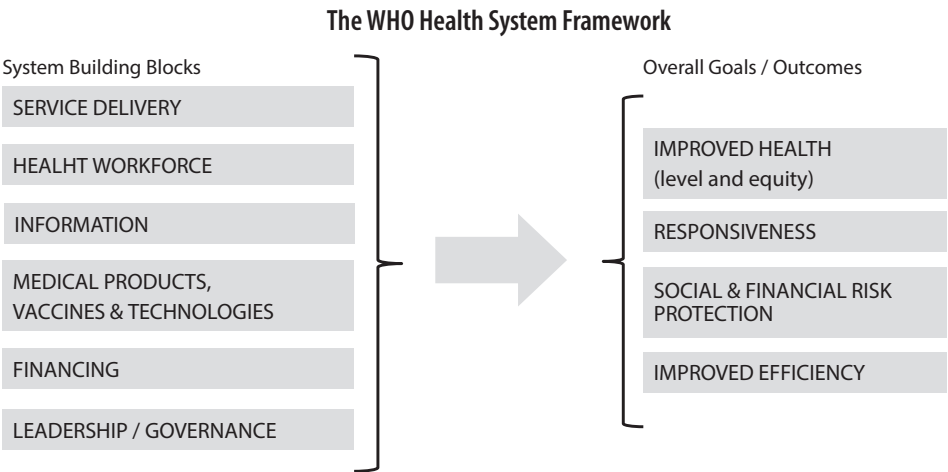
criteria, and to avoid overlap and double-counting of criteria. Criteria, especially those related to health distribution (i.e. equity) concerns are often difficult to define and a proper mapping sets boundaries to facilitate this.

Methods

Conceptual mapping of criteria

This paper introduces a conceptual mapping of criteria based on an integration of two well established health systems frameworks, i.e. the World Health Organization’s (WHO) Health Systems Performance framework [14] and Health Systems Building Blocks framework [15,16] (Figure 1). These frameworks spell out a country’s health system goals and input – we reason that the criteria that decision makers use in priority setting exercises are a direct manifestation of this. More specifically, the Health System Performance framework is a generally accepted concept to reflect the goals of a health system. Here, in our interpretation, the framework reflects criteria that indicate the goals of interventions in health, i.e. to improve the level and distribution of health, to improve responsiveness, to offer financial protection and to make efficient use of resources. This can be loosely defined as ‘what should a health system do’. The Health System Building Blocks framework is a generally accepted concept to reflect the required components (or inputs) for an effective health system. Here, in our interpretation, the framework reflects criteria that relate to the feasibility of interventions, or loosely defined as ‘what can a health system do’. These criteria relate to the building blocks: ‘service delivery’, ‘health workforce’, ‘information’, ‘medical products, vaccines & technologies,’ ‘financing’, and ‘leadership/governance’. Together, the two frameworks offer a comprehensive framework for classifying priority setting criteria. We employ both WHO frameworks because they are worldwide used by decision makers at country level and are credible conceptualizations of health systems [15,17].

Figure 1. The building blocks and goals of a health system [14-16]



**Table 1. Definitions of categories used in the criteria map
(based on the health system goals and building blocks)**

CATEGORY	DEFINITION
Health system goals [14]	
Health level	To improve the total average level of health in the population
Health distribution	To achieve absence of avoidable or remediable differences in health among groups of people, defined socially, economically, demographically, or geographically
Responsiveness	To use interventions that are responsive to people's expectations in regard to non-health matters and reflect the importance of people's dignity, autonomy and the confidentiality of information
Social & financial risk protection	To provide financial protection against the costs of ill-health
Improved efficiency	To make the best and most efficient use of resources
Health system building blocks [15]	
Service delivery	Good health services are those which deliver effective, safe, quality personal and non-personal health interventions to those that need them, when and where needed, with minimum waste of resources.
Health workforce	A well-performing health workforce is one that works in ways that are responsive, fair and efficient to achieve the best health outcomes possible, given available resources and circumstances (i.e. there is sufficient staff, fairly distributed; they are competent, responsive and productive).
Information	A well-functioning health information system is one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health system performance and health status.
Medical products, vaccines & technologies	A well-functioning health system ensures equitable access to essential medical products, vaccines and technologies of assured quality, safety, efficacy and cost-effectiveness, and their scientifically sound and cost-effective use.
Financing	A good health financing system raises adequate funds for health, in ways that ensure people can use needed services, and are protected from financial catastrophe or impoverishment associated with having to pay for them. It provides incentives for providers and users to be efficient.
Leadership/governance	Leadership and governance involves ensuring strategic policy frameworks exist and are combined with effective oversight, coalition-building, regulation, attention to system-design and accountability.

We carried out two steps to develop our conceptual mapping of criteria. In a first step, we made an inventory of all possible criteria for priority setting on the basis of literature reviews [4,8,11–13]. In a second step, we categorized these criteria according to the health systems goals and building blocks, based on their definitions (Table 1). For example, following the health system performance framework, we distinguished the objective to improve health in two categories, i.e. to improve the ‘level of health’ and the ‘distribution of health’. We defined and classified criteria in these categories in order to avoid overlap between criteria.

Results

The conceptual mapping of criteria for priority setting is provided in Figure 2. The definitions of the categories are similar to those in the original WHO health system frameworks and are presented in Table 1. Our literature review resulted in the identification of a large set of criteria, which are often similar in concept but different in the ways they are described. In the appendix of this chapter we list all criteria we considered for inclusion in our framework, and present a rationale for their inclusion or exclusion. The included thirty-one criteria are all single not-overlapping arguments to prioritize health interventions and are defined in Table 2. Here, we will give the rationale used for a selection of the criteria considered.

On the right panel of the map we distinguish five categories of criteria related to intervention’s goals. The first category is ‘health level,’ and includes criteria ‘effectiveness on individual level,’ ‘effectiveness on population level’ ‘patient reported health status’ and ‘safety’. Whereas reviews include ‘quality of evidence on effectiveness,’ we excluded this from our map, as we consider quality of evidence to be relevant to all criteria, e.g. how costly or complex an intervention is. Rather, we propose to capture quality of evidence in uncertainty analysis. The second category is ‘health distribution,’ and included criteria that relate to the core concept of ‘equal life time health,’ which means that all people independent of their background, their disease status or the availability of treatment should have a fair chance to live a full healthy life [18]. This concept encompasses both horizontal and vertical equity. We define horizontal equity as the provision of equal treatment for people with equal health needs. Horizontal equity is non-discriminative towards certain groups in society to give them equal access to care as other groups with the same needs. We define vertical equity as the provision of unequal but equitable treatment for people with unequal health needs – this implies giving priority to certain groups in society, on the basis of their background (‘socioeconomic status,’ ‘area of living,’ ‘sex and gender,’ ‘age,’ ‘ethnicity,’ ‘sexual orientation’), disease status (‘severity of disease’) or the ‘availability of treatment’ [19]. ‘Responsibility for health’ is included as interventions that focus on people that have bad luck may deserve more priority. The precise identification and definition of equity-related criteria is topic of a recent collaboration between different experts (ethicists, public health experts, economist, etc.) from academic institutes and the WHO [4,19]. Therefore we only provisionally list and define these criteria here.

Figure 2. Mapping of priority setting criteria

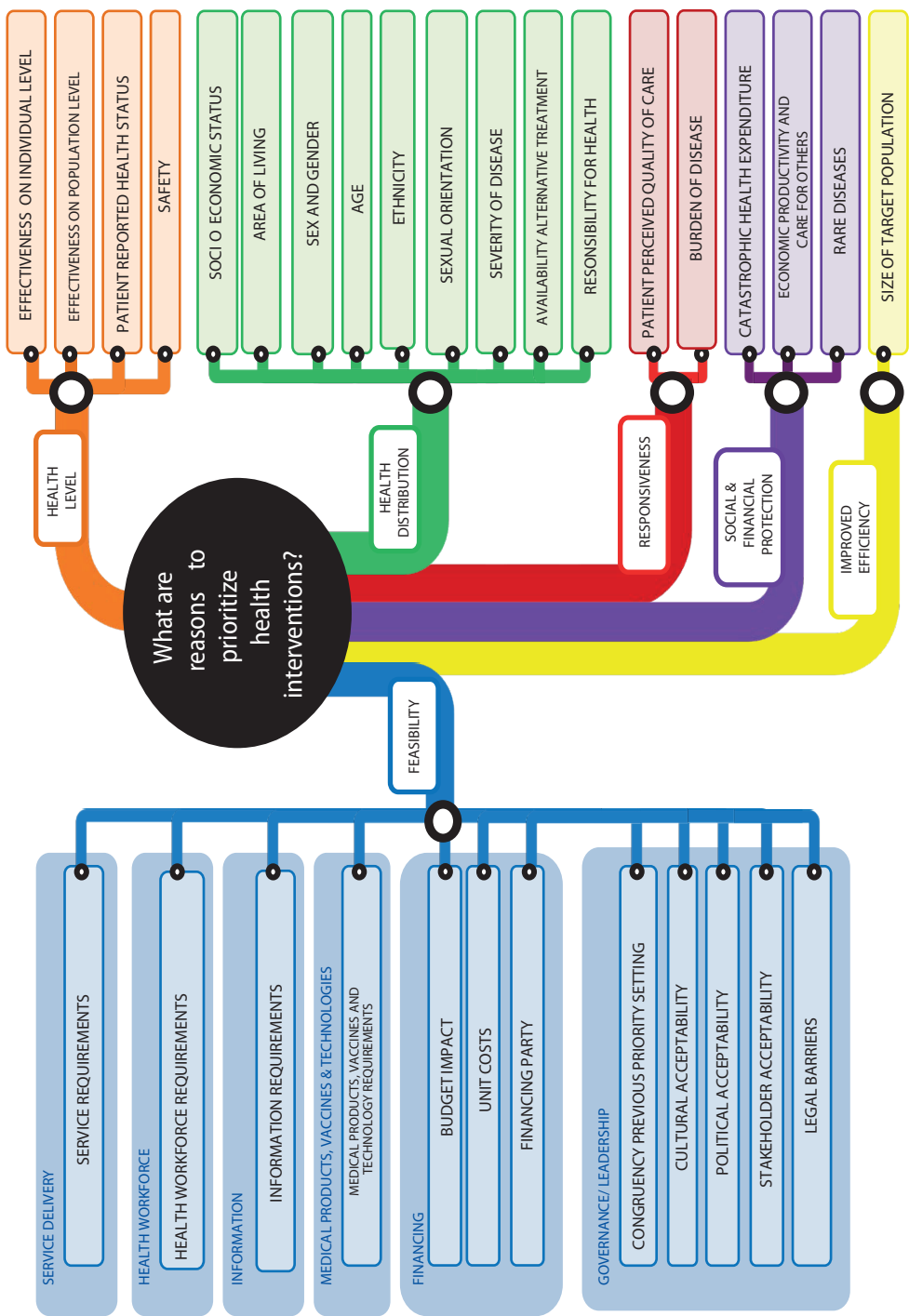


Table 2. Definition of categories and criteria for priority setting

CATEGORY		CRITERIA	DEFINITION
Health level		Individual effectiveness	Interventions that are effective in reduction of individual level morbidity and mortality may deserve priority
		Patient reported health status	Interventions that have high impact on patient reported health status may deserve priority
		Safety	Interventions that do not harm in terms of morbidity and mortality may deserve priority
Health distribution		Various criteria	All criteria proposed in the map have the same underlying rationale: all people should have as much of a fair chance to live a healthy life, and therefore interventions focusing on certain social groups may deserve priority
Responsiveness		Patient perceived quality of care	Interventions should be responsive to people's expectations in regard to non-health matters and reflect the importance of people's dignity, autonomy and the confidentiality of information
		Burden of disease	Interventions that focus on a high burden of disease in society may deserve priority
Social and financial protection		Catastrophic health expenditure	Health care related costs can push people into poverty. Interventions that protect people against catastrophic health expenditure may deserve priority
		Economic productivity and care for others	People who are economically productive and/or take care of others and become ill, face income loss and health related costs, which could lead to poverty. Interventions that target those people may deserve priority
		Rare diseases	Interventions of rare diseases might be very costly (because of the small number patients) and could push people into poverty. Therefore, these interventions may deserve priority
Improved efficiency		Size of target population	Interventions that show economies of scale because they target a high number of people may deserve priority
Feasibility	Service delivery	Service requirements	Interventions that are easy to implement because of the current service capacity may have priority. E.g. availability of: service infrastructure, delivery models, safety & quality, management
	Health care workforce	Health care workforce requirements	Interventions that are easy to implement because of the current health care workforce capacity may have priority. E.g. availability workforce and workforce policies, preferences of workforce for working conditions
	Information	Information requirements	Interventions that are easy to implement because of the current information system capacity may have priority. E.g. availability of surveillance systems

Table 2. Continued

CATEGORY		CRITERIA	DEFINITION
Feasibility	Medical product, vaccines & technology	Medical product, vaccines & technology requirements	Interventions that are easy to implement because of the current medical products, vaccines & technology capacity may have priority. E.g. norms, standards and reliability procurement
		Financing	
		Budget impact	Interventions that consume a small part of the budget may have priority
	Governance & leadership	Unit costs	Interventions that have small unit cost per patient may have priority
		Financing party	Interventions that receive sustainable financing may have priority
		Congruency previous priority setting	Interventions that are in line with previous spending pattern may have priority
		Cultural acceptability	Interventions that are cultural acceptable, because of the norms and values, may have priority
		Political acceptability	Interventions that are political acceptable may have priority
		Stakeholder acceptability	Interventions that are accepted by important stakeholder groups (e.g. patients groups, taxpayers, health care providers, donor agencies, voters) may have priority.
		Legal barriers	Interventions that face no legal barriers may have priority

The third category is 'responsiveness', and includes 'patient perceived quality of care'. Interventions should be responsive to people's expectations in regard to non-health matters and reflect the importance of people's dignity and autonomy, and the confidentiality of information.

Although this seems a general, and therefore system wide concern, some interventions do better than other interventions in satisfying perceived quality of care. We include 'burden of disease' to represent the wish of society to target high burden diseases. The fourth category is 'social and financial risk protection' and includes 'catastrophic health expenditure', 'economic productivity and care for others' and 'rare diseases'. Regarding the latter, interventions targeting rare diseases may deserve priority because they may be very costly (as intervention (especially drug) development costs are only shared by a small number of patients) and could push people into poverty. The fifth category is 'improved efficiency' and reflects the economies of scale that can be obtained when reaching large number of people. Therefore we have included the criterion 'size of target group'. We decided to exclude 'cost-effectiveness' as a criterion on itself, as theoretically costs (as a feasibility constraint) and effectiveness (as a goal) are both implicitly included in the mapping as individual criteria. However, regarding

the importance of the criterion of cost-effectiveness in decision-making, decision makers may nevertheless consider it as a separate criterion.

On the left panel of the map we distinguish one category of criteria related to the feasibility of implementation of interventions. This category is divided in six subcategories, based on the building blocks, i.e. 'service delivery', 'health workforce', 'information', 'medical products, vaccine and technologies', 'financing', and 'leadership/ governance'. In contrast to the criteria related to intervention goals (discussed above), little work has been done on these criteria (except on the criteria 'cost') and the criteria we put forward are first propositions. The first four subcategories relate to the current capacity of the health system and criteria reflect the requirements for implementation of an intervention. The fifth subcategory on financing encompasses 'unit costs', 'budget impact' and 'financing party'. The 'unit costs' are the total costs per patient from a health systems perspective whereas 'budget impact' incorporates the scale of an intervention. The 'financing party' criterion captures who is paying for a health intervention and reflects notions on its financial sustainability. The sixth subcategory represents the feasibility in terms of leadership/governance and includes 'congruency previous priority setting', 'cultural acceptability', 'political acceptability', 'stakeholder acceptability', and 'legal barriers'.

Discussion

Our map should not be regarded as a top-down expert advice on a fixed set of criteria that should always be considered in all prioritization decisions, but rather as an aid to decision-makers in their selection of relevant criteria. We see two broad applications of priority setting, and therefore of our mapping of criteria. First, it can inform decision makers who work in a specific context, e.g. on the reimbursement decision of a single intervention. These decisions are taken in the presence of a known budget and are likely limited by factors such as the currently available physical infrastructure, human resources or political consideration, at least in the short to medium term. This is labeled 'context-specific priority setting'. The second application is to guide decisions on a wide range of interventions, to provide general information on their relative rank order to arrive a more informed debate on resource allocation priorities. Because priority setting in this application is not meant to provide a solution to a specific resource allocation question, it need not be highly contextualized in terms of e.g. physical infrastructure and/or human resources constraints. This is labeled 'generalized priority setting' [20]. The set of criteria for 'context-specific priority setting' is likely to be much more specific than those for 'generalized priority setting', but stem from the same conceptual mapping of criteria as presented above. That our mapping of criteria should not be considered as a fixed set of criteria is especially clear when setting priorities in a specific disease area. For example, an important criterion in HIV/AIDS health rationing decisions is whether the intervention reduces stigma. To include these disease-specific criteria in a generic list would increase its total number of criteria and make it unmanageable.

As our mapping is based on the WHO health systems frameworks, it has a certain credibility among decision makers. However, the choice of a different underlying framework might lead to another mapping of criteria.

In our framework, we included criteria related to the health system inputs and health system goals, but no criteria related to intermediate outcome measures as access and utilization. These measures are instrumental to reach health system goals, and are as such no goals in themselves. However, decision-makers can use them to monitor and evaluate progress towards the realization of the health system goals.

Another important step in MCDA is to define indicators to operationalize the criteria. For example, the severity of disease that an intervention targets can be measured in terms of health state valuations [21] and health gains in terms of disability adjusted life years averted. The operationalization of criteria would complement our mapping of criteria, and would allow the construction of a performance matrix that systematically demonstrates the performance of an intervention on all criteria [7,8]. Such a matrix can consequently be the basis for rationing decisions on (a set of) health interventions. Such decisions should eventually also account for non-quantifiable criteria related to e.g. complicated ethical judgments. These criteria are not reflected in our framework, and further research should be carried out on how these can best be accounted for, e.g. through a process of deliberation [8,20,22].

We consider the presented mapping of priority setting criteria as preliminary only and not as a final map. We welcome discussions to further develop it, to improve the use of MCDA for setting priorities in health.

Conclusions

This conceptual mapping of criteria, based on well-established health system frameworks, will further develop the field of priority setting by assisting decision makers in the identification of multiple criteria for selection of health interventions. ■

References

1. The World Bank (1993) The World Bank World Development Report 1993: investing in Health. New York: Oxford University Press.
2. Ham C (1997) Priority setting in health care: learning from international experience. *Health Policy* 42: 49–66.
3. WHO-CHOICE (2003) Making choices in health: WHO guide to cost-effectiveness analysis. Geneva: World Health Organization.
4. Johri M, Norheim OF (2012) Can cost-effectiveness analysis integrate concerns for equity? Systematic review. *Int J Technol Assess Health Care* 28: 125–132.
5. Gericke CA, Kurowski C, Ranson MK, Mills A (2005) Intervention complexity—a conceptual framework to inform priority-setting in health. *Bull World Health Organ* 83: 285–293.
6. Goddard M, Hauck K, Smith PC (2006) Priority setting in health – a political economy perspective. *Health Econ Policy Law* 1: 79–90.
7. Baltussen R, Niessen L (2006) Priority setting of health interventions: the need for multi-criteria decision analysis. *Cost Eff Resour Alloc* 4: 14.
8. Devlin N, Sussex J (2011) Incorporating multiple criteria in HTA: methods and processes. London: Office of Health Economics.
9. Musgrove P (1999) Public spending on health care: how are different criteria related? *Health Policy* 47: 207–223.
10. The EVIDEM (Evidence and Value: Impact on Decision Making) framework. Available: <http://www.evidem.org>. Accessed 12 September 2014
11. Guindo LA, Wagner M, Baltussen R, Rindress D, van Til J, et al. (2012) From efficacy to equity: Literature review of decision criteria for resource allocation and healthcare decisionmaking. *Cost Eff Resour Alloc* 10: 9.
12. Cleary SM, Mooney GH, McIntyre DE (2010) Claims on health care: a decision-making framework for equity, with application to treatment for HIV/AIDS in South Africa. *Health Policy Plan* 26: 464–470.
13. Golan O, Hansen P, Kaplan G, Tal O (2011) Health technology prioritization: Which criteria for prioritizing new technologies and what are their relative weights? *Health Policy (New York)* 102: 126–135.
14. World Health Organization (2000) The World Health Report 2000 - Health Systems: Improving Performance. Geneva: World Health Organization.
15. World Health Organization (2007) Everybody's Business: Strengthening Health Systems to Improve Health Outcomes: WHO's framework for Action. Geneva: World Health Organization.
16. World Health Organization (2008) The World Health Report 2008 - Primary Health Care: Now More Than Ever. Geneva: World Health Organization.
17. Frenk J (2007) Briding the divide: global lessons from evidence-based health policy in Mexico. *Lancet* 368 (9539):954–961.
18. Daniels N (2008) Just Health: Meeting Health Needs Fairly. Cambridge: Cambridge University Press.
19. World Health Organization (2011) Setting equitable priorities in health and health care: from theory to practice. Brocher Symposium 2011. Geneva.
20. Baltussen R, Youngkong S, Paolucci F, Niessen L (2010) Multi-criteria decision analysis to prioritize health interventions: Capitalizing on first experiences. *Health Policy* 96: 262–264.
21. Murray CJ, Lopez AD (1994) Quantifying disability: data, methods and results. *Bull World Health Organ* 72: 481–494.
22. Youngkong S, Baltussen R, Tantivess S, Koolman X, Teerawattananon Y (2010) Criteria for priority setting of HIV/AIDS interventions in Thailand: a discrete choice experiment. *BMC Health Serv Res* 10: 197.

Appendix

This appendix contains an overview of all criteria considered for inclusion in our map according to the consulted data sources. A rationale is given on why a criterion is excluded. For all the criteria that are included, we present the category and criteria it belongs to and for the related definitions we refer to table 1 and 2 of the chapter.

Table A. Overview of criteria presented by review of Guindo et al. 2012 [11]

CRITERIA CATEGORY	CRITERIA	EXCLUDED/ INCLUDED (CATEGORY/CRITERION)	RATIONALE FOR EXCLUSION
A Health outcomes and benefits of intervention	A1: Health benefit	Included (health level, effectiveness on individual level)	
	A2: Efficacy/ effectiveness	Included (health level, effectiveness on individual level and effectiveness on population level)	
	A3: Life saving	Included (health level, effectiveness on individual level)	
	A4: Safety	Included (health level, safety)	
	A5: PRO (patient reported outcomes)	Included (health level, patient reported outcomes)	
	A6: Quality of care	Included (responsiveness, patient reported quality of live)	
B Type of health benefit	B1: Population effect (prevention)	Included (health level, effectiveness on individual level and effectiveness on population level)	
	B2: Individual effect (medical service)	Included (health level, effectiveness on individual level)	
C Impact of the disease targeted by intervention	C1: Disease severity	Included (health distribution, disease severity)	
	C2: Disease determinants	Included (health distribution, all criteria)	
	C3: Disease burden	Included (responsiveness, burden of disease)	
	C4: Epidemiology	Included (responsiveness, burden of disease)	

Table A. Continued

CATEGORY	CRITERIA	EXCLUDED/ INCLUDED	RATIONALE FOR EXCLUSION
D Therapeutic context of intervention	D1: Treatment alternatives	Included (health distribution, availability alternative treatment)	
	D2: Need	Included (improved efficiency, size of target population)	
	D3: Clinical guidelines & Practices	Included (feasibility, service requirements)	
	D4: Pre-existing use	Included (feasibility, congruency previous priority setting)	
E Economic impact of intervention	E1: Cost	Included (feasibility, unit costs)	
	E2: Budget impact	Included (feasibility, budget impact)	
	E3: Broad financial impact	Included (social & financial risk protection, economic productivity and care for others)	
	E4: Poverty reduction	Included (social & financial risk protection, catastrophic health expenditure)	
	E5: Cost-effectiveness	Implicitly included (this criterion is a combination of unit costs (financing building block) and effectiveness on individual/population level (health level goal))	
	E6: Value	Included (health level, all criteria)	
	E7: Efficiency and opportunity costs	Efficiency is implicitly included (this criterion is a combination of unit costs (financing building block) and effectiveness on individual/population level (health level goal)), opportunity costs is included (feasibility, unit costs)	
	E8: Resources	Included (feasibility, all criteria)	
	E9: Insurance premiums	Excluded	This criterion is conceptually not linked to building blocks or goals.

Table A. Continued

CATEGORY	CRITERIA	EXCLUDED/ INCLUDED	RATIONALE FOR EXCLUSION
F Quality and uncertainty of evidence	F1: Evidence available	Excluded	The level of evidence can be captured in sensitivity analysis.
	F2: Strength of evidence	Excluded	The strength of evidence can be captured in sensitivity analysis.
	F3: Relevance of evidence	Excluded	Any evidence used in decision-making should be relevant and this differentiates between interventions.
	F4: Evidence characteristics	Excluded	All relevant evidence characteristics should be included in decision-making and this differentiates between interventions.
	F5: Research ethics	Excluded	This criterion is conceptually not linked to building blocks or goals.
	F6: Evidence requirements	Excluded	Evidence is required in decision making on all criteria.
G Implementation complexity of intervention	G1: Legislation	Included (feasibility, legal barriers)	
	G2: Organizational requirements and capacity to implement	Included (feasibility, service and health care workforce requirements)	
	G3: Skills	Included (feasibility, health care workforce requirements)	
	G4: Flexibility of implementation	Included (feasibility, service requirements)	
	G5: Characteristics of intervention	Included (all criteria)	
	G6: Appropriate use	Included (health level, safety)	
	G7: Barriers and acceptability	Included (feasibility, cultural, political and stakeholder acceptability)	
	G8: Integration and system efficiencies	Included (feasibility, all criteria)	
	G9: Sustainability	Included (feasibility, financing party)	

Table A. Continued

CATEGORY	CRITERIA	EXCLUDED/ INCLUDED	RATIONALE FOR EXCLUSION
H Priorities fairness and ethics	H1 Population priorities	Included (health distribution, all criteria)	This criterion is an intermediate outcome measure and is not directly related to the goals or building blocks.
	H2: Access	Excluded	
	H3: Vulnerable and needy population	Included (health distribution, all criteria)	
	H4: Equity, fairness and justice	Included (health distribution, all criteria)	
	H5: Utility	Included (all goals)	
	H6: Solidarity	Included (health distribution, all criteria)	
	H7: Ethics and moral aspects	Included (health distribution, all criteria)	
I Overall context	I1: Mission and mandate of health system	Included (all goals)	
	I2: Overall priorities	Included (feasibility, political acceptability/ all goals)	
	I3: Financial constraints	Included (feasibility, financing party)	
	I4: Incentives	Included (feasibility, stakeholder acceptability)	
	I5: Political aspects:	Included (feasibility, political acceptability)	
	I6: Historical aspects	Included (feasibility, congruency previous priority setting)	
	I7: Cultural aspects	Included (feasibility, cultural acceptability)	
	I8: Innovation	Included (medical products, vaccine and technology requirements)	
	I9: Partnership and leadership	Included (feasibility, political acceptability)	
	I10: Citizen involvement	Included (feasibility, stakeholder acceptability)	
	I11: Stakeholders interests and pressures	Included (feasibility, stakeholder acceptability)	

Table B. Criteria included in EVIDEM framework (www.evidem.org)

CATEGORY	SAMPLE CRITERIA	INCLUSION / EXCLUSION / REPRESENTED BY OTHER CRITERIA	RATIONALE FOR EXCLUSION
Disease-related criteria	Disease severity	Included (health distribution, disease severity)	
	Poor capacity to benefit from treatment	Included (health distribution, disease severity)	
	Rare diseases	Included (social & financial risk protection, rare diseases)	
Criteria related to characteristics of social groups	Equality among the members of distinct groups in relation to a normative standard of equal lifetime health.	Included (health distribution, all criteria)	
Criteria related to protection against the financial and social effects of ill health	Economic productivity	Included (social & financial risk protection, economic productivity and care for others)	
	Catastrophic health expenditures	Included (social & financial risk protection, catastrophic health expenditures)	
	Impact on dependents	Included (social & financial risk protection, economic productivity and care for others)	
Other	Personal responsibility for health	Included (health distribution, responsibility for health)	
	Discounting	Excluded	This is presented in Johri & Norheim in reaction to cost-effectiveness analysis. This criterion is conceptually not linked to building blocks or goals.

Table C. Criteria for equity presented by Johri & Norheim 2012 [4]

CATEGORIES		CRITERIA (overlap with criteria from Guindo review presented in table 1)
MCDA model criteria (intrinsic criteria, universally operationalizable)	Disease impact	D1 - Disease severity → C1 in Table 1 D2 - Size of population → D4
	Context of intervention	C1 - Clinical guidelines → D3 C2 - Comparative interventions limitations (unmet needs) → D2
	Intervention outcomes	I1 - Improvement of efficacy/ effectiveness → A2 I2 - Improvement of safety & tolerability → A4 I3 - Improvement of patient reported outcomes → A5
	Type of benefit	T1 - Public health interest (e.g., prevention, risk reduction) → B1 T2 - Type of medical service (e.g., cure, symptom relief) → B2
	Economics	E1 - Budget impact on health plan (cost of intervention) → E2 E2 - Cost-effectiveness of intervention (optional) → E5 E3 - Impact on other spending (e.g., hospitalization, disability) → E3
	Quality of evidence	Q1 - Adherence to requirements of decisionmaking body → F6 Q2 - Completeness and consistency of reporting evidence → F2 Q3 - Relevance and validity of evidence → F2
	Ethical framework	Et1 - Utility - Goals of healthcare → H5 Et2 - Efficiency - Opportunity costs → E7 Et3 - Fairness - Population priority & access → H4
	Contextual criteria	O1 - System capacity & appropriate use of intervention → G2 O2 - Stakeholder pressures → I11 O3 - Political/historical context → I5/I6

Note: In the last column we show the overlap between the criteria from *evidem.org* and Guindo et al (presented in table 1)

Table D. Criteria presented by Golan et al 2010 [13]

PRINCIPLE OF ALLOCATIVE JUSTICE	CRITERIA	INCLUSION / EXCLUSION / REPRESENTED BY OTHER CRITERIA	RATIONALE FOR EXCLUSION
Need	General	Included (responsiveness, burden of disease)	
	Severity of the condition	Inclusion (health distribution, severity of disease)	
	Availability of alternatives	Inclusion (health distribution, availability alternative treatment)	
Appropriateness	Efficacy and safety	Included (health level, effectiveness on individual level, effectiveness on population level, safety)	
	Effectiveness	Included (health level, effectiveness on individual level)	
Clinical benefits	General	Included (health level, effectiveness on individual level)	
	Effect on mortality (life-saving)	Included (health level, effectiveness on individual level)	
	Effect on longevity	Included (health level, effectiveness on individual level)	
	Effect on health-related-quality-of-life	Included (health level, effectiveness on individual level)	
Efficiency	Cost-effectiveness/benefit	Implicitly included (this criterion is a combination of unit costs (financing building block) and effectiveness on individual/population level (health level goal))	
	Budgetary impact	Included (feasibility, budget impact)	
	Cost	Included (feasibility, unit costs)	
Equality	General	Included (health distribution, all criteria)	
	Accessibility to the service	Excluded	This criterion is an intermediate outcome measure and therefore indirectly related to the goals and building blocks of our map.

Table D. Continued

PRINCIPLE OF ALLOCATIVE JUSTICE	CRITERIA	INCLUSION / EXCLUSION / REPRESENTED BY OTHER CRITERIA	RATIONALE FOR EXCLUSION
Solidarity Other ethical or social values	Affordability to the individual	Included (health distribution, socio economic status/social and financial risk protection, catastrophic health expenditure)	The quality of the clinical and economic evidence can be captured in sensitivity analysis.
	-		
	Autonomy	Included (responsiveness, patient perceived quality of care)	
	Public health value	Included (all goals)	
Quality of the clinical and economic evidence	Impact on future generations	Included (health level, effectiveness on population level)	
	-	Excluded	
Other considerations not elsewhere classified	Strategic issues consistency with previous decisions and precedents	Inclusion (feasibility, congruency previous priority setting)	

Table E. Criteria presented by Devlin & Sussex 2010 [8] (additional to Golan et al. 2010 [13])

NICE (ENGLAND) – FACTORS TAKEN INTO ACCOUNT IN JUDGEMENTS ABOUT COST EFFECTIVENESS		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Severity of underlying illness	Included (health distribution, severity of disease)	
End of life treatments	Included (health distribution, severity of disease)	
Stakeholder persuasion	Included (feasibility, stakeholder acceptability)	
Significant innovation	Included (feasibility, medical products, vaccines and technology requirements)	
Disadvantaged populations	Included (health distribution, all criteria)	
Children	Included (health distribution, age)	
AGNSS 2010 (ADVISORY GROUP FOR NATIONAL SPECIALISED SERVICE, ENGLAND) 2010		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Health gain		
Severity and ability of patients to benefit	Included (health distribution, severity of disease)	
Clinical safety and risk	Included (health level, safety)	
Clinical effectiveness and potential for improving health	Included (health level, effectiveness on individual level)	
Societal value		
Stimulating research and innovation	Included (feasibility, medical products, vaccines and technology requirements)	
Needs of patients and society	Included (health distribution, severity of disease)	
Reasonable cost		
Average cost per client	Included (feasibility, unit costs)	
Overall cost impact and affordability including opportunity cost	Included (feasibility, budget impact / social & financial risk protection, catastrophic health expenditure)	
Value for money compared to alternatives	Implicitly included (this criterion is a combination of unit costs (financing building block) and effectiveness on individual/population level (health level goal))	
Best practice		
Best clinical practice in delivering the service	Included (health level, effectiveness on individual level)	

Table E. Continued

AGNSS 2010 (ADVISORY GROUP FOR NATIONAL SPECIALISED SERVICE, ENGLAND) 2010		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Economic efficiency of provision	Implicitly included (this criterion is a combination of unit costs (financing building block) and effectiveness on individual/population level (health level goal))	
Continuity of provision	Included (feasibility, financing party)	
Accessibility and balanced geographic distribution	Accessibility is excluded, balanced geographic distribution is included (health distribution, area of living)	
HUNTINGDONSHIRE PRIMARY CARE TRUST (SUB-NATIONAL NHS COMMISSIONING, USED MCDA ON PRIORITIZATION OF THEIR SPENDING) (BOX 5.1)		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Effectiveness (QALYs)	Included (health level, effectiveness on individual level)	
Burden of disease	Included (responsiveness, burden of disease)	
Equity/fairness between social groups	Included (health distribution, all criteria)	
Deliverability and speed of implementation	Included (feasibility, all criteria)	
Engagement of public and professionals in demand management	Included (feasibility, health care workforce requirements)	
Acceptability to public and professions	Included (feasibility, cultural and stakeholder acceptability)	
Certainty/quality of evidence	Excluded	The certainty/quality of evidence can be captured in sensitivity analysis.
Fit with national standards/targets	Included (feasibility, political acceptability)	
ISLE OF WIGHT PRIMARY CARE TRUST (MCDA FOR COMMISSIONING STRATEGY 2008-2013) (BOX 5.2)		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Health benefit (= QALYs)	Inclusion (health level, effectiveness on individual level)	
Health inequalities between geographical areas, sexes, 'special groups'	Inclusion (health distribution, all criteria)	
Probability of success, comprising: ease of implementation, availability of workforce, acceptability to stakeholders, process complexity (number of steps needed)	Included (feasibility, all criteria)	

Table E. Continued

"HEALTH AUTHORITY D" PRIORITISING DEVELOPMENTS FOR USE OF ADDITIONAL FUNDING OVER THE NEXT FIVE YEARS USING SEVEN CRITERIA. (NHS SUB COMMISSION)		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Evidence of effectiveness	Excluded	The evidence of effectiveness may be used to conduct a sensitivity analysis.
Value for money	Implicitly included (this criterion is a combination of unit costs (financing building block) and effectiveness on individual/population level (health level goal))	
Health gain or maintenance	Included (health level, effectiveness on individual level and effectiveness on population level)	
Equity	Included (health distribution, all criteria)	
Risk management	Excluded	
National or Board priority	Included (health distribution, political acceptability)	
Public preference	Included (feasibility, stakeholder acceptability)	
ARGYLL AND CLYDE HEALTH BOARD IN SCOTLAND		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Potential health gain	Included (health level, effectiveness on individual level/ effectiveness on population level)	The strength of evidence can be captured in sensitivity analysis.
Prevention of ill health	Included (health level, effectiveness on individual level/ effectiveness on population level)	
Quality of life	Included (health distribution, severity of disease)	
Equity of access	Included (health distribution, all criteria)	
Addressing health status inequalities at population level	Included (health distribution, all criteria)	
Expressed demand	Included (feasibility, stakeholder acceptability)	
Appropriateness	Included (responsiveness, patient perceived quality of care)	
Strength of evidence	Excluded	
Known priorities	Included (feasibility, congruency previous priority setting)	

Table E. Continued

DEPARTMENT OF HEALTH - STRATEGIC OUTLINE CASE FOR EPSOM GENERAL HOSPITAL REDEVELOPMENT SCHEME (BOX 5.3)		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Patient safety	Included (health level, safety)	
Meet quality standards	Included (health level, safety)	
Performance + outcomes	Excluded	This criterion is not related to one specific goal or building blocks. In a decision making process the performance and outcomes on all relevant criteria should be taken into account.
Long term clinical and financial stability	Included (feasibility, financing party)	
Productivity and efficiency of care services	Productivity is included (feasibility, service requirements) and efficiency is implicitly included (this criterion is a combination of unit costs (financing building block) and effectiveness on individual/population level (health level goal))	
Patient focus	Included (responsiveness, patient perceived quality of care)	
Scope for modernization and innovation	Included (feasibility, medical products, vaccines and technology requirements)	
Achievability	Included (feasibility, all criteria)	
Strategic fit	Included (feasibility, political acceptability)	
Co-location of services	Included (feasibility, service requirement)	
Fits with "Centres of Clinical Excellence"	Included (feasibility, leadership)	
Fit with organizational cultures	Included (feasibility, leadership)	
Stakeholder' expectations	Included (feasibility, stakeholder acceptability)	
Utilisation of estate	Included (feasibility, legal barriers)	
DEPARTMENT OF HEALTH - OUTLINE BUSINESS CASE FOR THE ROYAL NATIONAL ORTHOPAEDIC HOSPITAL, STANMORE, REDEVELOPMENT SCHEME (BOX 5.4)		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Centre of excellence	Included (feasibility, leadership)	
Quality of clinical care	Included (responsiveness, patients perceived quality of care)	
Patient centered	Included (responsiveness, patients perceived quality of care)	

Table E. Continued

DEPARTMENT OF HEALTH - OUTLINE BUSINESS CASE FOR THE ROYAL NATIONAL ORTHOPAEDIC HOSPITAL, STANMORE, REDEVELOPMENT SCHEME (BOX 5.4)		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Access	Excluded	This criterion is an intermediate outcome measure and is not directly related to the goals or building blocks.
Elective capacity	Included (feasibility, political acceptability)	
Workforce recruitment and retention	Included (feasibility, health care workforce requirements)	
Suitable for working with partners	Included (feasibility, service requirements)	
Deliverability/achievability	Included (feasibility, all criteria)	
Design, sustainability and quality of life	Design is included (feasibility, all criteria), sustainability is included (feasibility, financing party), quality of life is included (health distribution, severity of disease)	
What impact does the patient's condition have on their QoL	Included (health distribution, severity of disease)	
To what extent is the patient's condition able to be ameliorated by treatment?	Included (health level, effectiveness on individual level)	
ISRAEL'S HEALTH BASKET COMMITTEE: PILOT (BOX 5.8)		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Indicators:		
Lives saved, Life prolongation, Quality of life benefits	Included (health level, effectiveness on individual level)	
Availability of alternative treatments	Included (health distribution, availability alternative treatment)	
Other ethical/social benefits (e.g. reduces health gaps).	Included (health distribution, all criteria)	
Criteria:		
A. Benefits	Included (all goals)	
B. Net costs	Included (feasibility, unit costs)	
C. Quality of Evidence	Excluded	The quality of evidence may be used to conduct a sensitivity analysis.
D. Other considerations	Included (all goals)	
Also presented on this case:		
pCIEff - Probability that the new technology is clinically effective	Excluded	The probability that the new technology is clinically effective may be used to conduct a sensitivity analysis.

Table E. Continued

ISRAEL'S HEALTH BASKET COMMITTEE: PILOT (BOX 5.8)		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
pCostEf 20k - Probability that the new technology is cost-effective relative to the comparator at a willingness to pay of < 20k per QALY gained	Excluded	The probability that the new technology is cost-effective relative to the comparator at a willingness to pay of < 20k per QALY gained may be used to conduct a sensitivity analysis.
Acceptability/Appropriateness/ Preferences (of public and patients)	Included (feasibility, stakeholders acceptability)	
Terminality - End of life use	Included (health distribution, severity of disease)	
Orph/no alt/rescue - The new technology is an 'orphan drug' or it has no alternatives besides best supportive case, or it is used in a 'rule of rescue' situation.	Included (financial and social risk protection, rare diseases)	
OtherEq - Other equity considerations	Included (health distribution, all criteria)	
DH priorities - Clinical priority areas as designed by Secretary of State for Health and Welsh Assembly Government	Included (feasibility, leadership)	
Health System (HS) feasibility/ impact (no additional definition provided)	Included (feasibility, all criteria)	
Innovativeness - (no additional definition provided)	Included (feasibility, medical products, vaccines and technology requirements)	
Wider Societal Considerations (no additional definition provided)	Included (social and financial risk protection/ economic productivity and care for others)	

FIGURE 7.1 A TEMPLATE FOR EXPLICIT AND TRANSPARENT CONSIDERATION OF SOCIAL VALUE JUDGEMENTS IN NICE'S DELIBERATIVE PROCESS

Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
End of life	Included (health distribution, severity of disease)	
Severity	Included (health distribution, severity of disease)	
Children	Included (health distribution, age)	
Social disadvantage	Included (health distribution, all criteria)	
Small patient numbers	Included (social & financial risk protection, rare diseases)	

Table E. Continued

FIGURE 7.1 A TEMPLATE FOR EXPLICIT AND TRANSPARENT CONSIDERATION OF SOCIAL VALUE JUDGEMENTS IN NICE’S DELIBERATIVE PROCESS		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Lack of alternative treatments	Included (health distribution, availability of alternative treatment)	
Aspects of innovation not taken into account the ICER	Innovation (feasibility, medical products, vaccines and technology requirements)	
TABLE 7.2 ATTRIBUTES (CRITERIA) AND LEVELS (THE WAY THAT CRITERIA ARE MEASURED) INCLUDED IN A DISCRETE CHOICE EXPERIMENT WITH NICE APPRAISAL COMMITTEE MEMBER		
Criteria	Inclusion/exclusion/represented by other criteria	Rationale for exclusion
Incremental cost-effectiveness analysis	Implicitly included (this criterion is a combination of unit costs (financing building block) and effectiveness on individual/population level (health level goal))	
Uncertainty	Excluded	The uncertainty of evidence can be captured in sensitivity analysis.
Age	Included (health distribution, age)	
Baseline HR-QoL	Included (health distribution, severity of disease)	
Availability of other therapies	Included (health distribution, availability alternative treatment)	

Table F. Criteria (claims) presented by Cleary et al. 2010 [12] for considering to whom good should be distributed

CRITERIA	INCLUSION / EXCLUSION / REPRESENTED BY OTHER CRITERIA	RATIONALE FOR EXCLUSION
Claim based on need as illness	Included (health distribution, all criteria)	
Claim based on need as capacity to benefit	Included (health distribution, severity of disease)	
Claim based on morally arbitrary bad luck	Included (health distribution, responsibility for health)	
Claim based on deprivation or disadvantage	Included (health distribution, all criteria)	
Claim based on extent to which someone is responsible for her HIV status	Included (health distribution, responsibility for health)	
Claim based on the impact of treatment on social fabric	Included (social & financial risk protection, economic productivity and care for others)	
Claim based on net impact on the health of society	Included (health level, effectiveness on population level)	

- Sub-question 2
Which criteria are important
for priority setting in
HIV/AIDS control?

CHAPTER 4

Stakeholders' views on the importance of multiple criteria for priority setting in HIV/AIDS control in Indonesia

Submitted as:

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Stakeholders' views on the importance of multiple criteria for priority setting in HIV/AIDS control in Indonesia.

Abstract

Background: Indonesia faces an urgent need to prioritized interventions for HIV/AIDS control as resources are far below needed to effectively respond to the epidemic. In priority setting processes many considerations (also called criteria), like an intervention's impact on health and equity and its feasibility, play a role. However, until now criteria have not been explicitly used for selection of HIV/AIDS interventions in Indonesia. This study identifies the views of various stakeholders on the importance of different criteria for priority setting of HIV/AIDS interventions in Indonesia.

Methods: Based on a literature search and a focus group discussion with stakeholders (n=6) a list was developed of 32 criteria that may play a role in priority setting in HIV/AIDS control in West-Java province. Criteria were categorized according the World Health Organization's health system goals and building block frameworks. People living with HIV/AIDS (PLWHA) (n=49), health care workers (HCW) (n=41), the general population (n=43) and policy makers (n=22) rated the importance of all 32 criteria for priority setting on a 5 point Likert-scale. Thereafter, respondents ranked the highest rated criteria to express more detailed preferences.

Results: Based on the average ranking scores, all stakeholders perceived an intervention's impact on the epidemic as the most important criterion for priority setting. In addition, an intervention's impact on stigma in society, its quality of care and its feasibility related to the health system infrastructure (i.e. health care workers, service and information requirements) were considered highly important. Most criteria related to equity (i.e. prioritizing groups on the basis of their gender, SES and age) were considered least important.

Conclusions: This study identified that an intervention's impact on the epidemic, its impact on stigma in society, its quality of care and its requirements related the health system were perceived most important criteria among stakeholders for priority setting in HIV/AIDS control. This information may contribute to more transparent and systematic decision making in HIV/AIDS control in Indonesia.

Background

In Indonesia, priority-setting questions have arisen in the context of HIV/AIDS control as it faces one of Asia's fastest growing HIV/AIDS epidemics and resources are scarce. In 2013, an estimated 640 thousand people were living with HIV/AIDS (PLWHA) and this number will increase to 1,500,000 in 2020 if not the right actions are taken [1,2]. While the government seems to have the epidemic under control among people who inject drugs (PWID), the prevalence is increasing among female sex workers (FSW) and their clients, men having sex with men (MSM) and the general population. The budget for HIV/AIDS control is far from sufficient; in 2010 only US\$ 69 million was spend on HIV/AIDS while US\$ 152 million was estimated to be needed [3,4].

Both issues urge for a wisely choice between HIV/AIDS interventions. An evaluation at Bandung city and West-Java province level showed that priority setting in HIV/AIDS control in Indonesia could be improved. At this moment the strategic plans developed by the AIDS commissions include a long list interventions and although many stakeholders (e.g. government staff, communities and health care workers) are involved in the priority setting process their participation could be improved. Various criteria played a role in the development of the HIV/AIDS strategic plans but they remained implicit. Systematic analysis of how important different stakeholders find various criteria could contribute to more systematic and transparent priority setting but has not yet been done. [5].

Most methods introduced to guide resource allocation decisions in health (i.e. evidence-based medicine, cost-effectiveness analysis, burden of disease and equity analysis [6,7], rely on one single criteria (mostly cost and cost-effectiveness), while in reality many criteria can play a role (e.g. feasibility, equity, cultural and political factors) [8–15]. Therefore, multi criteria decision analysis (MCDA) is put forward as one of the most important methods for priority setting and provides a systematic process for clarifying what is being taken into account (the 'criteria') and how much importance ('weight') to put on each [14]. It has been successful in various case studies, e.g. in Ghana MCDA guided the Ministry of Health in prioritizing national health care interventions, in Nepal it showed that a lung health intervention should be a priority (ranking 13th out of 34 interventions), and in Thailand it guided decisions in HIV/AIDS control [16–31]. Multi criteria decision analysis contributed to transparent and accountable policy making and seems a step forward in rational decision-making. In HIV/AIDS field, the recognition of multiple criteria has risen and is reflected in the WHO programmatic guidance for ART that recommends taking besides health impact also equity and feasibility criteria into consideration [32]. However, only a few studies have tried to measure explicitly the importance of multiple criteria for HIV/AIDS priority setting [33,34] and worldwide the main focus remains on how to reduce new infections and AIDS related death [35,36].

Recently, a few empirical priority setting studies have included the identification and weighting of the views of different stakeholders, such as patients and the general population

besides those of policy makers. [7,37,38] Inclusion of different perspectives in priority setting is important to enhance the legitimacy of the process, as has been acknowledged in the Accountability for Reasonableness framework [39].

This study aims to elicit the views of multiple Indonesian stakeholders on the importance of various criteria for priority setting in HIV/AIDS control. This information may be used to support Indonesian policy makers in resource allocation decisions related to HIV/AIDS control.

Methods

Methods for MCDA - Identification of criteria

In MCDA, criteria can be identified by various approaches, e.g. a literature study, focus groups discussion with relevant stakeholders or using more structured approaches such as Q methodology [40] that combines qualitative and quantitative analyses [14].

In our study, we started with a draft general list of criteria, that is based on the World Health Organization's health system goals and building block frameworks and is published elsewhere [41]. We argue that the reasons why stakeholders prioritize certain health interventions is reflected in these two frameworks and that it can be used to categorize criteria. The health system goals framework contains criteria related to five criteria categories: improvement of the level and distribution of health, responsiveness, social & financial risk protection and improved efficiency. The second framework, the health system building blocks, reflects criteria related to the feasibility of criteria and comprises of six categories, i.e. service delivery, health workforce, information, medical products vaccines & technology, financing and leadership/governance [42]. We adapted the draft general list of criteria of criteria to the West-Java HIV/AIDS context based on HIV/AIDS priority setting literature [8–12,14,15] and a focus group discussion with a lay person, public health expert, health care worker, economists, psychologist and anthropologist working in the HIV/AIDS field in Indonesia. Criteria definitions and overlap were discussed. In the end thirty-two criteria remained and their definitions and categorization are presented in Table 1. Among others, specific HIV/AIDS criteria that were added were 'prevention versus treatment', 'HIV risk of target population', 'reduction of stigma in society' and 'marital status' as unmarried people in Indonesia might be more vulnerable as they have less access to reproductive health services.

Methods for MCDA – Assessing the importance of criteria

The importance (also called weights) of criteria can be identified by well-established economic methods like discrete choice experiments and conjoint analysis to uncover participants' preferences about the importance of the various attributes (criteria) through their choices. Discrete choice experiments have been applied in several MCDA studies but have been criticized for being too technocratic and not being able to include more than six to eight criteria [43].

Simpler and limited applied methods are rating and scaling of criteria and its feasibility for MCDA will therefore be explored in this study.

Table 1. Selected criteria and their definitions for HIV/AIDS priority setting in Indonesia, categorized according to WHO health systems frameworks

CATEGORY	CRITERIA	DEFINITION
Health system goals		
Health impact	Individual effectiveness	Interventions that have effect on a person's individual health status, for example prevention of a person becoming HIV infected or the extension of life of HIV/AIDS patients, may deserve priority
	Safety	Interventions that have no side effects in terms of health may deserve priority
	Reducing spread of HIV	Interventions that have high impact on the spread of the HIV epidemic may deserve priority
	Prevention or treatment	Either interventions that prevent new HIV infections or focus on treatment of HIV/AIDS patients may deserve priority
Health distribution	Income class	Interventions that target people with certain income classes may deserve priority
	Area of living	Interventions that target people in certain areas of living may deserve priority (for example underserved areas where people have less access to care and education and live in poor living circumstances)
	Sex and gender	Interventions that target people with certain sex or gender (i.e. men or women) may deserve priority
	Religion	Interventions that target certain religious groups may deserve priority
	Marital status	Interventions that target people with certain marital status may deserve priority
	Age	Interventions that target people with certain age may deserve priority
	Stigmatized groups	Interventions that target people that are stigmatized may deserve priority
	Sexual orientation	Interventions that target people with certain sexual orientation may deserve priority
	Responsible or bad luck	Interventions that target people who have bad luck and may not be responsible for their HIV infection may deserve priority
	Severity of disease	Interventions that target people that are severely ill (e.g. AIDS patients) may deserve priority
	Level of at risk for HIV infection	Interventions that target people at high risk for HIV infection may deserve priority
	People who are easy to reach	Interventions that target people that are easy to reach (e.g. partners of HIV+ people, prisoners) may deserve priority

Table 1. Continued

CATEGORY	CRITERIA	DEFINITION
Health system goals		
Responsiveness	Quality of care	Interventions that provide good quality of care (are responsive to people's expectations in regard to non-health matters and reflect the importance of people's dignity, autonomy and the confidentiality of information) may deserve priority
	Stigma reduction in society	Interventions that reduce stigma in society may deserve priority
Social & financial protection	Economic impact	People who are economically productive and/or take care of others and become ill, face income loss and health related costs, which could lead to poverty. Interventions that target those people may deserve priority
Health system building blocks / Feasibility		
Service delivery	Service requirements	Interventions that are easy to implement because of the current service capacity may have priority. E.g. availability of service infrastructure, delivery models, safety & quality, management.
Health workforce	Health care personnel requirements	Interventions that are easy to implement because of the current health care workforce capacity may have priority. E.g. availability workforce and workforce policies, preferences of workforce for working conditions
Information	Information system requirements	Interventions that are easy to implement because of the current information system capacity may have priority. E.g. availability of surveillance systems
Medical products, vaccines & technologies	Medical products and technology requirements	Interventions that are easy to implement because of the current available medical products, vaccines & technology may have priority. E.g. norms, standards and reliability procurement
Financing	In line with previous spending pattern	Interventions that received funding last year may have priority
	Unit costs	Interventions that have small unit cost per patient may have priority
	Budget impact	Interventions that consume a small part of the budget may have priority
	Sustainability	Interventions that receive sustainable financing may have priority
Leadership/ governance	Political acceptability	Interventions that are political acceptable may have priority
	Donor acceptability	Interventions that are in line with requirements of donors may have priority
	Cultural acceptability	Interventions that are cultural acceptable, because of the norms and values, may have priority
	Religious acceptability	Interventions that are accepted by certain religions may have priority
	Legal regulations	Interventions that face no legal barriers may have priority

Study setting

Our study was embedded in the IMPACT project, a five-year (2006-2011) EU funded project, that aimed to respond to the HIV/AIDS problems in Bandung city and West Java province. West Java province is one of the worse hit provinces in Indonesia with an estimated number of people living with HIV/AIDS of 59 thousand in 2013 [44]. The project has set up HIV/AIDS services in hospitals, community and society and conducts scientific clinical, epidemiology and economic research and has build up strong links with government institutes and civil society. Bandung is the centre for HIV/AIDS control as it houses West Java's top governmental referral hospital (Rumah Sakit Hasan Sadikin) with a HIV/AIDS clinic (clinic Teratai) treating over 1000 patients per year. West-Java has established a range of HIV/AIDS activities, i.e. harm reduction interventions for PWID, including methadone maintenance treatment clinics in six cities, voluntary counselling and testing and ARV treatment at hospital and community clinics including outreach activities, and school-based education on sexual- and drug-related risk behaviour. The West Java AIDS commission consisting of representatives of various government offices, NGOs and health care facilities, coordinates these activities.

Data collection

Our questionnaire consisted of five parts. In part A we asked the general characteristics of the respondent, in part B we presented and explained all thirty-two criteria for HIV/AIDS priority setting and asked the respondent to compare them simultaneously and to rate the importance of each criteria on a five point Likert scale, where 1 = 'not important at all', 2 = 'important', 3 = 'indifferent', 4 = 'important' and 5 = 'very important'. For some criteria we asked an additional question to find out the preference for the level of a criteria, e.g. whether the respondent has a preference for prevention over treatment, or men over women for the gender criterion. In part C, the respondent was asked to rank the ten most important criteria, based on the highest scores on the Likert-scale. If less than ten criteria scored five on the Likert-scale, additional criteria were selected that scored four to include ten criteria for the ranking exercise. In part D, the respondents were asked to compare simultaneously eight interventions that each targets only one specific risk groups and to rate the importance on a five point Likert-scale (similar as the scale in Part B). In part E, the respondent could mention any additional criteria for HIV/AIDS priority setting that were missing in the questionnaire. At the start, the interviewer asked the respondent for informed consent and explained the topic of priority setting and handed over a souvenir afterwards. The questionnaire was translated in Indonesian language and Indonesian researchers (RP, AS) tested the face-validity. Four economic bachelor students who received an incentive per interview conducted the interviews and were trained in several sessions to make them familiar with the topic of priority setting and the questionnaire. Thereafter, the questionnaire was piloted tested several times among fifteen respondents to find optimal phrasing of the questions. The duration of the interviews was on average thirty minutes. Data was collected during five months (12 May - 13 October 2011).

Table 2. General characteristics of respondents per stakeholder group

	STAKEHOLDER GROUPS							
	Policy makers (n=22)		People living with HIV/AIDS (n=49)		Health care workers (n=41)		General population (n=43)	
Age, mean years (SD)	38.5	(13.3)	31.6	(4.1)	37.3	(11.0)	26.5	(9.9) (9.9)
Gender								
Male	14	(63.6%)	36	(73.5%)	14	(34.1%)	21	(48.8%)
Female	8	(36.4%)	13	(26.5%)	27	(65.9%)	22	(51.2%)
Marital status								
Not married	6	(27.3%)	22	(44.9%)	14	(34.1%)	31	(72.1%)
Married	15	(68.2%)	26	(53.1%)	27	(65.9%)	12	(27.9%)
Divorced	1	(4.5%)	-		-		-	
Widow	-		-		-		-	
Education								
No education	-		1	(2,0%)	-		-	
Elementary school	-		2	(4,1%)	-		3	(7,0%)
Junior high school	1	(4,5%)	2	(4,1%)	-		3	(7,0%)
Senior high school	4	(18,2%)	24	(49,0%)	3	(7,3%)	24	(55,8%)
College	4	(18,2%)	8	(16,3%)	17	(41,5%)	1	(2,3%)
University	13	(59,1%)	12	(24,5%)	21	(51,2%)	12	(28,0%)
Religion								
Islam	21	(95.5%)	45	(91.8%)	37	(90.2%)	39	(90.7%)
Christen	1	(4.5%)	4	(8.2%)	2	(4.9%)	3	(7.0%)
Catholic	-		-		2	(4.9%)	-	
Hindu	-		-		-		1	(2.3%)
Buddhism	-		-		-		-	
No religion	-		-		-		-	
Occupation								
Government officer	9	(40,9%)	3	(6.1%)	-		5	(11.6%)
Private company employee	-	(9,1%)	9	(18,4%)	-		11	(25.6%)
Health care worker								
Doctor	2	(29.3%)	-		12	(29.3%)	-	
Nurse	-	(43.9%)	-		18	(43.9%)	-	
Case manager/admin	-	(7.3%)	-		3	(7.3%)	-	
Pharmacist/analyst	-	(14.6%)	-		6	(14.6%)	-	
Entrepreneur/freelancer	2	(9,1%)	18	(36,7%)	-		2	(4.7%)
Student	2	(9,1%)	1	(2,0%)	-		19	(44.2%)
Housewife	-		6	(12,2%)	-		4	(9.3%)
NGO/social worker	5	(22,7%)	8	(16,3%)	2	(4.9%)	-	
Other	1	(4,5%)	-		-		-	
Unemployed	1	(4,5%)	4	(8,2%)	-		2	(4.7%)

Table 2. Continued

	STAKEHOLDER GROUPS							
	Policy makers (n=22)		People living with HIV/AIDS (n=49)		Health care workers (n=41)		General population (n=43)	
Income (monthly in million IDR (US\$)\$)								
0-0.5 (0- 57.9)	2	(9,1%)	7	(14,3%)	-		25	(58,1%)
0.5-1.0 (57.9-115.7)	-		10	(20,4%)	2	(4,9%)	3	(7,0%)
1.0-2.0 (115.7-231.4)	2	(9,1%)	12	(24,5%)	9	(22,0%)	8	(18,6%)
2.0-3.0 (231.4-347.1)	4	(18,2%)	7	(14,3%)	6	(14,6%)	2	(4,7%)
3.0-4.0 (347.1-462.9)	2	(9,1%)	2	(4,1%)	12	(29,3%)	1	(2,3%)
4.0-5.0 (462.9-578.6)	-		1	(2,0%)	5	(12,2%)	2	(4,7%)
5.0-7.0 (578.6-809.0)	6	(27,3%)	3	(6,1%)	3	(7,3%)	1	(2,3%)
> 7.0 (>809.0)	4	(18,2%)	3	(6,1%)	3	(7,3%)	1	(2,3%)
missing	2	(9,1%)	4	(8,2%)	1	(2,4%)	-	

\$Average exchange rate period May-October 2011: 1US\$ = 8642 Rp

Participants

We included four stakeholder groups in our study, i.e. policy makers, health care workers, people living with HIV/AIDS (PLWHA), and the general population, on the basis of the importance of their view in decision making. The policy makers (n = 22) were all involved in HIV/AIDS strategic planning and included representatives of the AIDS commissions, health office and government planning board (BAPPEDA), either at Bandung city or West-Java province level. The health care workers (n = 41) were all working with HIV/AIDS patients at in- and out-patients wards of Hasan Sadikin hospital in Bandung city (described above) and the PLWHA (n = 49) were all visitors of the outpatient Teratai clinic. The sample for the general population (n = 43) consisted of persons visiting the Sunday Market in Bandung city, a weekly market visited by diverse citizens of Bandung. General characteristics of each group are presented in table 2.

Data analysis

All data was entered in Excel Microsoft Office 2010 and average Likert-scores and standard deviations were calculated in SPSS for the importance rating of 32 criteria (part B) and the importance of prioritizing certain risk groups (part D). For the analysis of the ranking exercises, a criterion received 10 points when ranked in first place, nine in second place, etcetera, and zero points when ranked below the 10th place. Average ranking scores and standard deviations were calculated for each criterion. For part D, de reasons for prioritizing a risk group were entered in Excel and the frequency was counted accordingly.

Results

Likert-scale scores

Table 3 (page 88) shows the importance of 32 criteria based on the mean Likert-scale scores per stakeholder group. Policy makers expressed a preference for interventions that are effective in improving health on individual level while health care workers, PLWHA and the general population valued reduction in spread of HIV in society as most important criterion. All stakeholder groups valued feasibility criteria related to the current capacity of the health system (i.e. health care workers and service requirements) and stigma reduction in society as highly important and criteria related to health distribution (i.e. equity and prioritization for certain groups in society) as least important. In general the views of stakeholders overlapped as in the top ten criteria seven are similar.

Ranking scores

Table 4 (page 90) presents per stakeholder group the importance of 32 criteria based on the ranking scores. All stakeholders considered reduction of spread of HIV as the most important criteria to prioritize an intervention. While looking at the top 10 criteria all stakeholder groups perceived an intervention's impact on stigma reduction in society, its quality of care and its additional requirements related to Indonesia's health system capacity (i.e. service requirements, health care workers requirement and information requirements). In addition to these criteria, policy makers also perceived political and legal acceptability highly important and the individual effectiveness in terms of health gain of an intervention. While the availability of sustainable funding was considered highly important, the budget impact of an intervention was the least important criteria for policy makers. People living with HIV/AIDS also considered the unit costs of intervention important and whether it was a prevention or treatment. The majority (40 out of 43 PLWHA that valued this criterion important) gave a preference for prevention over treatment interventions. The health care workers found it important that an intervention targets people at high risk of HIV infection and gave preference for prevention over treatment interventions. The general population also gave preference for prevention over treatment and considered an intervention's individual effectiveness, its unit costs and the level of risk for HIV infection of the target important. All stakeholder groups gave least priority to the majority of equity criteria meaning that they find it less important that interventions give priority to certain groups on the basis of their gender, age or socio-economic status.

Preferences for certain risk groups

Table 5 (page 92) shows the preference among stakeholders for a risk group that a HIV/AIDS intervention targets. Policy makers, PLWHA and health care workers find it most important to target injecting drug users while the general population gives most priority to female sex workers. Policy makers prefer to give least priority for transgender and the other three stakeholders for people at low risk for HIV infection. The following five reasons were mostly given

for their choices: 1) level of at risk for HIV, 2) importance in spread of HIV epidemic, 3) size of population (infected), 4) equity considerations (a target group's current access to HIV interventions, socio economic status and responsibility for HIV infection) and 5) experienced feasibility/effectiveness of existing interventions, for example whether a group is already effectively targeted. An overview of the reasons given by the stakeholders to prioritize certain risk groups is given in Table 6 (page 92) .

Additional criteria

Twelve health care workers, eleven PLWHA and four persons from the general population mentioned additional criteria for HIV/AIDS priority setting. However, most were criteria already captured in our questionnaire, examples of interventions or irrational criteria for priority setting. One valid criterion mentioned was the human resources capacity within government institutions, and relates to the governance and leadership category of the feasibility criteria.

Discussion

This study has identified criteria for priority setting of HIV/AIDS interventions in Indonesia using perspectives of policy makers, PLWHA, health care workers and the general population. Overall all stakeholders found it most important that interventions have impact on the HIV epidemic, are feasible in terms of Indonesia's health system capacity, provide good quality of care and reduce HIV related stigma in society. Most criteria related to equity (i.e. whether interventions give priority to groups on the basis of for example their gender, SES or age) were considered least important for choosing between HIV/AIDS interventions.

The perceived importance of an intervention's impact on the epidemic can be explained by Indonesia's epidemic, which is still one of the fastest growing in Asia [45]. It is also in line with the worldwide preference to reduce new infections and AIDS related deaths, as is reflected in the UNAIDS goals for Asia (i.e. zero new infections, zero new death and zero discrimination). Indonesia's National and West Java provincial HIV/AIDS strategies stress the importance of intervention's impact on the epidemic, however it is not mentioned as an explicit criterion for priority setting. [3,5] Similarly, our respondents rated injecting drug users as the most important target group for interventions with the reason that they are important in the spread of the HIV epidemic. At time of interview, most new infection were indeed seen among PWID, while now the epidemic has decreased in this population and MSM, low-at risk women and clients of sex workers are most at risk for HIV infection.

Table 3. Mean Likert scale scores and standard deviation per criterion and per stakeholder group

STAKEHOLDER GROUPS					
Policy makers (n=22)		People living with HIV/AIDS (n=49)		Health care workers (n=41)	
Criterion	Mean (SD)	Criterion	Mean (SD)	Criterion	Mean (SD)
1 Individual effectiveness	4.64 (0.49)	1 Reduction spread HIV	4.67 (0.59)	1 Reduction spread HIV	4.76 (0.49)
2 Service requirements	4.64 (0.49)	2 Quality of care	4.67 (0.77)	2 Quality of care	4.54 (0.67)
3 HCWs ^a requirements	4.59 (0.50)	3 Individual effectiveness	4.59 (0.64)	3 Stigma reduction	4.49 (0.81)
4 Sustainable financing	4.55 (0.74)	4 HCWs ^a requirements	4.59 (0.67)	4 Sustainable financing	4.49 (0.81)
5 Reduction spread HIV	4.50 (0.60)	5 Stigma reduction	4.55 (0.94)	5 HCWs ^a requirements	4.41 (0.77)
6 Stigma reduction	4.50 (0.67)	6 Information ^c requirements	4.53 (0.74)	6 Individual effectiveness	4.37 (0.54)
7 Information ^c requirements	4.41 (0.50)	7 Products ^b requirements	4.53 (0.62)	7 Information ^c requirements	4.32 (0.72)
8 Products ^b requirements	4.41 (0.59)	8 Donors acceptability	4.53 (0.79)	8 Products ^b requirements	4.29 (0.84)
9 Quality of care	4.27 (0.94)	9 Service requirements	4.45 (0.65)	9 Legal rules acceptability	4.24 (0.66)
10 Legal rules acceptability	4.27 (0.70)	10 Sustainable financing	4.37 (1.01)	10 Service requirements	4.22 (0.85)
11 Cultural acceptability	4.18 (0.66)	11 Side effects	4.27 (0.86)	11 Level at risk individual	4.20 (0.99)
12 Economic impact	4.14 (0.71)	12 Unit cost	4.27 (1.32)	12 Religious acceptability	4.17 (0.80)
13 Political acceptability	4.09 (1.02)	13 Legal rules acceptability	4.08 (1.02)	13 Cultural acceptability	4.00 (0.97)
14 Religious acceptability	4.00 (1.02)	14 Cultural acceptability	4.00 (1.17)	14 Economic impact	3.98 (0.88)
15 Side effects	3.86 (0.71)	15 Prevention or treatment	3.96 (1.32)	15 Donors acceptability	3.98 (0.79)
16 Unit cost	3.86 (1.32)	16 Religious acceptability	3.94 (1.28)	16 Prevention or treatment	3.93 (1.19)
17 Donors acceptability	3.73 (0.83)	17 Economic impact	3.76 (1.53)	17 Side effects	3.90 (0.89)
18 Severity of disease	3.55 (1.22)	18 Stigmatized groups	3.41 (1.55)	18 Unit cost	3.71 (1.36)
19 Easy to target	3.36 (0.90)	19 Level at risk individual	3.31 (1.70)	19 Stigmatized groups	3.46 (1.57)
20 Prevention or treatment	3.32 (1.39)	20 Severity of disease	3.22 (1.57)	20 Severity of disease	3.39 (1.43)
21 Level at risk individual	3.00 (1.51)	21 People easy to target	3.20 (1.40)	21 People easy to target	3.39 (1.16)
22 Age	2.91 (1.44)	22 Political acceptability	3.08 (1.66)	22 Age	3.34 (1.30)
23 Previous spending ^d	2.91 (1.44)	23 Age	2.94 (1.75)	23 Political acceptability	3.24 (1.48)
24 Stigmatized groups	2.68 (1.62)	24 Previous spending ^d	2.81 (1.57)	24 Area of living	3.20 (1.29)
25 Area of living	2.45 (1.53)	25 Budget impact	2.52 (1.58)	25 Responsibility for health	3.05 (1.43)
26 Income class	2.18 (1.50)	26 Area of living	2.39 (1.55)	26 Previous spending ^d	2.90 (1.50)
27 Responsibility for health	2.14 (1.42)	27 Sexual orientation	2.33 (1.61)	27 Sexual orientation	2.76 (1.46)
28 Sexual orientation	1.86 (1.36)	28 Marital status	2.02 (1.51)	28 Marital status	2.73 (1.61)
29 Budget impact	1.68 (1.13)	29 Responsibility for health	1.78 (1.36)	29 Budget impact	2.61 (1.45)
30 Marital status	1.59 (0.96)	30 Income class	1.61 (1.24)	30 Income class	2.44 (1.42)
31 Gender	1.18 (0.66)	31 Gender	1.18 (0.81)	31 Gender	1.95 (1.34)
32 Religion	1.00 (0.00)	32 Religion	1.00 (0.00)	32 Religion	1.20 (0.60)

^a HCW = health care workers, ^b products = medical products & technology requirements, ^c information = information system requirements,

STAKEHOLDER GROUPS

General population (n=43)		Overall (n=155)	
Criterion	Mean (SD)	Criterion	Mean (SD)
1 Reduction spread HIV	4.65 (0.57)	1 Reduction spread HIV	4.66 (0.57)
2 Stigma reduction	4.63 (0.58)	2 Stigma reduction	4.55 (0.77)
3 Products ^b requirements	4.63 (0.85)	3 HCWs ^a requirements	4.52 (0.73)
4 Sustainable financing	4.51 (0.77)	4 Quality of care	4.50 (0.78)
5 HCWs ^a requirements	4.49 (0.86)	5 Products ^b requirements	4.48 (0.75)
6 Service requirements	4.44 (0.77)	6 Individual effectiveness	4.47 (0.63)
7 Unit cost	4.42 (0.70)	7 Sustainable financing	4.46 (0.85)
8 Donors acceptability	4.42 (0.85)	8 Service requirements	4.41 (0.73)
9 Quality of care	4.40 (0.79)	9 Information ^c requirements	4.39 (0.72)
10 Individual effectiveness	4.35 (0.72)	10 Donors acceptability	4.24 (0.82)
11 Legal rules acceptability	4.33 (0.84)	11 Legal rules acceptability	4.22 (0.84)
12 Information ^c requirements	4.28 (0.80)	12 Unit cost	4.10 (1.24)
13 Religious acceptability	4.21 (0.91)	13 Side effects	4.09 (0.80)
14 Side effects	4.19 (0.63)	14 Religious acceptability	4.08 (1.03)
15 Cultural acceptability	4.19 (0.88)	15 Cultural acceptability	4.08 (0.98)
16 Level at risk individual	4.12 (1.26)	16 Prevention or treatment	3.83 (1.31)
17 Prevention or treatment	3.86 (1.36)	17 Economic impact	3.76 (1.29)
18 Political acceptability	3.60 (1.33)	18 Level at risk individual	3.72 (1.46)
19 Economic impact	3.37 (1.48)	19 Political acceptability	3.41 (1.47)
20 Severity of disease	3.35 (1.27)	20 Severity of disease	3.35 (1.46)
21 People easy to target	3.35 (1.51)	21 People easy to target	3.32 (1.23)
22 Stigmatized groups	3.33 (1.55)	22 Stigmatized groups	3.30 (1.57)
23 Age	3.23 (1.65)	23 Age	3.12 (1.56)
24 Area of living	3.07 (1.70)	24 Previous spending ^d	2.86 (1.45)
25 Previous spending ^d	2.86 (1.32)	25 Area of living	2.80 (1.56)
26 Responsibility for health	2.74 (1.56)	26 Budget impact	2.44 (1.49)
27 Budget impact	2.56 (1.52)	27 Responsibility for health	2.43 (1.52)
28 Sexual orientation	2.51 (1.62)	28 Sexual orientation	2.43 (1.55)
29 Income class	2.44 (1.62)	29 Marital status	2.25 (1.56)
30 Marital status	2.40 (1.69)	30 Income class	2.14 (1.47)
31 Gender	1.53 (1.24)	31 Gender	1.48 (1.12)
32 Religion	1.02 (0.15)	32 Religion	1.06 (0.33)

^d previous spending = in line with previous spending patterns

Table 4 Mean ranking scores and standard deviation per criterion and per stakeholder group

STAKEHOLDER GROUPS								
Policy makers (n=22)			People living with HIV/AIDS (n=49)			Health care workers (n=41)		
Criterion	Mean (SD)		Criterion	Mean (SD)		Criterion	Mean (SD)	
1 Reduction spread HIV	5.23	(4.29)	1 Reduction spread HIV	5.43	(4.04)	1 Reduction spread HIV	7.24	(3.95)
2 Service requirements	4.50	(3.54)	2 Quality of care	5.00	(3.22)	2 Quality of care	4.71	(3.76)
3 Sustainable financing	4.50	(3.76)	3 HCWs ^a requirements	4.47	(3.48)	3 Level at risk individual	3.85	(3.89)
4 Quality of care	4.27	(3.76)	4 Prevention or treatment	3.84	(4.40)	4 Stigma reduction	3.76	(3.53)
5 Stigma reduction	4.23	(3.19)	5 Stigma reduction	3.80	(3.84)	5 Prevention or treatment	3.66	(4.14)
6 HCWs ^a requirements	4.14	(3.11)	6 Unit cost	3.24	(3.56)	6 HCWs ^a requirements	3.61	(3.20)
7 Individual effectiveness	3.68	(3.43)	7 Information ^c requirements	3.22	(3.51)	7 Sustainable financing	3.22	(3.63)
8 Information ^c requirements	2.45	(3.28)	8 Service requirements	2.98	(3.24)	8 Service requirements	3.05	(3.37)
9 Political acceptability	2.45	(3.96)	9 Products ^b requirements	2.82	(2.71)	9 Information ^c requirements	2.59	(2.83)
10 Legal rules acceptability	2.36	(3.58)	10 Individual effectiveness	2.22	(2.92)	10 Products ^b requirements	2.24	(2.89)
11 Products ^b requirements	2.27	(2.95)	11 Donors acceptability	2.08	(3.22)	11 Individual effectiveness	1.78	(2.80)
12 Religious acceptability	2.18	(3.76)	12 Sustainable financing	1.98	(2.81)	12 Stigmatized groups	1.68	(2.48)
13 Prevention or treatment	1.95	(3.48)	13 Level at risk individual	1.65	(3.06)	13 Economic impact	1.59	(2.86)
14 Economic impact	1.82	(2.48)	14 Side effects	1.37	(2.51)	14 Unit cost	1.41	(2.48)
15 Cultural acceptability	1.73	(3.17)	15 Religious acceptability	1.37	(2.77)	15 Side effects	1.39	(2.75)
16 Unit cost	1.55	(2.82)	16 Economic impact	1.35	(2.39)	16 Severity of disease	1.22	(2.29)
17 Level at risk individual	1.00	(2.43)	17 Stigmatized groups	1.20	(2.92)	17 Religious acceptability	1.02	(2.14)
18 Severity of disease	0.77	(1.66)	18 Severity of disease	1.12	(2.65)	18 Donors acceptability	0.98	(2.33)
19 Side effects	0.73	(2.10)	19 Political acceptability	1.06	(2.66)	19 Legal rules acceptability	0.88	(2.48)
20 Donors acceptability	0.73	(1.91)	20 Age	0.82	(2.21)	20 Age	0.76	(1.96)
21 Stigmatized groups	0.55	(1.50)	21 Legal rules acceptability	0.82	(1.98)	21 Political acceptability	0.71	(1.90)
22 Previous spending ^d	0.55	(1.87)	22 Cultural acceptability	0.76	(2.12)	22 Cultural acceptability	0.63	(1.53)
23 Income class	0.41	(1.22)	23 Budget impact	0.63	(2.05)	23 Sexual orientation	0.51	(1.86)
24 Age	0.36	(1.33)	24 Sexual orientation	0.39	(1.34)	24 Easy to target	0.46	(1.25)
25 Sexual orientation	0.18	(0.85)	25 Easy to target	0.39	(1.44)	25 Marital status	0.44	(1.29)
26 Easy to target	0.18	(0.66)	26 Marital status	0.27	(1.06)	26 Area of living	0.39	(1.41)
27 Responsibility for health	0.14	(0.64)	27 Responsibility for health	0.18	(0.95)	27 Gender	0.39	(1.76)
28 Area of living	0.09	(0.29)	28 Previous spending ^d	0.18	(0.83)	28 Budget impact	0.37	(1.64)
29 Gender	0.00	(0.00)	29 Area of living	0.16	(1.14)	29 Income class	0.20	(1.10)
30 Religion	0.00	(0.00)	30 Income class	0.10	(0.51)	30 Responsibility for health	0.15	(0.69)
31 Marital status	0.00	(0.00)	31 Gender	0.10	(0.51)	31 Previous spending ^d	0.12	(0.78)
32 Budget impact	0.00	(0.00)	32 Religion	0.00	(0.00)	32 Religion	0.00	(0.00)

^aHCWs = health care workers, ^bproducts = medical products & technology requirements, ^cinformation = information system requirements,

STAKEHOLDER GROUPS				
General population (n=43)			Overall (n=155)	
Criterion	Mean (SD)		Criterion	Mean (SD)
1 Reduction spread HIV	5.58	(4.34)	1 Reduction spread HIV	5.92 (4.17)
2 HCWs ^a requirements	3.95	(3.30)	2 Individual effectiveness	2.41 (3.17)
3 Products ^b requirements	3.77	(2.95)	3 Quality of care	4.34 (3.44)
4 Stigma reduction	3.72	(3.77)	4 HCWs ^a requirements	4.05 (3.29)
5 Prevention or treatment	3.26	(4.24)	5 Stigma reduction	3.83 (3.62)
6 Quality of care	3.26	(3.05)	6 Prevention or treatment	3.36 (4.18)
7 Level at risk individual	2.98	(4.08)	7 Service requirements	3.06 (3.25)
8 Individual effectiveness	2.58	(3.54)	8 Products ^b requirements	2.85 (2.90)
9 Unit cost	2.44	(3.15)	9 Sustainable financing	2.72 (3.32)
10 Service requirements	2.42	(2.86)	10 Information ^c requirements	2.59 (3.21)
11 Sustainable financing	2.19	(2.99)	11 Level at risk individual	2.51 (3.65)
12 Information ^c requirements	1.95	(3.15)	12 Unit cost	2.30 (3.15)
13 Side effects	1.81	(3.06)	13 Religious acceptability	1.43 (2.81)
14 Severity of disease	1.77	(3.31)	14 Economic impact	1.42 (2.60)
15 Legal rules acceptability	1.72	(2.76)	15 Side effects	1.41 (2.68)
16 Religious acceptability	1.49	(2.88)	16 Donors acceptability	1.39 (2.63)
17 Age	1.42	(2.78)	17 Legal rules acceptability	1.30 (2.64)
18 Donors acceptability	1.35	(2.36)	18 Severity of disease	1.28 (2.65)
19 Area of living	1.26	(2.83)	19 Stigmatized groups	1.14 (2.45)
20 Economic impact	1.14	(2.70)	20 Political acceptability	0.99 (2.49)
21 Stigmatized groups	0.86	(2.18)	21 Age	0.90 (2.24)
22 Cultural acceptability	0.77	(2.02)	22 Cultural acceptability	0.86 (2.15)
23 Marital status	0.60	(1.69)	23 Area of living	0.52 (1.83)
24 Easy to target	0.56	(1.71)	24 Easy to target	0.43 (1.39)
25 Responsibility for health	0.49	(1.65)	25 Sexual orientation	0.41 (1.56)
26 Sexual orientation	0.44	(1.78)	26 Marital status	0.37 (1.26)
27 Political acceptability	0.44	(1.33)	27 Budget impact	0.32 (1.46)
28 Gender	0.33	(1.38)	28 Responsibility for health	0.25 (1.11)
29 Income class	0.23	(1.15)	29 Gender	0.23 (1.19)
30 Previous spending ^d	0.14	(0.91)	30 Income class	0.21 (0.98)
31 Budget impact	0.07	(0.46)	31 Previous spending ^d	0.21 (1.05)
32 Religion	0.00	(0.00)	32 Religion	0.00 (0.00)

^d previous spending = in line with previous spending patterns

Table 5 Priority for targeting certain risk group, mean Likert scores and standard deviation per stakeholder group Stakeholder groups

STAKEHOLDER GROUPS			
Health care workers (n=41)		People living with HIV/AIDS (n=49)	
Risk group	Mean (SD)	Risk group	Mean (SD)
1 Injecting drug users	4.51 (0.68)	1 Injecting drug users	4.39 (0.61)
2 Partners of HIV+ people	4.41 (0.63)	2 Female sex workers	4.20 (0.93)
3 Female sex workers	4.27 (0.59)	3 Clients of FSW	3.65 (1.16)
4 Clients of FSW	4.02 (1.01)	4 Men having sex with men	3.63 (1.24)
5 Prisoners	4.00 (1.14)	5 Transgender	3.45 (0.96)
6 Transgender	3.85 (1.01)	6 Prisoners	3.55 (1.10)
7 Men having sex with men	3.71 (1.23)	7 Partners of HIV+ people	3.82 (1.03)
8 People at low risk	2.51 (1.33)	8 People at low risk	2.94 (1.27)

FSW = female sex workers

Table 6. Reasons and frequency given by stakeholders to prioritize or not prioritize (Likert scale score 3-5) certain risk groups in HIV/AIDS control

REASONS TO PRIORITIZE RISK GROUP (LIKERT SCORES 3-5)							
Risk groups and stakeholders (# missing reasons)	At high HIV risk	Important in spread of HIV epidemic	Large number of people (infected)	Equity:	Feasibility:	Feasibility:	Other
				less access to services, more vulnerable	effective interventions are available/easy group to reach	no effective interventions available/difficult group to target	
PWID							
Policy makers (1)	3	10	5		1	3	
Health care workers (1)	16	15	12			1	
PLWHA (1)	20	9	4	4		4	1
General population (0)	23	3	5	1		5	
FSWs							
Policy makers (1)	3	9		4	2	1	
Health care workers (2)	15	15	1	2		9	
PLWHA (3)	17	9	2	8		1	
General population (1)	27	2	4	5		1	
Clients of FSWs							
Policy makers (1)	3	13				6	
Health care workers (2)	9	15		4		5	1
PLWHA (4)	9	10		3		3	
General population (1)	19	4	3	3		1	

Policy makers (n=22)			General population (n=43)		
Risk group		Mean (SD)	Risk group		Mean (SD)
1	Injecting drug users	4.27 (0.63)	1	Female sex workers	4.19 (1.10)
2	Clients of FSW	4.27 (0.83)	2	Injecting drug users	3.95 (0.87)
3	Partners of HIV+ people	4.14 (0.83)	3	Partners of HIV+ people	3.86 (0.89)
4	Female sex workers	4.09 (0.87)	4	Clients of FSW	3.53 (1.10)
5	Prisoners	3.77 (1.31)	5	Prisoners	3.12 (1.14)
6	Men having sex with men	3.41 (0.91)	6	Men having sex with men	3.09 (1.17)
7	People at low risk	3.32 (1.36)	7	Transgender	3.05 (1.11)
8	Transgender	3.18 (0.73)	8	People at low risk	2.43 (1.15)

4

REASONS TO NOT PRIORITIZE GROUP (LIKERT SCORES 1-3)

At low HIV risk	Not im- portant in spread of HIV epidemic	Small number of people (infected)	Equity: group with relatively high socio economic status	Equity: own re- sponsibility	Feasibility: effective interventions are available/ group is already targeted	Feasibility: no effective interventions available/ difficult group to target	No need for services (already show safe behaviour)
					2		
				1		1	
		1	1	1			3
	1	1					
					2		
					2		1
							5
						1	
1					1		2
				1	1		6
			3	1	2		7

Table 6. Continued

REASONS TO PRIORITIZE RISK GROUP (LIKERT SCORES 3-5)							
Risk groups and stakeholders (# missing reasons)	At high HIV risk	Important in spread of HIV epidemic	Large number of people (infected)	Equity: less access to services, more vulnerable	Feasibility: effective interventions are available/ easy group to reach	Feasibility: no effective interventions available/ difficult group to target	Other
MSM							
Policy makers (1)	5	1	1	2		5	
Health care workers (4)	12	2	4	3		6	
PLWHA (6)	13	4	1	5		1	
General population (4)	11	1	1	2		4	
Transgender							
Policy makers (1)	4	3		3	5		
Health care workers (7)	11	9	3	2		3	1
PLWHA (6)	14	3		6			4
General population (3)	12		2	7	2		
Prisoners							
Policy makers (2)	6	3		3	1	3	1
Health care workers (6)	22	11		1	2	1	
PLWHA (4)	18	3		9	6	2	1
General population (3)	13	1	2	4	3	2	
Partners of HIV+ people							
Policy makers (1)	9	2			5	5	
Health care workers (2)	25	3		7	2		
PLWHA (5)	27	4	1	10	1		1
General population (1)	27	2	2	3	1		
People at low risk							
Policy makers (1)	9	1			2	3	
Health care workers (7)			3	2		2	1
PLWHA (7)	3	1	1	12			
General population (4)			3	3	5		
Total							
Policy makers (9)	42	42	6	12	16	26	1
Health care workers (31)	110	70	23	21	4	27	3
PLWHA (35)	121	43	9	57	7	11	7
General population(17)	132	13	22	28	11	13	0
Overall	405	168	60	118	38	77	11

PWID = people who inject drugs, FSW = female sex workers, MSM = men having sex with men, PLWHA = people living with HIV/AIDS

REASONS TO NOT PRIORITIZE GROUP (LIKERT SCORES 1-3)

	At low HIV risk	Not important in spread of HIV epidemic	Small number of people (infected)	Equity: group with relatively high socio-economic status	Equity: own responsibility	Feasibility: effective interventions are available/ group is already targeted	Feasibility: no effective interventions available/ difficult group to target	No need for services (already show safe behaviour)
	1	1	2			2		2
	2	2	1			2	1	2
	1	1				1		7
			11	1	2			3
	2	1	1			1	1	
	1		2			2		
	1		3			2		3
	3	1	8		1			2
		1						1
	1			1		1		
	3				1	2		
	11				2			
	1						3	
						2		1
			1		1			4
	3					1	1	1
	18					5		
	20					1		2
	15					1		5
	6	4	4	0	0	4	3	4
	24	2	3	1	0	15	4	4
	25	1	3	0	3	11	1	20
	29	1	21	5	8	3	0	29
	84	8	31	6	11	33	8	57

The preference among all stakeholders for interventions that provide good quality of care and are feasible in terms of health care workers, service and information requirements can be explained by Indonesia poor quality of care and health system capacity that has not much improved after decentralization of services from national to district level in 2000 [46–48]. Currently, the coverage of most HIV/AIDS interventions is low (e.g. 18% coverage for ART [1]) and although scaling up at community level clinics (Puskesmas) is recommended [49] this is challenging regarding Indonesia's current health system infrastructure for HIV/AIDS. Community health care workers still have limited knowledge about HIV/AIDS, testing and treatment services are established at small scale at community level and monitoring and referral systems work suboptimal [50]. The preference among stakeholder for intervention's that reduce stigma in society can be clarified by the high presence of HIV/AIDS related stigma in Indonesia among health care workers and in society [51–53]. Many risk groups and HIV/AIDS patients in Indonesia face stigma related barriers for accessing care [54,55]. However, little is known about which interventions are most effective in for the reduction of stigma [56,57].

Policy makers showed an additional preference for legal and political acceptability of interventions as these factors usually play a major role in HIV/AIDS resource allocation in Indonesia and other settings [5,58]. Their high concern for whether and intervention receives sustainable financing and less for its budget impact can be explained by the high amount of donor funding in Indonesia [4,50]. In addition, most policy makers in our study were implementing donor-funded interventions and had therefor no need to consider the budget impact of interventions. The perceived importance of PLWHA and the general population for unit costs can be explained by the high costs that people face when accessing HIV/AIDS care in Indonesia [59,60]. The general population, HCWs and PLWHAs gave more preference for interventions that prevent HIV infections compared to treating patients. However, with the knowledge that treatment also works as prevention [61], the categories of this criterion should be adapted and treatment should be defined as 'services for palliative patients and opportunistic infections'.

All stakeholders valued equity criteria related to people's social background characteristics as least important. This could be related to Indonesia's strong community system in which persons are considered equal and may explain why our respondents do not prefer to prioritize people on the basis of income, gender and sexual orientation [62]. It could be that equity considerations are more important in a generalized epidemic like in South Africa where resources are even tighter and questions on how to balance efficiency and equity considerations are more prominent [12]. In addition, as access to treatment is still low (i.e. 18%) in Indonesia it might not be a stakeholder's first concern to consider inequities but how to provide access for as many people as possible. However, surveys show that inequities exist for other health services in Indonesia and may therefor also exist for HIV/AIDS related interventions [63,64]. Our respondents did mention various equity related reasons for targeting a specific group. For example

they considered the socio-economic status and the vulnerability of the target group. This might indicate that our questionnaire did not measure the concept of equity properly.

We observed several study limitations. Firstly, the questionnaire was challenging for the respondents, as they had to become familiar with 32 criteria and compare them simultaneously. However, inclusion of fewer criteria is a risk for leaving out criteria that might be perceived important by stakeholders. Compared to discrete choice experiments, it seems equally challenging as the method presents hypothetical choice sets to the respondents and there is limited space to explain the criteria. In a DCE approach, there is a risk to leave out important criteria and establishment of Likert-scale questionnaire is relatively simple. In addition, the results can be explained in the context of Indonesia and this may indicate that respondents had a good understanding of the topic. Secondly, the policy makers in our study were mainly implementing donor funded interventions and do not decide on allocation of budget for HIV/AIDS control. However, it is difficult to identify the persons within the local planning board and different government offices that actually decide on the budget allocation for HIV/AIDS control. In Indonesia the funding for HIV/AIDS control is fragmented and all government offices independently decide whether to follow recommendations of the AIDS commissions and usually set their own priorities [5]. Thirdly, due to our study design we were not able to check for consistency in the answers given by respondents. The ranking of criteria was an extension of the Likert-scale rating and not an independent exercise on itself. Fourthly, we used the WHO health systems frameworks as underlying concepts and another framework may have led to inclusion of a different set of criteria. Fifthly, we may have left out important criteria from the list of 32 criteria. For example, stakeholders also expressed the size of an intervention's target population as an important criterion for priority setting of target groups. This criterion fits into the responsiveness category as it reflects a society's preference that health systems focuses on problems that affect a large number of people or that cause a high burden of disease. On the other hand, it could also be an efficiency reason as with a large target group an intervention can reach economies of scale and may therefore be more cost-effective. These two criteria are now included in the list (or map) of criteria for priority setting in health as proposed by [41], however they were not in the draft list that we used to develop to our questionnaire. In addition, 'human resources capacity within government institutions' was proposed as an additional criteria and fits into the 'governance and leadership category' of the feasibility criteria. This is indeed reported as an important barrier for effective HIV/AIDS control in Indonesia and should have been included as a criterion in our questionnaire [5].

Our study showed that multiple criteria play a role in priority setting of HIV/AIDS interventions. It also outlines a feasible approach for other settings that would like to elicit the importance of multiple criteria among different stakeholders groups for priority setting of interventions within or across disease areas. For Indonesia, this study is a first exploration of the importance of criteria in the context of HIV/AIDS control. The study results may be used as input for

a particular HIV/AIDS priority setting question, either on micro-level: e.g. how to prioritize risk groups for HIV testing and treatment, or macro-level: e.g. what interventions should be part of a 5 years HIV/AIDS strategy in West Java province. On the basis of our survey it would be important to identify which interventions have most impact on the epidemic, reduce stigma in society, provide good quality of care and are feasible in terms of health system requirements. Multi-criteria decision analysis (MCDA) may be used as a framework to guide such priority setting process. Besides the importance of criteria, interventions options should be defined and compared on all criteria using a performance matrix. The performance matrix can then be input for a deliberative process among various stakeholders to make a final decision on which interventions should be prioritized and implemented.

Conclusions

This study has identified criteria for priority setting of HIV/AIDS interventions in Indonesia using perspectives of policy makers, PLWHA, health care workers and the general population. Overall all stakeholders found it most important that interventions have impact on the HIV epidemic, are feasible in terms of Indonesia's health system capacity, reduce HIV/AIDS related stigma in society and provide good quality of care. Most criteria related to equity (i.e. prioritizing groups on the basis of their gender, SES and age) were considered least important for choosing between HIV/AIDS interventions.

Our study design outlines an approach for other settings to identify which criteria are important for priority setting of health interventions within or across disease areas. For Indonesia, these study results may be used in priority setting processes for HIV/AIDS control and may contribute to more transparent and systematic decision-making. ■

References

1. AIDSdatahub (2014) Indonesia Country Profile. Available: <http://www.aidsdatahub.org/en/country-profiles/indonesia>. Accessed 31 March 2014.
2. Indonesian National AIDS Commission (2013) Asian Epidemic Model estimations. Jakarta.
3. Indonesian National AIDS Commission (2009) Strategy of the national action plan for HIV/AIDS 2010–2014. Jakarta. Available: <http://www.aidsindonesia.or.id/elib/home/detail/240>. Accessed 31 March 2014.
4. Indonesian National AIDS Commission (2012) Republic of Indonesia Country Report on the Follow up to the declaration of commitment on HIV/AIDS (UNGASS). Reporting Period 2010–2011. Jakarta.
5. Tromp N, Prawiranegara R, Riparev Subhan H, Siregar A, Sunjaya D, et al. (2014) Priority setting in HIV control in West Java Indonesia: an evaluation based on the accountability for reasonableness framework. *Health Policy Plan*: Apr 14.
6. Baltussen R, Niessen L (2006) Priority setting of health interventions: the need for multi-criteria decision analysis. *Cost Eff Resour Alloc* 4: 14.
7. Youngkong S, Kipiriri L, Baltussen R (2009) Setting priorities for health interventions in developing countries: a review of empirical studies. *Trop Med Int Health* 14: 930–939.
8. Johri M, Norheim OF (2012) Can cost-effectiveness analysis integrate concerns for equity? Systematic review. *Int J Technol Assess Health Care* 28: 125–132.
9. Gericke CA, Kurowski C, Ranson MK, Mills A (2005) Intervention complexity--a conceptual framework to inform priority-setting in health. *Bull World Health Organ* 83: 285–293.
10. Goddard M, Hauck K, Smith PC (2006) Priority setting in health - a political economy perspective. *Health Econ Policy Law* 1: 79–90.
11. Guindo LA, Wagner M, Baltussen R, Rindress D, van Til J, et al. (2012) From efficacy to equity: Literature review of decision criteria for resource allocation and healthcare decisionmaking. *Cost Eff Resour Alloc* 10: 9.
12. Cleary SM, Mooney GH, McIntyre DE (2010) Claims on health care: a decision-making framework for equity, with application to treatment for HIV/AIDS in South Africa. *Health Policy Plan* 26: 464–470.
13. Tanios N, Wagner M, Tony M, Baltussen R, van Til J, et al. (2013) Which criteria are considered in health-care decision? Insights from an international survey of policy and clinical decision makers. *Int J Technol Assess Health Care* 29: 456–465.
14. Devlin N, Sussex J (2011) Incorporating multiple criteria in HTA: methods and processes. London: Office of Health Economics.
15. Golan O, Hansen P, Kaplan G, Tal O (2011) Health technology prioritization: Which criteria for prioritizing new technologies and what are their relative weights? *Health Policy (New York)* 102: 126–135.
16. Hummel JM, Boomkamp ISM, Steuten LMG, Verkerke BGJ, Ijzerman MJ (2012) Predicting the health economic performance of new non-fusion surgery in adolescent idiopathic scoliosis. *J Orthop Res* 30: 1453–1458.
17. Miot J, Wagner M, Khoury H, Rindress D, Goetghebuer MM (2012) Field testing of a multicriteria decision analysis (MCDA) framework for coverage of a screening test for cervical cancer in South Africa. *Cost Eff Resour Alloc* 10: 2.
18. Youngkong S, Baltussen R, Tantivess S, Mohara A, Teerawattananon Y (2012) Multicriteria decision analysis for including health interventions in the universal health coverage benefit package in Thailand. *Value Health* 15: 961–970.
19. Youngkong S, Teerawattananon Y, Tantivess S, Baltussen R (2012) Multi-criteria decision analysis for setting priorities on HIV/AIDS interventions in Thailand. *Health Res Policy Syst* 10: 6. Available: <http://www.pubmedcentral.nih.gov/articlerender>.
20. Defechereux T, Paolucci F, Mirelman A, Youngkong S, Botten G, et al. (2012) Health care priority setting in Norway a multicriteria decision analysis. *BMC Health Serv Res* 12: 39.
21. Hongoh V, Hoen AG, Aenishaenslin C, Waaub J-P, Bélanger D, et al. (2011) Spatially explicit multi-criteria decision analysis for managing vector-borne diseases. *Int J Health Geogr* 10: 70.
22. Tony M, Wagner M, Khoury H, Rindress D, Papastavros T, et al. (2011) Bridging health technology assessment (HTA) with multicriteria decision analyses (MCDA): field testing of the EVIDEM framework for coverage decisions by a public payer in Canada. *BMC Health Serv Res* 11: 329.
23. Goetghebuer MM, Wagner M, Khoury H, Levitt RJ,

- Erickson LJ, et al. (2011) Bridging health technology assessment (HTA) and efficient health care decision making with multicriteria decision analysis (MCDA): applying the EVIDEM framework to medicines appraisal. *Med Decis Making* 32: 376–388.
24. Diaby V, Lachaine J (2011) An application of a proposed framework for formulary listing in low-income countries: the case of Côte d'Ivoire. *Appl Health Econ Health Policy* 9: 389–402.
25. Cunich M, Salkeld G, Dowie J, Henderson J, Bayram C, et al. (2011) Integrating evidence and individual preferences using a web-based multi-criteria decision analytic tool: an application to prostate cancer screening. *Patient* 4: 153–162.
26. Husereau D, Boucher M, Noorani H (2010) Priority setting for health technology assessment at CADTH. *Int J Technol Assess Health Care* 26: 341–347.
27. Goetghebeur MM, Wagner M, Khoury H, Rindress D, Grégoire J-P, et al. (2010) Combining multicriteria decision analysis, ethics and health technology assessment: applying the EVIDEM decision-making framework to growth hormone for Turner syndrome patients. *Cost Eff Resour Alloc* 8: 4.
28. Jehu-Appiah C, Baltussen R, Acquah C, Aikins M, d'Almeida SA, et al. (2008) Balancing equity and efficiency in health priorities in Ghana: the use of multicriteria decision analysis. *Value Health* 11: 1081–1087.
29. Baltussen R, Stolk E, Chisholm D, Aikins M (2006) Towards a multi-criteria approach for priority setting: an application to Ghana. *Health Econ* 15: 689–696.
30. Baltussen R, ten Asbroek AHA, Koolman X, Shrestha N, Bhattarai P, et al. (2007) Priority setting using multiple criteria: should a lung health programme be implemented in Nepal? *Health Policy Plan* 22: 178–185.
31. Goetghebeur MM, Wagner M, Khoury H, Levitt RJ, Erickson LJ, et al. (2008) Evidence and Value: Impact on DEcisionMaking--the EVIDEM framework and potential applications. *BMC Health Serv Res* 8: 270.
32. World Health Organization (2012) WHO Consultation on The Strategic Use of Antiretrovirals for Treatment and Prevention of HIV Infection. 2nd Expert Panel meeting. Geneva: World Health Organization.
33. Youngkong S, Baltussen R, Tantivess S, Koolman X, Teerawattananon Y (2010) Criteria for priority setting of HIV/AIDS interventions in Thailand: a discrete choice experiment. *BMC Health Serv Res* 10: 197.
34. Husain S, Kadir M, Fatmi Z (2007) Resource allocation within the National AIDS Control Program of Pakistan: a qualitative assessment of decision maker's opinions. *BMC Health Serv Res* 7: 11.
35. Wilson D, Halperin DT (2008) "Know your epidemic, know your response": a useful approach, if we get it right. *Lancet* 372: 423–426.
36. UNAIDS (2010) UNAIDS 2011-2015 Strategy Getting to Zero. Geneva: UNAIDS.
37. Baltussen R, Youngkong S, Paolucci F, Niessen L (2010) Multi-criteria decision analysis to prioritize health interventions: Capitalizing on first experiences. *Health Policy* 96: 262–264.
38. Rudan I, Kapiriri L, Tomlinson M, Balliet M, Cohen B, et al. (2010) Evidence-based priority setting for health care and research: tools to support policy in maternal, neonatal, and child health in Africa. *PLoS Med* 7: e1000308.
39. Daniels N (2008) *Just Health: Meeting Health Needs Fairly*. Cambridge: Cambridge University Press.
40. Baker R, Thompson C, Mannion R (2006) Q methodology in health economics. *J Health Serv Res Policy* 11: 38–45.
41. Tromp N, Baltussen R (2012) Mapping of multiple criteria for priority setting of health interventions: an aid for decision makers. *BMC Health Serv Res* 12: 454. A
42. World Health Organization (2007) *World Health Organization: Everybody's Business: Strengthening Health Systems to Improve Health Outcomes: WHO's framework for Action*. Geneva: World Health Organization.
43. Youngkong S, Baltussen R, Tantivess S, Koolman X, Teerawattananon Y (2010) Criteria for priority setting of HIV/AIDS interventions in Thailand: a discrete choice experiment. *BMC Health Serv Res* 10: 197.
44. Reukers D, Prawiranegara R, Siregar A, Tromp N (2014) Cost-effectiveness of condom promotion programs among injecting drug users, female sex workers and men who have sex with men in West Java province Indonesia (Draft). Nijmegen: Radboudumc.
45. UNAIDS (2013) *Global report: UNAIDS global report on the global AIDS epidemic 2013*. Geneva: UNAIDS.

46. Diana A, Hollingworth SA, Marks GC (2013) Quality of physical resources of health facilities in Indonesia: a panel study 1993-2007. *Int J Qual Health Care* 25: 488–496.
47. Heywood P, Choi Y (2010) Health system performance at the district level in Indonesia after decentralization. *BMC Int Health Hum Rights* 10: 3.
48. Heywood PF, Harahap NP (2009) Human resources for health at the district level in Indonesia: the smoke and mirrors of decentralization. *Hum Resour Health* 7: 6.
49. Indonesian National AIDS Commission (2014) Indonesia National Strategy for HIV 2015-2019 (draft). Jakarta: Indonesian National AIDS Commission.
50. Indonesian National AIDS Commission (2014) Mid-term review of the national AIDS strategy and action plan 2010-2014. Jakarta: Indonesian National AIDS Commission.
51. Waluyo A, Culbert GJ, Levy J, Norr KF (2014) Understanding HIV-related Stigma Among Indonesian Nurses. *J Assoc Nurses AIDS Care*.
52. Damar AP, du Plessis G (2010) Coping versus grieving in a “death-accepting” society: AIDS-bereaved women living with HIV in Indonesia. *J Asian Afr Stud* 45: 424–431.
53. Wisaksana R, Alisjahbana B, van Crevel R, Kesumah N, Sudjana P, et al. (2009) Challenges in delivering HIV-care in Indonesia: experience from a referral hospital. *Acta Med Indones* 41 Suppl 1: 45–51.
54. Sasaki Y, Arifin A, Ali M, Kakimoto K (2011) Willingness to undergo HIV testing among factory workers in Surabaya, Indonesia. *AIDS Care* 23: 1305–1313.
55. Mahendradhata Y, Ahmad RA, Lefèvre P, Boelaert M, Van der Stuyt P (2008) Barriers for introducing HIV testing among tuberculosis patients in Jogjakarta, Indonesia: a qualitative study. *BMC Public Health* 8: 385.
56. Stangl AL, Lloyd JK, Brady LM, Holland CE, Baral S (2013) A systematic review of interventions to reduce HIV-related stigma and discrimination from 2002 to 2013: how far have we come? *J Int AIDS Soc* 16: 18734.
57. Reis RK, Galvão MTG, Gir E (2013) Challenges to an effective response for addressing stigma and discrimination related to HIV: from denial of rights to construction of support networks. *J Int AIDS Soc* 16: 18931.
58. Lasry A, Carter MW, Zaric GS (2011) Allocating funds for HIV/AIDS: a descriptive study of KwaDukuza, South Africa. *Health Policy Plan* 26: 33–42.
59. Riyarto S, Hidayat B, Johns B, Probandari A, Mahendradhata Y, et al. (2010) The financial burden of HIV care, including antiretroviral therapy, on patients in three sites in Indonesia. *Health Policy Plan* 25: 272–282.
60. Afriandi I, Siregar AYM, Meheus F, Hidayat T, van der Ven A, et al. (2010) Costs of hospital-based methadone maintenance treatment in HIV/AIDS control among injecting drug users in Indonesia. *Health Policy* 95: 69–73.
61. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, et al. (2011) Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med* 365: 493–505.
62. Hofstede G (2001) *Culture’s Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations*, 2nd edition. Thousand Oaks California: Sage Publications.
63. Seeberg J, Pannarunothai S, Padmawati RS, Trisnantoro L, Barua N, et al. (2014) Treatment seeking and health financing in selected poor urban neighbourhoods in India, Indonesia and Thailand. *Soc Sci Med* 102: 49–57.
64. Utomo B, Suchaya PK, Utami FR (2011) Priorities and realities: addressing the rich-poor gaps in health status and service access in Indonesia. *Int J Equity Health* 10: 47.

- **Sub-question 3**
**What is the performance of
HIV/AIDS interventions on
criteria for priority setting?**

CHAPTER 5

Costs of HIV/AIDS treatment in Indonesia by time on treatment and stage of disease

Forthcoming as:

Siregar A, Tromp N, Komarudin D, Wisaksana R, Van Crevel R, Van der Ven A, Baltussen R.
Costs of HIV/AIDS treatment in Indonesia by time on treatment and stage of disease.
BMC Health Services Research

Abstract

Background: We report an economic analysis of HIV care and treatment in Indonesia to assess the options and limitations of increasing efficiency, improving access, and scaling up services.

Methods: We calculated the cost of providing HIV care and treatment in a main referral hospital in West Java, Indonesia from 2008 to 2010, differentiated by initiation of treatment at different CD4 cell count levels (0-50, 50-100, 100-150, 150-200, and >200 cells/mm³); time of treatment; HIV care and opportunistic infections cost components; and costs of patients for seeking and undergoing care.

Results: Before antiretroviral treatment (ART) initiation costs were dominated by laboratory tests (>65%), and after initiation by antiretroviral drugs (≥60%). Average treatment costs per patient decreased with time on treatment. Higher CD4 cell counts at initiation resulted in lower laboratory and opportunistic infection treatment costs. Transportation cost dominated the costs of patients for seeking and undergoing care (>40%).

Conclusions: Costs of providing ART are highest during the early phase of treatment. Efficiency gains can likely be realized by early treatment initiation and applying alternative laboratory tests. Although scaling up ART at the community level may improve early uptake and adherence, its implementation requires further study given the current low HIV prevalence in the general population and required HIV expertise.

Background

The face of the HIV/AIDS epidemic in Indonesia is changing. While the epidemic started among injecting drug users, now it is shifting towards the general population. The percentage of HIV transmission through injecting drug use decreased from 53% in 2001-2005 to 34% in 2011, and heterosexual transmission increased from 37% to 71% during the same period [1].

Indonesia's national response to the epidemic focuses on a wide range of programs, including continuing support for care and treatment programs [1]. The need for antiretroviral therapy (ART) is expected to increase from approximately 30,000 patients in 2008 to almost 87,000 patients in 2014 [2]. However, in 2013 only 18% of the HIV patients who were eligible for treatment in Indonesia received ART which indicates the need for the government to increase ART service, and puts pressure on the already-constrained budget for HIV/AIDS control in Indonesia [3].

There is an urgent need to address the following research questions. First, what are the present treatment unit costs by time of treatment and stage of disease, and is there any potential to increase efficiency? Although there is (limited) international evidence that initiating treatment early is more efficient than late treatment [4], and that delivery of ART is less costly at the community level than the hospital level [5], these have not been substantiated for Indonesia, and have only limited studies in Asia [6,7]. There is also limited Indonesian data to suggest that the use of less intense diagnostic and treatment procedures might lead to cost savings [8–10]; however, this data has not been placed in the context of total treatment costs.

Second, what are the costs of scaling up ART? International evidence suggests that cost increases stemming from increased patient numbers can partly be offset by reduced average treatment costs as patients are treated earlier [11]; however, there is no specific evidence for Indonesia to support this hypothesis.

Third, what is the financial burden of patients accessing care? Although international studies have shown that the financial burden on patients may constitute a barrier to treatment [12] and may affect adherence and retention to treatment [13,14], available evidence from Indonesia stems from a single study only [15].

This paper presents an economic analysis of the provision of ART and care for HIV/AIDS patients. It presents a cost profile differentiated by initiation of treatment at different CD4 cell count levels; time on treatment; cost components (e.g., drug and personnel costs) for HIV care and opportunistic infections (OIs); and finally patient costs of seeking and undergoing care. We believe our approach is unique in the context of Indonesia and Asia and can be generalized to other settings with similar HIV/AIDS epidemics and health system profiles.

Methods

Study setting and study population

The study was conducted in Bandung, at an HIV/AIDS clinic in the largest public referral and teaching hospital (Hasan Sadikin) in West Java province (43 million inhabitants). The clinic is visited by highly at-risk groups and the general population, and delivers HIV-related services such as voluntary counseling and testing, ART, and sexually transmitted infections services. The clinic operates at full capacity because it is among the few clinics that deliver ART in Bandung. The clinic generates its own revenues through government, hospital, and private funding; ART-related services are free, excepting hospitalization and the registration fee.

The study included all records on inpatients and outpatients starting ART in the clinic between 2008 and 2010. The study population was divided into five groups by CD4 cell count: 0–50, 50–100, 100–150, 150–200, and >200 cells/mm³. The starting point of every patient initiating ART was uniformed as month 1, and patients were analyzed at 6, 12, 18, and 24 months of ART. We also observed the pre-ART period when patients received HIV care and treatment but had not yet initiated ART, which ranged from one week to 6 months before treatment initiation. Based on these starting points, each patient's treatment pattern was tracked from available medical and financial records and all costs were calculated. Patients were required to visit the clinic monthly to take their antiretroviral drugs (ARVs), and undergo CD4 cell count, viral load, and routine laboratory tests approximately every 6 months.

Data collection and cost estimation

The cost estimation was divided into health care costs (costs related to the consumption of resources in the health care system) and non-health care costs (costs falling on the patient for seeking and undergoing care). Health care costs were divided into hospitalization, outpatient visits, OI treatment, and ARVs, as well as CD4 cell count, viral load, and routine laboratory test costs. The micro-costing approach [16] was used to calculate the unit cost of an outpatient visit and OI treatment. All resources consumed, prices, and salaries related to service utilization were listed and estimated based on clinical records, pharmacy databases, staff interviews, government price standards, and hospital or market prices.

Outpatient costs were calculated based on the recurrent and capital costs of the clinic. Recurrent personnel costs were estimated based on actual wages or government salary scales [17]. Other recurrent costs (e.g., administration goods consumed during the observation period) were estimated using both actual and market prices. Capital costs included trainings and workshops attended by the clinic staff, and unit costs for organizing these activities were obtained from the actual budgetary or governmental records. Market prices were used to estimate other capital costs, including equipment, furniture, and start-up costs (e.g., renovation costs, if applicable). Capital costs were subsequently annualized on the basis of the lifetime of the capital items, using a 3% discount rate [16]. We omitted the cost of utilities (i.e. water and

electricity). This result was then multiplied by the proportion of time allocated by the clinic to deliver ART, calculated through a separate time motion study in which we observed clinical activity and calculated the amount of time spent on ART-related duties per week by the clinic staff. The total outpatient visit cost was then divided by the number of total outpatient visits to obtain the unit cost per outpatient visit. Patients registered as outpatient were never also registered as inpatient in the same period. For example, a patient who is registered as inpatient in a certain month may be registered as outpatient in the next month, but never at the same month. The details of outpatient cost is presented in the Appendix (Table A).

OI treatment cost was calculated based on the medical resources consumed by OI treatment (e.g. drugs and equipment), excluding hospitalization. Medical records and the physician's patient database were used to estimate resource utilization, and the official hospital prices issued in 2011 were used to calculate the unit costs of drugs and equipment. We obtained the unit cost of OI treatment by dividing the total cost of OI treatment for each CD4 cell count group by its population. We were unable to retrieve data regarding the specific OIs that drugs and equipment were used to treat. The average unit cost of OI treatment is presented in the Appendix (Table B).

Because the data was limited, we did not perform micro-costing when calculating the costs of hospitalization, ARVs, or laboratory tests. We used the World Health Organization's Choosing Interventions that are Cost Effective (WHO-CHOICE) estimates [18] to estimate the per day inpatient hotel cost, which we then used to calculate the total hospitalization cost. The WHO-CHOICE estimates for inpatient cost include items such as personnel, capital, and food costs, and exclude drugs and diagnostic test costs. The prices of ARV drugs (except for Tenofovir) issued by Kimia Farma (a national pharmaceutical corporation) were used as the unit costs of ARVs, while the price of Tenofovir was based on Bender et al. (2010) [19]. The unit costs of laboratory tests (CD4 cell count, viral load, and other laboratory tests) were derived from the 2011 official hospital price for each test. The summary of all unit costs used is presented in Appendix (Table C).

The non-health care costs comprised the patient costs, which were estimated by conducting a survey among 41 patients undergoing ART at the hospital. We collected information including (but not limited to) clinic service fee, travel costs, travelling time, the patient's monthly income, the average number of daily working hours, and monthly expenditures. Next, we estimated patients' monthly incomes based on their monthly expenditures. Patients did not have to pay for ARV, ARV monitoring, other lab tests, or OI medication/treatment. The patient cost estimation does not, at any rate, collide with the calculation of provider cost as it is calculated separately using different cost items specific to the patients. Therefore, there is no issue of double counting in this respect.

All costs were measured in Rupiah, and converted to US\$ using the 2010 exchange rate [20]. Both the utilization and cost data were analyzed using Microsoft Excel 2007. We report costs

from both the health care system and patient perspective. We did not approach an ethical committee or seek for ethical approval as our study mostly focus on costs and resources data spent for HIV treatment (mostly secondary data). Secondary data related to patients (e.g. ARV and OI drugs intake per patient) were taken from the clinic's patients database (in a form of an Excel file). The database was anonymized after the data were received and prior to analysis (we utilize the patients hospital ID number during analysis), and none of the patients personal identity is published in any part of the study. On the event of non-health care costs (primary) data collection, all patients were asked to fill in written informed consent forms prior to participating in the survey and the survey was anonymous (no patient names were collected). The survey was conducted by a group of enumerators and authors only receive the results.

Results

Patient characteristics

Patient characteristics are presented in Table 1. The majority of patients with a CD4 cell count of 0–150 cells/mm³ are male, while females dominate the >150 cells/mm³ group. All patients are in their productive age and the majority are married, employed, and have experience with injecting drug use. The highest education level attained by patients was the secondary level (high school).

Resource utilization and costs of providing ART

Table 2 presents the resources used to provide ART. Hospitalization occurred only before ART and up to 6 months after treatment was initiated; the duration ranged from 3 to 20 days. The switch to second line ART occurred in 5% of patients with a CD4 cell count of 0–50 cells/mm³ and 15% of those with 50–100 cells/mm³. Few patients with CD4 cell counts >200 cells/mm³ were hospitalized and received OI treatment. Details regarding unit costs per item are summarized in the appendix.

Table 3 details the costs associated with providing ART. Before ART initiation, costs were mainly dominated by laboratory tests (including the CD4, viral load, and routine laboratory tests). After the initiation of ART, costs were dominated by ARV, regardless of patients' CD4 levels. Both total costs and per patient average costs decreased over time after ART initiation. The one anomaly was the OI drugs/treatment cost for patients with a CD4 level of 50–100 cells/mm³, which increased from US\$725 in 1–6 months to 2,099 in 7–12 months. A relatively high CD4 cell count at treatment initiation relates to relatively low costs of ARVs, laboratory tests, and OI drugs/treatment. Figure 1 shows the average costs per patient for different CD4 cell count levels and over time. The highest total costs for 24 months of ART per patient were for patients with a CD4 cell count <50 cells/mm³. The distribution of total costs for patients with different CD4 cell counts is provided in the Appendix (Figure A).

Non-health care costs per visit

Table 4 presents non-health care costs. The average patient's non-health care costs per visit are US\$10 and US\$11, for patients with CD4 cell counts below and above 200 cells/mm³, respectively. Transportation cost and the clinic fee dominated the costs, while productivity loss accounted for less than 25% of the total cost per visit. Per visit, almost all patients spent US\$2 for the registration fee and US\$5 – US\$6 for transportation. The mean time to reach the clinic was approximately 1 hour (most patients lived < 20 km away) and the average time spent in the clinic was approximately 100 min. There were no major differences in non-health care costs between patients with CD4 cell counts less than or greater than 200 cells/mm³ (we did not perform significance test for this due to our small sample size)

Table 1. Characteristics of patients on ART

	CD4 CELL COUNT AT TIME OF STARTING ART					
	0-50	50-100	100-150	150-200	>200	Overall
No. of observation at the start of ART	96	33	22	17	10	178
CD4 level at the start of ART, mean (CI)*	19 (16 – 22)	71 (66 – 76)	124 (118 – 130)	177 (170-184)	275 (252 – 298)	39 (13-110)**
Sex (male)	80%	82%	59%	41%	40%	72%
Age, mean (CI*)	30 (29 - 31)	30 (28-32)	29 (28-30)	27 (26-28)	27 (25 – 29)	30 (29-31)
History of injecting drug use	69%	70%	55%	41%	70%	65%
Marital status						
Married	52%	58%	45%	35%	60%	51%
Not married	36%	24%	41%	29%	10%	33%
Widowed/ divorced	10%	15%	14%	29%	30%	15%
Occupation status						
Employed	67%	82%	86%	82%	80%	74%
Student	2%	-	-	6%	-	2%
Unemployed	30%	15%	14%	12%	20%	23%
Highest education						
Primary	3%	-	-	-	-	2%
Secondary	58%	51%	59%	77%	80%	60%
Tertiary	36%	48%	41%	24%	20%	37%

*CI = Confidence interval, 95%), ** Median (IQR)

Table 2. Resource utilization of patients on ART by CD4 cell count at the start of ART, per specified period

CD4 CELL COUNT	ITEM	PERIOD				
		Before ART	1 - 6 months	7 - 12 months	13 - 18 months	19 - 24 months
0-50	Number of patients	96	96	95	84	61
	% hospitalized*	14%	22%	-	-	-
	Average days of hospitalization (CI**)	6 (4-8)	15 (10-20)	-	-	-
	Number of outpatient visit	95	47	75	63	41
	% of patients treated for OI*	2%	63%	27%	18%	8%
	% switched to 2nd line ARV*	-	-	1%	2%	3%
	Number of CD 4 tests	95	47	75	63	41
	Number of viral load tests	-	6	16	9	4
50-100	Number of routine lab tests	87	45	74	62	40
	Number of patients	33	33	33	32	25
	% hospitalized*	3%	12%	-	-	-
	Average days of hospitalization (CI)**	3	6 (5-7)	-	-	-
	Number of outpatient visit	36	13	29	20	10
	% of patients treated for OI*	3%	36%	21%	13%	4%
	% switched to 2nd line ARV*	-	3%	3%	6%	12%
	Number of CD 4 tests	36	13	29	20	10
100-150	Number of viral load tests	0	5	6	4	0
	Number of routine lab tests	30	14	28	20	9
	Number of patients	22	22	22	18	13
	% hospitalized*	-	14%	-	-	-
	Average days of hospitalization	-	7	-	-	-
	Number of outpatient visit	29	8	18	13	7
	% of patients treated for OI*	-	45%	18%	11%	15%
	% switched to 2nd line ARV*	-	-	-	-	-
150-200	Number of CD 4 tests	29	8	18	13	7
	Number of viral load tests	1	1	4	3	-
	Number of routine lab tests	21	8	17	13	7
	Number of patients	16	16	13	13	11
	% hospitalized*	12%	6%	-	-	-
	Average days of hospitalization	5	3	-	-	-
	Number of outpatient visit	26	9	9	11	7
	% of patients treated for OI*	-	47%	14%	21%	-
>200	% switched to 2nd line ARV*	-	-	-	-	-
	Number of CD 4 tests	26	9	9	11	7
	Number of viral load tests	1	4	4	1	-
	Number of routine lab tests	16	8	9	11	7
	Number of patients	10	10	10	7	4
	% hospitalized*	-	-	-	-	-
	Average days of hospitalization	-	-	-	-	-
	Number of outpatient visit	17	5	6	4	4
	% of patients treated for OI*	-	10%	-	-	-
	% switched to 2nd line ARV*	-	-	-	-	-
	Number of CD 4 tests	17	5	6	4	4
	Number of viral load tests	-	-	-	-	-
	Number of routine lab tests	9	5	6	41	4

*for the whole sample within the indicated period, ** Confidence Interval, 95%

Table 3. Health care costs of patients on ART by CD4 cell count at the start of ART, per specified period (US\$*)

CD4 CELL COUNT	ITEM	PERIOD				
		Before ART	1 - 6 months	7 - 12 months	13 - 18 months	19 - 24 months
0-50	Number of patients	96	96	95	84	61
	Hospitalization	1,483 (10%)	6,161 (9%)	-	-	-
	Outpatient visits	1,110 (8%)	6,707 (10%)	6,462 (12%)	5,247 (11%)	3,517 (11%)
	OI treatment	86 (1%)	10,867 (16%)	2,163 (4%)	564 (1%)	1,538 (5%)
	ARV drugs	-	40,012 (60%)	41,281 (78%)	37,724 (81%)	26,915 (81%)
	CD 4 test	1,254 (9%)	620 (1%)	990 (2%)	832 (2%)	541 (2%)
	Viral load test	-	396 (1%)	1,056 (2%)	594 (1%)	264 (1%)
	Routine lab test	10,452 (73%)	1,488 (2%)	1,289 (2%)	1,548 (3%)	363 (1%)
	Total costs	14,377 (100%)	66,205 (100%)	53,196 (100%)	46,472 (100%)	33,115 (100%)
	Average costs per patient (CI**)	150 (139 - 160)	690 (593-787)	560 (522-599)	554 (515-592)	543 (481-606)
50-100	Number of patients	33	33	33	32	25
	Hospitalization	57 (1%)	418 (2%)	-	-	-
	Outpatient visits	421 (9%)	2,337 (12%)	2,232 (11%)	1,951 (11%)	1,110 (11%)
	OI treatment	12 (0.3%)	725 (4%)	2,099 (10%)	13 (0.1%)	9 (0.1%)
	ARV drugs	-	14,694 (77%)	15,360 (73%)	14,763 (83%)	9,058 (87%)
	CD 4 test	475 (10%)	172 (1%)	383 (2%)	264 (1%)	132 (1%)
	Viral load test	-	330 (2%)	396 (2%)	264 (1%)	-
	Routine lab test	3,608 (79%)	478 (2%)	494 (2%)	508 (3%)	104 (1%)
	Total costs	4,570 (100%)	19,138 (100%)	20,947 (100%)	17,749 (100%)	10,405 (100%)
	Average costs per patient (CI**)	139 (126-151)	580 (568-593)	635 (622-648)	555 (542-568)	417 (404-429)
100-150	Number of patients	22	22	22	18	13
	Hospitalization	-	418 (4%)	-	-	-
	Outpatient visits	339 (10%)	1,566 (14%)	1,391 (13%)	1,157 (13%)	771 (14%)
	OI treatment	-	815 (7%)	77 (0.7%)	29 (0.3%)	2 (0.04%)
	ARV drugs	-	8,147 (72%)	8,587 (79%)	6,858 (79%)	4,661 (83%)
	CD 4 test	383 (11%)	106 (1%)	238 (2%)	172 (2%)	92 (2%)
	Viral load test	66 (2%)	66 (1%)	264 (2%)	198 (2%)	-
	Routine lab test	2,547 (76%)	222 (2%)	293 (3%)	317 (4%)	63 (1%)
	Total costs	3,333 (100%)	11,329 (100%)	10,839 (100%)	8,722 (100%)	5,585 (100%)
	Average costs per patient (CI**)	159 (144-173)	515 (501-530)	493 (479-508)	485 (470-500)	430 (415-445)
150-200	Number of patients	17	17	14	14	11
	Hospitalization	190 (7%)	57 (1%)	-	-	-
	Outpatient visits	304 (11%)	1,133 (14%)	982 (15%)	935 (14%)	654 (14%)
	OI treatment	-	66 (1%)	3 (0.05%)	5 (0.1%)	-
	ARV drugs	-	6,188 (77%)	4,865 (76%)	5,162 (77%)	3,717 (82%)
	CD 4 test	343 (12%)	119 (1%)	119 (2%)	145 (2%)	92 (2%)
	Viral load test	66 (2%)	264 (3%)	264 (4%)	66 (1%)	-
	Routine lab test	1,969 (69%)	200 (2%)	195 (3%)	362 (5%)	63 (1%)
	Total costs	2,870 (100%)	8,020 (100%)	6,421 (100%)	6,670 (100%)	4,522 (100%)
	Average costs per patient (CI**)	169 (136-202)	472 (440-505)	459 (427-492)	477 (444-509)	411 (379-444)
>200	Number of patients	10	10	10	7	4
	Hospitalization	-	-	-	-	-
	Outpatient visits	199 (13%)	701 (15%)	608 (13%)	363 (12%)	257 (20%)
	OI treatment	-	1 (0.02%)	-	-	-
	ARV drugs	-	3,637 (79%)	3,797 (83%)	2,715 (84%)	938 (73%)
	CD 4 test	224 (15%)	66 (1%)	79 (2%)	53 (2%)	53 (4%)
	Viral load test	-	-	-	-	-
	Routine lab test	1,119 (73%)	223 (5%)	92 (2%)	68 (2%)	35 (3%)
	Total costs	1,541 (100%)	4,623 (100%)	4,572 (100%)	3,218 (100%)	1,281 (100%)
	Average costs per patient (CI**)	154 (114-195)	463 (422-503)	458 (417-498)	460 (420-501)	321 (280-361)

*except for number of patients, **Confidence Interval, 95%

Figure 1. Average service costs per patient per specified period, health care system perspective (US\$)

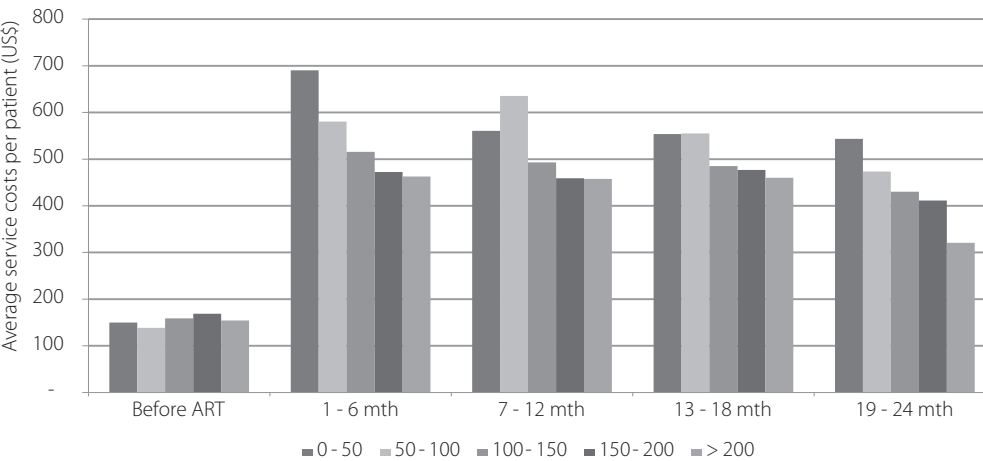


Table 4. Patient costs of accessing ART (patient’s perspective) (US\$)

CD4 LEVEL AT THE START OF ART	ESTIMATED AVERAGE PER VISIT ACCESS COSTS				MONTHLY HOUSEHOLD INCOME*
	Average transportation cost	Average estimated productivity loss	Average fee for clinic	Average per visit total costs	
0 – 200 (n=17)	6 (0-12)*	1 (0.5-2)*	2.4 (2-3)*	10 (3 – 16)**	71 (42 – 101)**
>200 (n=23)	5 (2-7)*	3 (2-5)*	2	11 (4 – 18)**	147 (72 – 221)**

*average, **Confidence Interval, 95%

Discussion

To our knowledge, this study is the first in Indonesia and among the few in Asia [21,22] to estimate the cost of providing ART. The overall cost profile shows that the total costs and average costs per patient are reduced when patients’ CD4 levels are higher at the time of clinic enrollment and ART initiation. In most instances, hospitalization, OI treatment, and ART average costs per patient decrease with longer use of ART. During the early phase of the treatment, the highest costs are the costs of hospitalization, OI treatment, and ART initiation; these costs decrease over time as a result of patients’ improved health. This trend is comparable with the results of a study conducted in Southern Africa [23].

These findings lead to several observations in response to the research questions. Regarding the cost of treatment and potential efficiency gain, the study confirms the hypothesis that the

following two measures have potential to improve efficiency in ART delivery.

First, early ART initiation. Most cost items are lower when patients' CD4 cell counts are higher at ART initiation and especially the total cost share of hospitalization and OI treatment was reduced. CD4 cell counts can predict the likelihood of OIs; patients with CD4 cell counts >200 cells/mm³ appear to be at lower risk for the majority of OIs, compared with patients with <200 cells/mm³ [24–27] and this explains our study results. Additionally, early treatment also reduces (1-year) mortality in Indonesia and its cost-effectiveness in resource-limited settings as well as its impact on the global epidemic have been proven [4,28]

Second, alternative diagnostics. Before ART initiation, costs are dominated by laboratory tests (CD4, viral load, and routine laboratory tests) followed by outpatient visits and hospitalization. After ART initiation, costs were dominated by ARV drugs followed by laboratory tests. Although efficiency gains in hospitalization and ARV use might be difficult, gains are possible for laboratory test costs, as is found in the DART trial in four African countries [29], which showed that ART can be delivered safely without routine laboratory monitoring for toxicity. A recent study within the same hospital clinic with our study demonstrated that the total lymphocyte count (TLC) is a good alternative for CD4 testing as it is much cheaper and easier to implement in rural settings. Combining TLC test results with an algorithm of simple patient characteristics could save US\$14 per patient compared with the current scenario [8]. Also, De Jong et al. (2012) [9] in Indonesia (study conducted at the same clinic as our study) and Kumarasamy et al. (2002) [30] in India found that TLC may reduce the need for routine CD4 measurements during ART (excepting the first year of treatment). In Indonesia, another method to reduce laboratory costs is proposed by Indrati et al. (2009) [10], who found that a dual-test or single rapid-test algorithm (instead of a serial three-test algorithm) may be just as accurate and more cost-effective, although the single rapid-test should be interpreted carefully. Although these alternative laboratory testing methods may lead to efficiency gains, additional study is needed to determine the cost savings.

Regarding our second research question about scaling up ART, the study indicates that although increased ART coverage may cause a large increase in health expenditure in the short run [22,31], it could also save costs in the long run. By reaching more people in need of ART, assuming that these are detected at earlier stages, costs related to opportunistic infections and hospitalization may be avoided as has been shown in our study. Importantly, providing ART can also act as HIV/AIDS prevention [32,33] because ART treatment reduces transmission rates. Universal voluntary HIV testing and early ART could therefore have a major effect on the HIV/AIDS epidemic and could be cost saving [4,34]. The costs of treatment of new HIV infections will be averted and may potentially free resources to prevent even more infections [11]. Considering these findings, we suggest further study regarding advantages (e.g., health benefits of early treatment) and disadvantages (e.g., budget impact) of scaling up ART in Indonesia from both the short term and long term perspective.

Table 5. Recommendation on role of clinics in delivering ART[†]

COSTS ITEMS	TYPE OF CLINIC	
	Hospital	Community/Primary Health Care Centre
Hospitalization	+	-
Outpatient visits	+/-	+
OI treatment	+*	+
ARV drugs	+/-	+
CD 4 test	+	-
Viral load test	+**	-
Routine lab test	+	+/-

[†] '+' and '-' denote respectively a role of high and low importance for the clinic in the specified activities in HIV/AIDS control.

* for severe cases; ** if necessary, ART = antiretroviral treatment

In terms of the location for scaling up ART, we cannot draw strong conclusions on the basis of the costing analysis in the hospital setting only. Yet, there seem to be advantages in scaling up ART at the community level as this may potentially increase early detection and reduce the burden in hospital clinics [35]. Also, the shorter waiting and travel time to the clinic may lead to lower patient's costs and better uptake and adherence of ART [13,14,36]. In this scenario, the hospital and community health centres will have different roles (Table 5). The hospital will be a referral centre for complicated AIDS cases and treatment of OIs just as current practice [35,36]. Because patients become relatively stable over time (indicated by decrease in hospitalization and OI treatment over time) they could continue ART at community clinics, reducing the hospital burden. Patients that initiate ART at >200 cell/mm³ could also obtain ART at the community health care center, as our analysis suggests that hospitalization and OIs are rare in this population. In addition, patients mostly utilize first line ARV, and no patients with CD4 cell counts >100 cells/mm³ switch to second line ARV (Table 2), indicating a low rate of treatment failure within this group [37]. As such, the ARV distribution (in terms of medicine type) in community/primary health care centres for patients with CD4 cell counts >100 cells/mm³ might not be too complex, as most patients are likely to require only first line ARV. Currently, there are only two primary health care centers in Bandung that provide ART, which presents considerable potential to increase the service to other community clinics.

However, providing ART at all community health clinics in Indonesia at this stage seems inefficient due to the low HIV prevalence in the general population which will result in a low patient load per clinic for which all community staff will require training [38]. Therefore, providing HIV services through clinics in certain high prevalence settings such as prisons or cities may be preferable [39,40], although this strategy requires further study.

Regarding our third research question about patients' financial burden, the study shows that

patient's non-health care costs per visit are US\$10 and US\$11, for patients with CD4 cell counts below and above 200 cells/mm³. This relates to approximately 14% and 7% of their monthly income, respectively. Especially for patients with CD4 cell counts <200 cells/mm³ these costs could be a barrier, as it exceeds 10% of their monthly income and can be considered to be catastrophic for a household economy [41].

Transportation comprises the highest proportion of costs: 62% and 43% for patients with CD4 cell counts below and above <200 cells/mm³, respectively, and this is comparable with the finding of Riyarto et al. [15] in Indonesia. A study by Haroen et al. [unpublished data] in Bandung, Indonesia, and international studies by Portelli et al. [13], Brinkhof et al. [14], and Posse et al. [12] have shown that transportation costs are a common reason why patients cease ARV. This information provides another reason to scale up ART at community level, as it likely reduces transportation costs for patients and may increase the uptake of ART, especially of patients with CD4 cell counts <200 cells/mm³.

Study limitations

Our results should be interpreted with some caution. First, this study has evaluated a contextualized ART service delivery model, which may hamper the generalizability of its results. Cost structures and levels as well as patient populations are likely to vary between clinics, and specific costing studies for other settings (e.g., other hospitals, community/primary health centers, and prisons) should be considered. Regardless, we believe that our approach is of relevance also to other resource-limited settings. Second, we may have overestimated the total patient costs of seeking and undergoing care as this was based on assumptions regarding patients' labour productivity losses, and not on empirical data collection on these losses per se. Third, although we have conducted a time motion study to control for inefficiency in ART delivery in the clinic (e.g., related to personnel and equipment), discrepancies may still exist, and we may have over- or undervalued the total costs. Fourth, we did not perform any comparison between WHO CHOICE estimates (that we used for calculating inpatient cost) and any local data. Although this is an important aspect, currently there is very limited local data available to do this comparison.

Conclusions

Three main conclusions can be derived from our study. First, we show that the costs of providing ART are highest during the early phase of treatment, and will decrease and stabilize as treatment progresses. Second, our findings suggest that efficiency gains can be realized by early treatment initiation (which may reduce hospitalization, OI drug/treatment costs, and patient mortality) and by applying alternative laboratory tests. Third, scaling up ART at the community level has potential to save costs and improve uptake and adherence. However, provision of ART at all community clinics seems inefficient due to the low prevalence in the general population and options to select certain clinics in high prevalence areas need further investigation. ■

Reference

1. Indonesian National AIDS Commission (2012) Republic of Indonesia Country Report on the Follow up to the declaration of commitment on HIV/AIDS (UNGASS). Reporting Period 2010–2011. Jakarta: Indonesian National AIDS Commission.
2. Ministry of Health of Indonesia (2008) Mathematic Model of HIV Epidemic in Indonesia. Jakarta: Ministry of Health of Indonesia.
3. AIDSdatahub (2014) Indonesia country profile. Available: <http://www.aidsdatahub.org/en/country-profiles/indonesia>. Accessed 31 March 2014.
4. Granich RM, Gilks CF, Dye C, De Cock KM, Williams BG (2009) Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model. *Lancet* 373: 48–57.
5. Long L, Brennan A, Fox MP, Ndibongo B, Jaffray I, et al. (2011) Treatment outcomes and cost-effectiveness of shifting management of stable ART patients to nurses in South Africa: an observational cohort. *PLoS Med* 8: e1001055.
6. Chan P, Karthikeyan K, Stephen J, Ramesh N, Palicheralu B, et al. (2008) WHO integrated management of adult and adolescent illness package for HIV care helps strengthen primary health systems in two high HIV burden districts of Southern India. *AIDS* 2008 XVII. International AIDS conference.
7. Srikantiah P, Ghidinelli M, Bachani D, Chasombat S, Daoni E, et al. (2010) Scale-up of national antiretroviral therapy programs: progress and challenges in the Asia Pacific region. *AIDS* 24 Suppl 3: S62–71.
8. Oudenhoven HPW, Meijerink H, Wisaksana R, Oetoyo S, Indrati A, et al. (2011) Total lymphocyte count is a good marker for HIV-related mortality and can be used as a tool for starting HIV treatment in a resource-limited setting. *Trop Med Int Health* 16: 1372–1379.
9. De Jong MA, Wisaksana R, Meijerink H, Indrati A, van de Ven AJAM, et al. (2012) Total lymphocyte count is a reliable surrogate marker for CD4 cell counts after the first year of antiretroviral therapy: data from an Indonesian cohort study. *Trop Med Int Health* 17: 581–583.
10. Indrati AR, van Crevel R, Parwati I, Tjandrawati A, Noormartany, et al. (2009) Screening and diagnosis of HIV-infection in Indonesia: one, two or three tests? *Acta Med Indones* 41 Suppl 1: 28–32.
11. Stover J, Bertozzi S, Gutierrez J-P, Walker N, Stanecki KA, et al. (2006) The global impact of scaling up HIV/AIDS prevention programs in low- and middle-income countries. *Science* 311: 1474–1476.
12. Posse M, Meheus F, van Asten H, van der Ven A, Baltussen R (2008) Barriers to access to antiretroviral treatment in developing countries: a review. *Trop Med Int Health* 13: 904–913.
13. Portelli MS, Tenni B, Kounnavong S, Chanthivilay P (2012) Barriers to and Facilitators of Adherence to Antiretroviral Therapy Among People Living With HIV in Lao PDR: A Qualitative Study. *Asia Pac J Public Health*.
14. Brinkhof MWG, Pujades-Rodriguez M, Egger M (2009) Mortality of patients lost to follow-up in antiretroviral treatment programmes in resource-limited settings: systematic review and meta-analysis. *PLoS One* 4: e5790.
15. Riyarto S, Hidayat B, Johns B, Probandari A, Mahendradhata Y, et al. (2010) The financial burden of HIV care, including antiretroviral therapy, on patients in three sites in Indonesia. *Health Policy Plan* 25: 272–282.
16. Drummond MF, Sculpher MJ, Torrance GW (2005) *Methods for the Economic Evaluation of Health Care Programmes*. New York: Oxford University Press.
17. Ministry of Finance (MoF) of Indonesia (2007) Circular Letter No. SE-03/PB/2007 on the Main Salary Adjustment for Government Official, Judge of General, State Administrative, and Religious Courts, National Army, and National Police. Jakarta: Ministry of Finance.
18. Adam T, Evans DB, Murray CJ (2003) Econometric estimation of country-specific hospital costs. *Cost Eff Resour Alloc* 1: 3.
19. Bender MA, Kumarasamy N, Mayer KH, Wang B, Walensky RP, et al. (2010) Cost-effectiveness of tenofovir as first-line antiretroviral therapy in India. *Clin Infect Dis* 50: 416–425.
20. The World Bank (2010) Official Exchange Rate (LCU per US\$, period average) 2010. Available: <http://data.worldbank.org/indicator/PANUSFCRF>. Accessed 17 June 2014.
21. Paton NI, Chapman CAT, Sangeetha S, Mandalia S, Bellamy R, et al. (2006) Cost and cost-effectiveness of antiretroviral therapy for HIV infection in Singapore. *Int J STD AIDS* 17: 699–705.

22. Kitajima T, Kobayashi Y, Chaipah W, Sato H, Chadbun-chachai W, et al. (2003) Costs of medical services for patients with HIV/AIDS in Khon Kaen, Thailand. *AIDS* 17: 2375–2381.
23. Leisegang R, Cleary S, Hislop M, Davidse A, Regensberg L, et al. (2009) Early and late direct costs in a Southern African antiretroviral treatment programme: a retrospective cohort analysis. *PLoS Med* 6: e1000189.
24. Masur H, Ognibene FP, Yarchoan R, Shelhamer JH, Baird BF, et al. (1989) CD4 counts as predictors of opportunistic pneumonias in human immunodeficiency virus (HIV) infection. *Ann Intern Med* 111: 223–231.
25. Phair J, Muñoz A, Detels R, Kaslow R, Rinaldo C, et al. (1990) The risk of *Pneumocystis carinii* pneumonia among men infected with human immunodeficiency virus type 1. Multicenter AIDS Cohort Study Group. *N Engl J Med* 322: 161–165. Available: <http://www.ncbi.nlm.nih.gov/pubmed/1967190>. Accessed 17 June 2014.
26. Miller V, Mocroft A, Reiss P, Katlama C, Papadopoulos AI, et al. (1999) Relations among CD4 lymphocyte count nadir, antiretroviral therapy, and HIV-1 disease progression: results from the EuroSIDA study. *Ann Intern Med* 130: 570–577.
27. Kovacs JA, Masur H (2000) Prophylaxis against opportunistic infections in patients with human immunodeficiency virus infection. *N Engl J Med* 342: 1416–1429.
28. Loubiere S, Meiners C, Sloan C, Freedberg KA, Yazdanpanah Y (2010) Economic evaluation of ART in resource-limited countries. *Curr Opin HIV AIDS* 5: 225–231.
29. Mugenyi P, Walker AS, Hakim J, Munderi P, Gibb DM, et al. (2010) Routine versus clinically driven laboratory monitoring of HIV antiretroviral therapy in Africa (DART): a randomised non-inferiority trial. *Lancet* 375: 123–131.
30. Kumarasamy N, Mahajan AP, Flanigan TP, Hemalatha R, Mayer KH, et al. (2002) Total lymphocyte count (TLC) is a useful tool for the timing of opportunistic infection prophylaxis in India and other resource-constrained countries. *J Acquir Immune Defic Syndr* 31: 378–383.
31. Afriandi I, Aditama TY, Mustikawati D, Oktavia M, Alisjahbana B, et al. (2009) HIV and injecting drug use in Indonesia: epidemiology and national response. *Acta Med Indones* 41 Suppl 1: 75–78.
32. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, et al. (2011) Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med* 365: 493–505.
33. Mathers BM, Degenhardt L, Ali H, Wiessing L, Hickman M, et al. (2010) HIV prevention, treatment, and care services for people who inject drugs: a systematic review of global, regional, and national coverage. *Lancet* 375: 1014–1028.
34. De Cock KM, Gilks CF, Lo Y-R, Guerna T (2009) Can antiretroviral therapy eliminate HIV transmission? *Lancet* 373: 7–9.
35. Siregar AYM, Komarudin D, Wisaksana R, van Crevel R, Baltussen R (2011) Costs and outcomes of VCT delivery models in the context of scaling up services in Indonesia. *Trop Med Int Health* 16: 193–199.
36. Wisaksana R, Alisjahbana B, van Crevel R, Kesumah N, Sudjana P, et al. (2009) Challenges in delivering HIV-care in Indonesia: experience from a referral hospital. *Acta Med Indones* 41 Suppl 1: 45–51.
37. World Health Organization HIV Department (2007) Prioritizing Second-Line Antiretroviral Drugs for Adults and Adolescents: a Public Health Approach, Report of a WHO Working Group Meeting. Geneva: World Health organization.
38. Curran J, Debas H, Arya M, Knobler S, Pray L (2005) Scaling Up Treatment for the Global AIDS Pandemic: Challenges and Opportunities. Washington: The National Academies Press.
39. Nelwan EJ, Crevel R Van, Alisjahbana B, Indrati AK, Dwiyanita RF (2010) Human immunodeficiency virus, hepatitis B and hepatitis C in an Indonesian prison: prevalence, risk factors and implications of HIV screening. *Trop Med Int Heal* 15: 1491–1498.
40. World Health Organization (2004) Scaling up HIV/AIDS care: service delivery & human resources perspectives. Geneva: World Health Organization.
41. The Economic Burden of Illness for Households in Developing Countries: A Review of Studies Focusing on Malaria, Tuberculosis, and Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (2004).

Appendix

Table A. Yearly Cost of ART outpatient service (US\$)

TYPE OF COST	US\$ (2010)	%
1. CAPITAL COST (Annualized)		
1.1 Personnel (trainings & workshops)	111.37	0.5
1.2 Building/Space	477.24	2.0
1.3 Equipments	510.72	2.1
Subtotal	1,099.33	
2. RECURRENT COST		
2.1 Personnel (number)	21,123.40	91.7
Medical doctor (4)	6,701.66	
Nurse (2)	5,370.67	
Laboratory (1)	1,196.22	
Administration and cleaning service (6)	15,178.81	
2.2 Supplies	895.13	3.7
Subtotal	23,018.54	
Total	24,117.86	
Unit cost per visit	11.69	

Table B. Average unit costs of OI treatment by CD 4 cell count at the beginning of ART (US\$)

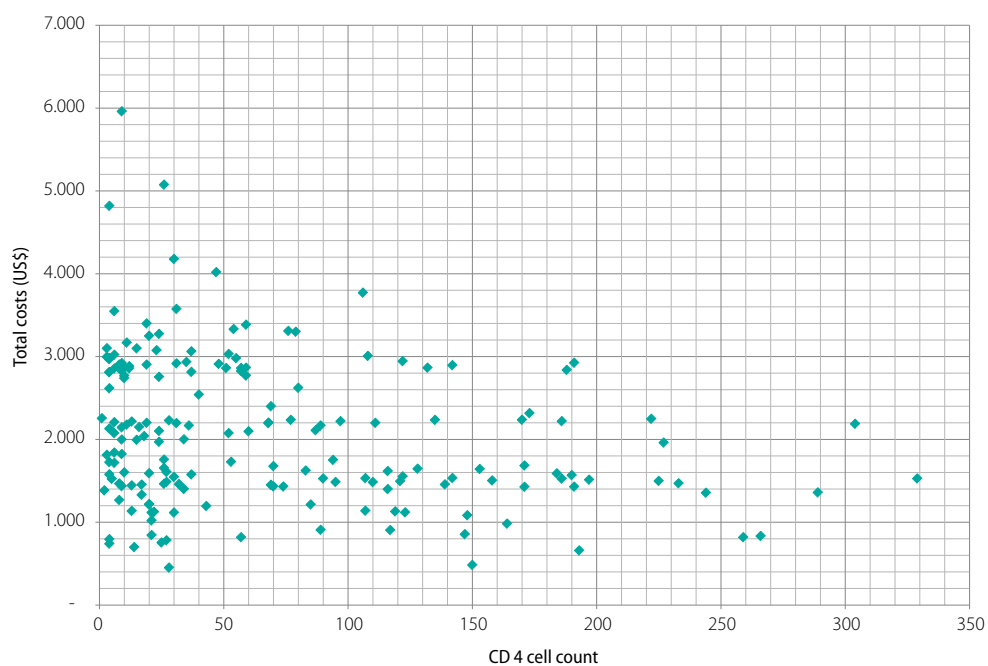
CD 4 CELL COUNT	PERIOD				
	Before ART*	1 - 6 months*	7 - 12 months*	13 - 18 months*	19 - 24 months*
0-50	1 (0-2)	113 (48-179)	23 (3-42)	7 (0-16)	25 (0-60)
50-100	0.4 (0-1)	22 (1-43)	64 (0-170)	0.4 (0-1)	0.3 (0-1)
100-150	-	37 (0-94)	3 (0.1 – 7)	2 (0-3)	0.2 (0-0.4)
150-200	-	4 (0-9)	0.2 (0-1)	0.4 (0-1)	-
>200	-	0.1 (0-0.3)	-	-	-

*Confidence Interval 95%

Table C. Unit Costs per Cost Item (US\$)

COSTS ITEM	UNIT COST	SOURCE
Inpatient day	19.2	WHO CHOICE
Outpatient visit	11.7	Own calculation
Average unit costs of ARV drugs (min-max)		
First line	28 (7-79)	Kimia Farma
Second line	90 (56-117)	Kimia Farma and Bender et al., 2010
CD 4 test	13.2	Hospital Decree
Viral load test	66	Hospital Decree
Average unit costs of laboratory tests (confidence interval)	6 (4-8)	Hospital Decree

Figure A. HIV treatment total costs per patient on ART, over 24 months



- **Sub-question 3**
**What is the performance of
HIV/AIDS interventions on
criteria for priority setting?**

CHAPTER 6

Cost-effectiveness of scaling up voluntary counselling and testing in West-Java, Indonesia

Published as:

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Abstract

Background: Voluntary counseling and testing (VCT) is a key component in combating Indonesia's growing HIV epidemic, but coverage among most-at-risk populations is low, approximately 30%. Indonesia's national HIV/AIDS strategy aims for coverage of 80% through a community-based approach. Because information on costs and health effects is lacking, this study aims 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 estimates were most sensitive to the impact of VCT on condom use and to the population size of clients of female sex workers (FSW), but were overall robust. The total costs for scaling up community-based VCT range between US\$1.3 and US\$3.8 million per year and require the number of VCT clinics integrated at public community health centers to increase from 6 in 2010 to 594 in 2030.

Conclusion: In our analysis, 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.

Background

In most Asian countries national HIV epidemics are stabilizing, but Indonesia's is growing [1]. The epidemic is concentrated among risk groups, such as people who inject drugs (PWID) and female sex workers (FSW), 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 at a very late stage, reflected in extremely low median CD4 cell counts (33/ml among PWID and 84/ml among non-PWID) [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. (2011) [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 US\$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].

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

2009		2010	2011	2012	2013	2014							
Most-at-risk populations (size in West-Java province in 2009)	Population covered												
	Coverage (%)												
	PWID (9,596)	37.02	3,551	44	4,313	64	6,403	68	6,940	72	7,496	80	8,490
	FSW (37,422)	33.42	12,498	48	18,337	56	21,798	64	25,387	68	27,472	72	29,614
	Higher risk MSM (15,117)	22.82	3,447	22.8	3,521	36	5,674	48	7,718	56	9,184	64	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 FSW (204,200)	2.2#	4,492	15	31,293	23	48,971	30	65,159	35	77,540	40	90,334
	Prisoners (20,199)	11.4#	2,304	48	9,851	64	13,318	68	14,344	72	15,389	80	17,303
	Partners PWID (5,829)	0.0#	0,0	2	119	4	243	8	496	12	759	20	1,289
	Total (294,132)	7.9	27,806	23.0	68,972	32.0	97,967	38.9	121,625	43.8	139,442	49.1	159,352

Note: population size increases over the years by overall West-Java population growth

PWID = people who inject drugs, FSW = 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 [7]

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 West-Java province, with 40 million inhabitants and a high HIV prevalence in most-at-risk populations: 42.8% in PWID, 11.6% in direct FSW, and 3.3% in indirect FSW (direct FSW are those working in brothels and indirect FSW 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. To date in West-Java, 59 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 27,007 people. However, in 2009 overall coverage was only 30% among the majority of most-at-risk populations and 2% among clients of FSW (Table 1) [3,7]. Because many stakeholders agreed upon a strategy of scaling up community-based 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 life 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 FSW, PWID, higher risk MSM, transgenders, clients of FSW, prisoners, and partners of PWID. 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 (see 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, 87% of the targeted people receive VCT at public community health centers, 9% at private community health centers, 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 Appendix. Because of model limitations we only modeled the impact of a reduction of condom use in contacts between direct and indirect FSW and their clients, PWID and FSW and their spouses or regular partners, and between MSM and their male partners. In our sensitivity analysis we anticipated 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 PWID 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]:

$$DALY = YLL + YLD$$

Years of Lives Lost (YLL) due to AIDS related death:

$$YLLs[r, K, \beta] = \frac{KCe^{ra}}{(r+\beta)^2} \left\{ e^{-(r+\beta)(L+a)} \left[-(r+\beta)(L+a) - 1 \right] - e^{-(r+\beta)a} \left[-(r+\beta)a - 1 \right] \right\} + \frac{1-K}{r} (1 - e^{-rL})$$

where 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 a .

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

$$YLDs[r, K, \beta] = D \left\{ \frac{K C e^{ra}}{(r + \beta)^2} \left\{ e^{-(r + \beta)(L + a)} \left[-(r + \beta)(L + a) - 1 \right] - e^{-(r + \beta)a} \left[-(r + \beta)a - 1 \right] \right\} + \frac{1 - K}{r} (1 - e^{-rL}) \right\}$$

where 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; a = age of onset 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. (2011) 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 Indonesian 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]

ANNUAL COSTS OF DELIVERING VCT SERVICE				
Type of cost / clinic setting	Public community health center†	Private community health center	Hospital	Prison
Capital costs (annualized)				
Personnel training and 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
<i>Capital cost per VCT</i>	<i>2</i>	<i>6</i>	<i>3</i>	<i>10</i>
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
<i>Recurrent cost per VCT</i>	<i>12</i>	<i>48</i>	<i>65</i>	<i>12</i>
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 $\pm 25\%$ 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 $\pm 25\%$ approach. All uncertainty ranges are presented between brackets in an additional table in the Appendix.

Results

Between 2010 and 2014, scaling up VCT will increase condom use for direct FSW from 62% to 69%, for indirect FSW from 60% to 67%, for MSM from 45% to 55%, for sexual contact between PWID and FSW from 54% to 62%, and for sexual contact between PWID 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 PWID, 34.0% to 21.7% for FSW, 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 6 in 2010 to 594 in 2030 in order to provide VCT services to more than 180,000 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 FSW, HIV prevalence in the general population, population size of FSW, and condom use between FSW 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 infection in West Java

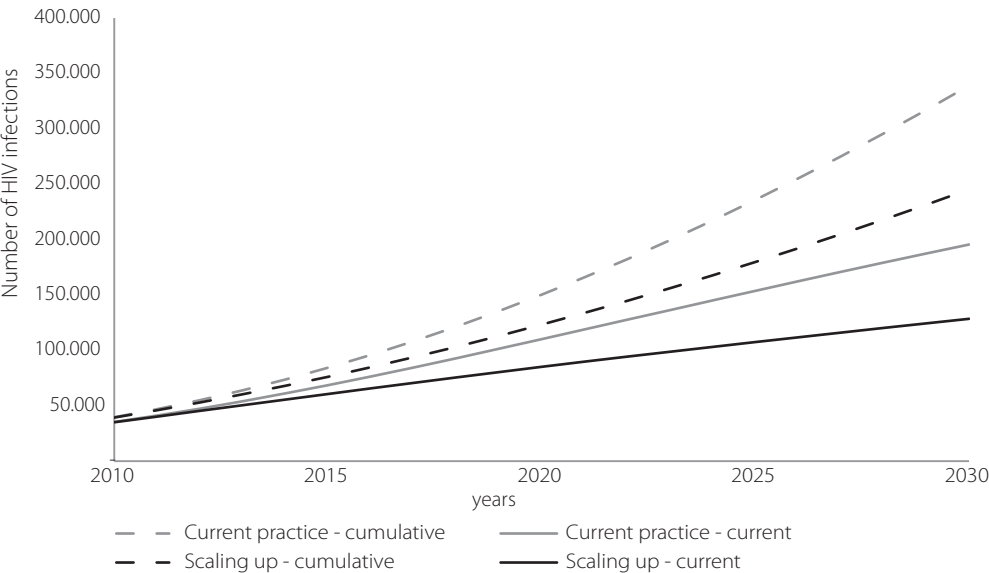
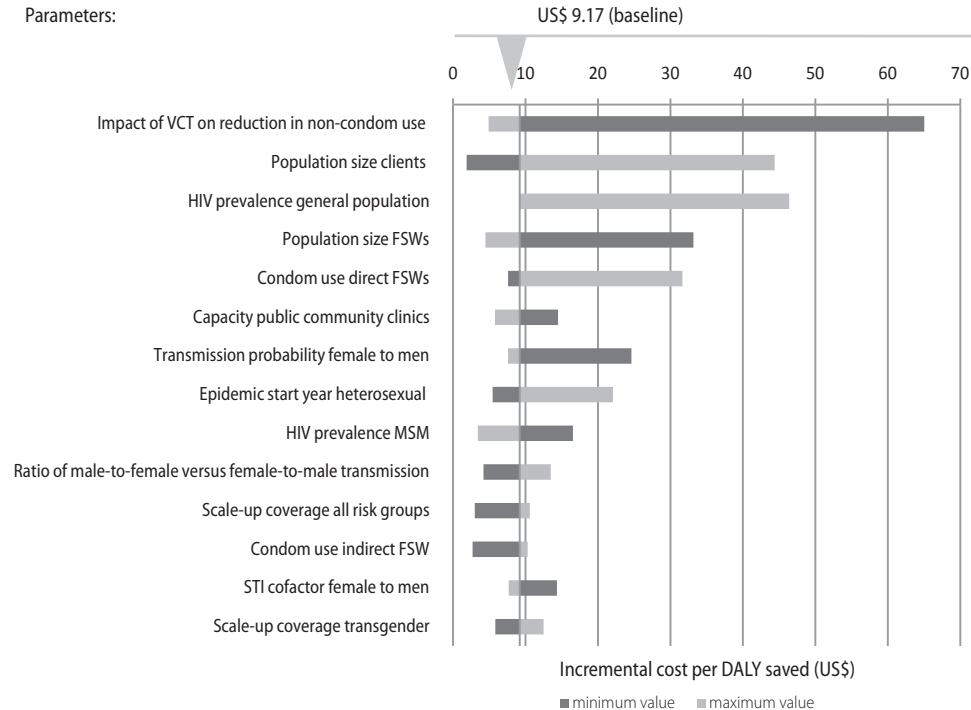


Figure 2. Results of one-way sensitivity analysis of incremental costs per DALY saved



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 while in 2010 the national HIV/AIDS expenditure for all 33 provinces together was only 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 10 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. (2012) 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, 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.

tive, 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.

Conclusions

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. ■

References

1. AIDSDatab (2012) Indonesia country profile 2012. Available: <http://www.aidsdatahub.org/Country-Profiles/Indonesia>. Accessed 10 December 2012.
2. IBBS (2007) Integrated Biological-Behavioral Surveillance among Most-at-Risk Groups (MARG) in Indonesia. Jakarta. Available: <http://www.aidsindonesia.or.id/news/5551/1/10/09/2012/Surveilans-Terpada-Biologis-dan-Perilaku-STBP-IBBS-2011#sthash.zrhsDoPS.2Cb9mzsi.dpbs>. Accessed 10 December 2012.
3. Indonesian National AIDS commission (2010) Republic of Indonesia Country Report on the Follow up to the Declaration of Commitment on HIV/AIDS (UNGASS). Reporting period 2008-2009. Jakarta: Indonesian National AIDS commission. Available: http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2010countries/indonesia_2010_country_progress_report_en.pdf. Accessed 10 December 2012.
4. Ministry of Health of Indonesia (2008) Mathematic Model Of HIV Epidemic In Indonesia. Available: <http://spiritia.or.id/Doc/model0814.pdf>. Accessed 10 December 2012.
5. Wisaksana R, Indrati AK, Fibriani A, Rogayah E, Sudjana P, et al. (2010) Response to first-line antiretroviral treatment among human immunodeficiency virus-infected patients with and without a history of injecting drug use in Indonesia. *Addiction* 105: 1055–1061.
6. UNAIDS (2001) The Impact of Voluntary Counselling and Testing: a Global Review and Challenges. Geneva: UNAIDS. Available: http://data.unaids.org/publications/irc-pub02/jc580-vct_en.pdf Accessed 10 December 2012.
7. Indonesian National AIDS Commission (2009) Strategy of the National Action Plan for HIV/AIDS 2010-2014. Jakarta. Available: <http://www.aidsindonesia.or.id/strategidanrencana-aksi-nasionalpenanggulangan-hiv-dan-aids-tahun-2010-2014>. Accessed 10 December 2012.
8. Siregar AYM, Komarudin D, Wisaksana R, van Crevel R, Baltussen R (2011) Costs and outcomes of VCT delivery models in the context of scaling up services in Indonesia. *Trop Med Int Health* 16: 193–199.
9. Wisaksana R, Alisjahbana B, van Crevel R, Kesumah N, Sudjana P, et al. (2009) Challenges in delivering HIV-care in Indonesia: experience from a referral hospital. *Acta Med Indones* 41 Suppl 1: 45–51.
10. Siregar AYM, Komarudin D, Leuwol B, Afriandi I, Djuhaeni H, et al. (2009) Economic aspect of HIV/AIDS control and injecting drug use in Indonesia. *Acta Med Indones* 41 Suppl 1: 70–74.
11. Galárraga O, Colchero MA, Wamai RG, Bertozzi SM (2009) HIV prevention cost-effectiveness: a systematic review. *BMC Public Health* 9 Suppl 1: S5.
12. Afriandi I, Siregar AYM, Meheus F, Hidayat T, van der Ven A, et al. (2010) Costs of hospital-based methadone maintenance treatment in HIV/AIDS control among injecting drug users in Indonesia. *Health Policy* 95: 69–73.
13. Wammes JGG, Siregar AY, Hidayat T, Raya RP, van Crevel R, et al. (2012) Cost-effectiveness of methadone maintenance therapy as HIV prevention in an Indonesian high-prevalence setting: a mathematical modeling study. *Int J Drug Policy* 23: 358–364.
14. Ministry of Health West Java (2011). HIV/AIDS report, quarter October-December 2010. Bandung: Ministry of Health.
15. Ministry of Health (2007) Workshop on Resource Needs Model in Bogor. Jakarta: Ministry of Health.
16. Ministry of Health West Java (2010) Presentation: Sustainable services for PLWHA at the level of basic services. Bandung: Ministry of Health West Java.
17. Bandung AIDS commission (2007) Strategy for HIV and AIDS Program in Bandung 2007-2011. Bandung: Bandung AIDS commission.
18. Brown T, Peerapatanapokin W (2004) The Asian Epidemic Model: a process model for exploring HIV policy and programme alternatives in Asia. *Sex Transm Infect* 80 Suppl 1: i19–24.
19. Saidel TJ, Des Jarlais D, Peerapatanapokin W, Dorabjee J, Singh S, et al. (2003) Potential impact of HIV among IDUs on heterosexual transmission in Asian settings: scenarios from the Asian Epidemic Model. *Int J Drug Policy* 14: 63–74.
20. Constella Futures - The Futures Group (2007) Resource needs for HIV/AIDS: model for estimating resource needs for prevention, care, and mitigation. Version INA 1.0 – September 2007. Available: http://futuresgroup.com/resources/software_models/

- resource_needs_model. Accessed 10 December 2012.
21. Sagung Sawitri AA, Sumantera GM, Wirawan DN, Ford K, Lehman E (2006) HIV testing experience of drug users in Bali, Indonesia. *AIDS Care* 18: 577–588.
22. Denison JA, O'Reilly KR, Schmid GP, Kennedy CE, Sweat MD (2008) HIV voluntary counseling and testing and behavioral risk reduction in developing countries: a meta-analysis, 1990–2005. *AIDS Behav* 12: 363–373.
23. Murray CJ, Lopez AD (1994) Quantifying disability: data, methods and results. *Bull World Health Organ* 72: 481–494.
24. WHO-CHOICE (2003) Making choices in health: WHO guide to cost-effectiveness analysis. Geneva: World Health Organization.
25. IMF (2012) World Economic Outlook Database. Available: <http://www.imf.org/external/pubs/ft/weo/2010/02/weodata/index.aspx>. Accessed 10 December 2012.
26. Baltussen R, Niessen L (2006) Priority setting of health interventions: the need for multi-criteria decision analysis. *Cost Eff Resour Alloc* 4: 14.
27. Aldridge RW, Iglesias D, Cáceres CF, Miranda JJ (2009) Determining a cost effective intervention response to HIV/AIDS in Peru. *BMC Public Health* 9: 352.
28. Dandona L, Kumar SGP, Kumar GA, Dandona R (2010) Cost-effectiveness of HIV prevention interventions in Andhra Pradesh state of India. *BMC Health Serv Res* 10: 117.
29. Sweat M, Gregorich S, Sangiwa G, Furlonge C, Balm-er D, et al. (2000) Cost-effectiveness of voluntary HIV-1 counselling and testing in reducing sexual transmission of HIV-1 in Kenya and Tanzania. *Lancet* 356: 113–121.
30. Riyarto S, Hidayat B, Johns B, Probandari A, Mahen-drathata Y, et al. (2010) The financial burden of HIV care, including antiretroviral therapy, on patients in three sites in Indonesia. *Health Policy Plan* 25: 272–282.

Appendix

Description of the Asian Epidemic Model and Resource Needs Model

Asian Epidemic Model (AEM)

The AEM is a dynamic, deterministic compartment model designed for macro simulation of populations and key processes driving HIV transmission; it is described in detail elsewhere [1,2]. The AEM considers HIV transmission within a population aged ≥ 15 years and divides the population in nine compartments: **1)** clients of FSW; **2)** males who are not clients of FSW; **3)** lower risk, general population females; **4)** direct FSW; **5)** indirect FSW; **6)** PWID in higher risk sharing networks; **7)** PWID in a lower risk or not sharing network; **8)** male sex workers; and **9)** MSM who are not sex workers. Each compartment is divided into those infected with HIV and not infected. Movement between compartments is determined by the average duration of sex work, or death, or infection with HIV. The AEM includes data on factors such as demography, population size, injecting, sexual behavior, and epidemiology for the years 1975-2030. The most important model output data are the number of new HIV infections, AIDS cases, deaths, and routes of transmission per year between 1975 and 2030. The number of new infections is calculated based on the prevalence in the partner population, the frequency of sex acts or injections, and the probability of HIV transmission. Corrections are made for increased HIV transmission due to the presence of other sexually transmitted infections (STIs) or the lack of male circumcision by adding co-factors that increase the effective transmission probability by a fixed amount. Finally, a correction is made for protective behaviors such as condom use. To fit the model, the AEM fitting parameters (e.g. probabilities of transmission, Table A) are adjusted in order to obtain a reasonable match between the prevalence reported and the prevalence calculated by the AEM.

We used the West-Java baseline model as defined by local leading experts from AID sina (Portal for Indonesia AIDS community) and the East-West Center (EWC), and as is compatible with data used by the MoH. This model is based on the National Indonesian AEM and adapted with local data for West-Java and assumptions made by ECW and AID sina, who consulted experts in MoH and AIDS commissions. Data sources were retrieved to verify the data used in the model and only minor adaptations were made. Table A presents an overview of the model parameters, and their baseline values and references. The AEM uses these data to project HIV prevalence for most-at-risk-populations. We adjusted AEM fitting parameters so that projected HIV prevalence fits the observed HIV prevalence among PWID, FSW, and MSM from surveillance studies in West-Java. HIV prevalence among the general population was not used for model fitting. Data on population sizes, and on epidemiological and behavior variables were sourced from government monitoring and evaluation systems and the International Biological Behavior Surveillance System (IBBS); no change in behavior parameters was assumed after 2007 (last year data of IBBS) [3]. The AEM was used, first, to reflect current practice of VCT delivery (base case) and second, to reflect the impact of increased condom use among most-

at-risk populations caused by scaling up VCT. This increase in condom use was estimated by the RNM, described below, and altered in the AEM. As the AEM does not represent transgenders, prisoners, and partners of PWID, these groups were excluded in our effectiveness analysis because we expected these groups to have minor impact on the spread of the epidemic.

Resource Needs Model

The RNM [4] was used primarily to estimate the resources needed for both the base case and the strategy of scaling up VCT, by combining population sizes, coverage of VCT, and unit costs. The RNM also calculated the impact of VCT on risk behavior, based on the RNM impact matrix (originally part of GOALS model [5]). This matrix is based on a literature review of VCT effectiveness on risk behavior [6] and differentiates the impact of VCT on the reduction in non-condom use for low-, middle-, and high-risk populations. We assumed that all populations targeted by VCT in the scaling up strategy are high-risk populations and used a baseline VCT impact value of 44% reduction in non-condom use.

Table A. Baseline values, sensitivity ranges and references of parameters used in Asian Epidemic Model adapted for West-Java Province

PARAMETER	BASELINE VALUE (sensitivity range)	REFERENCE
AEM fitting parameters		
Transmission probability		
Male to female (Pm_f)	0.00125 (-/+ 25%)	Fitting
Male to male (Pm_m)	0.01790 (-/+ 25%)	Fitting
Needle stick	0.03 (-/+ 25%)	Fitting
Ratio of male to female versus female to male transmission	3.80 (-/+ 25%)	Fitting
PWID network parameter (%)	80.00 (-/+ 25%)	Fitting
STI cofactor		
Female to male	16.00 (-/+ 25%)	Fitting
Male to female	20.00 (- 25%)	Fitting
Male to male	1.00 (+25%)	Fitting
Circumcision factor	2.55 (1.91-3.19)	Fitting
Epidemic start year		
PWID	2002 (1996-2004)	Fitting
Heterosexual	1989 (1985-1993)	Fitting
MSM	1992 (1988-1996)	Fitting
Population sizes (2006)		
FSW	37,422 (24,970-47,190)	[7]
FSW who are direct FSW (%)	62.20 (-/+ 25%)	[7]
PWID	9,596 (6,380-11,900)	[7]
Higher risk MSM	15,117 (14,361-15,872)	[7]
Lower risk MSM	133,220	[7]
Male sex workers	2,062	[7]
Prisoners	20,199 (15,149-25,249)	[7]
Transgender	1,769 (1,568-1,733)	[7]
Clients of FSW	204,200 (121,009 - 287,378)	[7]
Partners of PWID	5,829 (5,537-6,120)	[7]
Males age 15+	14,596,400	[8]
Females age 15+	14,152,600	[8]
HIV prevalence (% in 2007, used for fitting)		
Direct FSW	11.60 (-/+25%)	[3]
Indirect FSW	3.29 (-/+25%)	[3]
PWID	42.80 (-/+25%)	[3]
MSM	2.00 (-/+25%)	[3]
General population	0.00 (0.00-3.00)	[3]
Heterosexual behavior and STIs (2007)		
Direct female sex workers		
Direct to indirect FSW behavior movement each year (%)	1	Default value
Number of clients per day	1.7	[3]
Days worked per week	5.3	[3]
Condom use with clients (%)	62 (-/+25%)	[3]
Average duration of sex work (years)	2.5	[3]
STI prevalence (% neisseria gonorrhea)	44 (-/+25%)	[3]

Table A. Continued

PARAMETER	BASELINE VALUE (SENSITIVITY RANGE)	REFERENCE
Heterosexual behavior and STIs (2007)		
Indirect female sex workers		
Number of clients per day	0.86	[3]
Days worked per week	5.5	[3]
Condom use with clients (%)	60	[3]
Average duration of sex work (years)	2.0	Local expert opinion*
STI prevalence (% neisseria gonorrhea)	22 (-/+25%)	Local expert opinion
Clients of sex workers		
Males age 15-49 visiting sex workers (%)	1.7	[7]
Average duration of being a client (years)	11	Local expert opinion
Adult males circumcised (%)	87 (-/+25%)	[9]
Male and female casual sex		
Males having casual sex in last year (%)	0.3	Local expert opinion
Females having casual sex in last year (%)	0.1	Local expert opinion
Condom use in casual sex (%)	21 (-/+25%)	[3]
Average number of casual contacts in last year (male)	1	Default value
Sex with spouses or regular partners		
Number of weekly sexual contacts with spouse/regular partner	1.4	Local expert opinion
Condom use with spouses or regular partners (%)	10	Local expert opinion
Adult population with STI (%)	0.5	Local expert opinion
PWID injecting and sexual behavior (2007)		
PWID mortality (% additional mortality per year)	1.0	Default value
PWID sharing (%)	32 (-/+25%)	[3]
Injections shared, by those in sharing group (%)	70 (-/+25%)	[3]
Number of injections each day	0.74 (-/+25%)	[3]
Average duration of injecting (years)	8.0 (-/+25%)	[3]
Sharing to non-sharing movement in a year (%)	20 (-/+25%)	Local expert opinion
Visiting FSW (%)	41 (-/+25%)	[3]
Condom use with direct FSW (%)	54 (-/+25%)	[3]
Condom use with indirect FSW (%)	54 (-/+25%)	[3]
Condom use with spouse or regular partner (%)	34 (-/+25%)	[3]
Number of contacts with regular partners (per week)	1 (-/+25%)	Default value
Injecting sex workers (ISW) (2007)Ω		
Injecting behaviors - higher frequency injecting SWs		
% of higher frequency sex workers who inject	0.1%	[3]
% of higher frequency ISW in high risk networks	0%	Default value
% of higher frequency ISW sharing	0%	Default value
% of all injections shared (sharing higher frequency SW)	0%	Default value
Number of daily injections for higher frequency ISW	0.7	[3]
Average duration of injecting for higher frequency ISW (years)	2.5	[3]
% condom use with clients (higher frequency ISWs)	62%	[3]

Table A. Continued

PARAMETER	BASLINE VALUE (SENSITIVITY RANGE)	REFERENCE
Injecting sex workers (ISW) (2007)^Ω		
Injecting behaviors - lower frequency injecting SWs		
% of lower frequency sex workers who inject	0.1%	[3]
% of lower frequency ISW in high risk networks	0%	Default value
% of lower frequency ISW sharing	0%	Default value
% of all injections shared (sharing low frequency SW)	0%	Default value
Number of daily injections for lower frequency ISW	0.7%	[3]
Average duration of injecting for lower frequency ISW (years)	2.5	[3]
% condom use with clients (low frequency ISWs)	60%	[3]
MSM sexual behavior (2007)[§]		
Higher risk MSM (Hi MSM) sexual behavior		
Reporting anal sex last year (%)	93	Local expert opinion
Number anal sex contacts last week	0.5	Local expert opinion
Average duration of same-sex behavior (years)	12.7	Local expert opinion
Shift from Hi MSM to Lo MSM	25%	Default value
MSM having sex with other female partners (%)	34	[3]
Condom use in last anal sex (%)	45 (-/+25%)	[3]
Prevalence Hi MSM with anal STI (%)	21	[3]
Lower risk MSM (Lo MSM) sexual behavior		
% of Lo MSM reporting anal sex in last year	53%	Local expert opinion
Number anal sex contacts last week (for MSM w/anal sex)	0.1	Local expert opinion
Average duration of same-sex behavior (years)	18.1	Local expert opinion
% of Lo MSM with other female partners	20%	Local expert opinion
% condom use in anal sex with other Lo MSM	48%	Local expert opinion
% Lo MSM with anal STI	5.4%	Local expert opinion
MSM sexual behavior with commercial partners		
% of Hi MSM visiting male sex workers	13%	Local expert opinion
% of Lo MSM visiting male sex workers	2%	Local expert opinion
Ratio of frequency of visiting MSW (Lo MSM/Hi MSM)	0.1	Default value
% of Hi MSM visiting female sex workers	6%	Local expert opinion
% of Lo MSM visiting female sex workers	0%	Local expert opinion
Condom use in anal sex with male sex worker (%)	50%	Local expert opinion
Condom use direct FSW (%)	62%	[3]
Condom use indirect FSW (%)	60%	[3]
Male sex workers (MSW)		
MSW size and duration		
Average duration of male sex work (years)	6.3	Local expert opinion
Shifts from Hi MSM to MSW	1%	Default value
Shifts from Lo MSM to MSW	1%	Default value
Sexual behaviors and STI with clients		
% of MSW reporting anal sex with clients in last year	93%	Local expert opinion
Number anal sex contacts last week	1.0	Local expert opinion
% MSW with anal STI	23%	Local expert opinion

Table A. Continued

PARAMETER	BASELINE VALUE (SENSITIVITY RANGE)	REFERENCE
Male sex workers (MSW)		
Female partners of MSW		
% MSW visiting female sex workers in last year	9%	Local expert opinion
% MSW with other female partners in last year	43%	Local expert opinion
Intervention characteristics (2010 onwards)		
Impact of VCT on reduction in non-condom use (%)	44 (6-93)	[6]
Distribution delivery settings		
Current practice (base-case)		
Hospitals (%)	60 (-/+25%)	[10]
Community health centers (%)	10 (-/+25%)	[10]
Private health centers (%)	20 (-/+25%)	[10]
Prison (%)	10 (-/+25%)	[10]
Scaling up VCT		
Hospitals (%)	0 (-/+25%)	Assumption
Community health centers (%)	87 (-/+25%)	Assumption
Private health centers (%)	9 (-/+25%)	Assumption
Prison (%)	4 (-/+25%)	Assumption
Clinic capacity, number of VCT per year		
Hospitals	421 (-/+25%)	Current practice
Community health centers	300 (-/+25%)	[11]
Private health centers	784 (-/+25%)	Current practice
Prison	574 (-/+25%)	Current practice
Projection period (years)	2010-2030 (2010-2020)	Assumption
Disability adjusted life years		
Discount rate	0.3 (0)	Assumption
Age weighting	0 (1)	Assumption

Note: order and categorization of parameters are in line with presentation in Asian Epidemic Model.

PWID = injecting drug users, FSW = female sex workers, MSM = men having sex with men, STI = sexual transmitted infections; ¶ Local expert opinion was given by researchers from East West Center and AIDSIna; Ω The parameter values for injecting sex workers are copied from both FSW and PWID parameter values; § The IBBS 2007 report does not discriminate between higher risk MSM, lower risk MSM and MSW, but the raw IBBS data were used by local experts for parameter estimates.

References

1. Brown T, Peerapatanapokin W (2004) The Asian Epidemic Model: a process model for exploring HIV policy and programme alternatives in Asia. *Sex Transm Infect* 80 Suppl 1: i19–24.
2. Saidel TJ, Des Jarlais D, Peerapatanapokin W, Dorabjee J, Singh S, et al. (2003) Potential impact of HIV among IDUs on heterosexual transmission in Asian settings: scenarios from the Asian Epidemic Model. *Int J Drug Policy* 14: 63–74.
3. IBBS (2007) Integrated Biological-Behavioral Surveillance among Most-at-Risk Groups (MARG) in Indonesia. Jakarta, Indonesia, 2007. Available: <http://www.aidsindonesia.or.id/surveilans-terpadu-biologi-perilaku-integrated-biological-behavioral-surveillance.html> (accessed 4 July 2012).
4. Constella Futures - The Futures Group (2007) Resource needs for HIV/AIDS: model for estimating resource needs for prevention, care, and mitigation. Version INA 1.0 – September 2007. Available: http://futuresgroup.com/resources/software_models/resource_needs_model. Accessed 10 December 2012.
5. The Futures Group International (2003) Goals model for estimating the effects of resource allocation decisions on the achievement of the goals of the HIV/AIDS strategic plan. Manual. Available: <http://futuresgroup.com/files/softwaremodels/goals.pdf>. Washington: Futures group. Accessed 4 July 2012.
6. Bollinger L. How can we calculate the “E” in “CEA”? *AIDS* 2008;22 (Suppl 1):S51–57.
7. Indonesian National AIDS Commission (2006) Estimation of risk population sizes per province. Jakarta: Indonesian National AIDS Commission.
8. Central Bureau Statistics Indonesia (Badan Pusat Statistik (BPS)) (2009) Available: <http://www.bps.go.id>. Accessed 4 July 2012.
9. Indonesia Demographic and Health Survey (IDHS) (2007) Available: http://www.motorcycleoutreach.org/FR218_April_09_2009.pdf. Accessed 4 July 2012.
10. Ministry of Health West Java (2010) Presentation: Sustainable services for PLWHA at the level of basic services. Bandung: Ministry of Health West Java.
11. Ministry of Health (2007) Workshop on Resource Needs Model in Bogor. Jakarta: Ministry of Health.

- **Sub-question 3**
**What is the performance of
HIV/AIDS interventions on
criteria for priority setting?**

CHAPTER 7

Equity in utilization of antiretroviral therapy for HIV infected people in South Africa: a systematic review

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Equity in utilization of antiretroviral therapy for HIV-infected people in South Africa: a systematic review

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Abstract

Background: About half a million people in South Africa are deprived of antiretroviral therapy (ART), and there is little systematic knowledge on who they are – e.g. by severity of disease, sex, or socio-economic status (SES). We performed a systematic review to determine the current quantitative evidence-base on equity in utilization of ART among HIV-infected people in South Africa.

Methods: We conducted a literature search based on the Cochrane guidelines. A study was included if it compared for different groups of HIV infected people (by sex, age, severity of disease, area of living, SES, marital status, ethnicity, religion and/or sexual orientation (i.e. equity criteria)) the number initiating/adhering to ART with the number who did not. We considered ART utilization inequitable for a certain criterion (e.g. sex) if between groups (e.g. men versus women) significant differences were reported in ART initiation/adherence on that criterion.

Results: Twelve studies met the inclusion criteria. For sex, 2 out of 10 studies that investigated this criterion found that men are less likely than women to utilize ART, while the other 8 found no differences. For age, 4 out of 8 studies found inequities and reported less utilization for younger people. For area of living, 3 out of 4 studies showed that those living in rural areas or certain provinces have less access and 2 out of 6 studies looking at SES found that people with lower SES have less access. One study which looked at the marital status found that those who are married are less likely to utilize ART. For severity of disease, 5 out of 6 studies used more than one outcome measure for disease stage and reported within their study contradicting results. One of the studies reported inconclusive findings for ethnicity and no study had looked at religion and sexual orientation.

Conclusions: It seems that men, young people, those living in certain provinces or rural areas, people who are unemployed or with a low educational level, and those being unmarried have less access to ART. As studies stem from different contexts and use different methods conclusions should be taken with caution.

Background

South Africa is home to the largest HIV-infected population worldwide, with 6.1 million people living with HIV/AIDS in 2012 [1]. The country also has the largest antiretroviral therapy (ART) program worldwide: with domestic investments amounting to US\$1.9 billion in 2011 [2], it provided treatment to about 80% (2.0 million people) of all eligible people in 2012 [1]. Current South African guidelines state that all those with CD4 cell counts of ≤ 350 cells/ μL are eligible [3].

Nevertheless, a significant treatment gap of about half a million people remains between those who receive treatment and those in need according to the eligibility criteria [1]. There is little knowledge on which people are deprived from treatment – e.g. by severity of disease, sex, age, socio-economic status (SES) and area of living [4], limiting the development of policy measures to specifically target and improve treatment coverage among these groups. This is illustrated in South Africa's 'National Strategic Plan on HIV, STIs and TB 2012-2016' which flags the importance of inequalities in treatment utilization but is not specific on which marginalized groups should be targeted [5].

It is clear that ART not only improves a patient's health and survival [6,7], but also substantially reduce their infectiousness [8,9]. As a result, ART can play an important role in controlling the epidemic in South Africa [10–12]. The World Health Organization (WHO) recently released new consolidated guidelines, taking both the prevention and treatment benefits of ART into account [13,14]. The new guidelines state that ART should be provided for HIV infected people with a CD4 cell count of ≤ 500 cells/ μL , who are in a serodiscordant relationship, and/or pregnant [14]. In addition, the WHO also states that guidelines should be expanded when universal access for those with CD4 cell counts of ≤ 350 cells/ μL has already been achieved [14]. As treatment programs continue to expand, identifying and targeting hard-to-reach populations will be increasingly important.

We determined the current quantitative evidence-base on equity in utilization of antiretroviral therapy (ART) among HIV-infected people in South Africa. This information may provide insight into the methods used for equity research and may help policy makers to identify and target hard-to-reach populations and reach universal ART coverage.

Methods

We performed a systematic review on the basis of the Cochrane Handbook for Systematic Reviews of Interventions, Version 5.1.0.4 [15]. Our search strategy was performed on 18 February 2013 using Pubmed, Embase, Central And Psycinfo database. Our search syntax consisted of search terms in four categories (ART, HIV, South Africa and Equity), that were combined using AND. The search strategy is presented in summary in Table 1 and in detail in Appendix A.

Table 1. Search strategy employed in systematic review of studies on equity in utilization of ART in South Africa

CATEGORY	SEARCH TERMS (IN PUBMED DATABASE)
ART	antiretroviral therapy, highly active [MeSH Terms] OR ART [title/abstract] OR HAART [title/abstract] OR AR V [title/abstract] OR ARVs [title/abstract] OR Anti-Retroviral Agents [Mesh] OR antiretroviral [title/abstract] OR anti retroviral [title/abstract] OR anti-retroviral [title/abstract] OR antiviral [title/abstract] OR therapy [title/abstract] AND
HIV	acquired immunodeficiency syndrome [MeSH Terms] OR acquired immunodeficiency syndrome [title/abstract] OR aids [title/abstract] OR hiv [MeSH Terms] OR hiv [title/abstract] OR human immunodeficiency virus [title/abstract] OR HIV infections [MeSH Terms] AND
South Africa	(South Africa [MeSH Terms] OR (South [title/abstract] AND Africa* [title/abstract])) AND
Equity	(equity [title/abstract] OR equities [title/abstract] OR inequity [title/abstract] OR inequities [title/abstract] OR equality [title/abstract] OR equalities [title/abstract] OR equal [title/abstract] OR equitable [title/abstract] OR inequality [title/abstract] OR inequalities [title/abstract] OR unequal [title/abstract] OR disparity [title/abstract] OR disparities [title/abstract] OR vulnerability [title/abstract] OR fairness [title/abstract] OR unfair [title/abstract] OR social justice [MeSH Terms] OR social justice [title/abstract] OR justice [title/abstract] OR barrier [title/abstract] OR coverage [title/abstract] OR barriers [title/abstract] OR healthcare disparities [MeSH Terms] OR health services accessibility [MeSH Terms] OR health services accessibility [title/abstract] OR access to health care[title/abstract])

Conceptual model

Following the WHO’s guidance on monitoring equity in AIDS treatment programs [16], we distinguished five domains of coverage: 1) availability of resources; 2) physical and financial accessibility; 3) acceptability; 4) use of service; and 5) effective coverage (defined as the proportion of the population in need of an intervention who fully comply with the recommended treatment program). This review focuses on the latter two domains as the other domains feed into these. We included studies on both ART initiation and adherence, together labeled as ‘ART utilization’. We acknowledge that an individual’s health care utilization can be explained by a function of predisposing factors (e.g. education, culture, health beliefs, age and sex), enabling factors (income, health insurance, waiting time, genetic factors) and need factors (perceived need to seek and adhere to care and professional’s judgment about people’s health status) [17]. We used the terms ‘equity’ and ‘inequity’ to reflect differences in utilization of ART by criteria such as severity of disease, age, or SES [18].

Inclusion and exclusion criteria

A study was included if it: 1) compared for different groups of HIV infected people (by sex, age, severity of disease, area of living, socio-economic status, marital status, ethnicity, religion and/or sexual orientation (i.e. equity criteria [19,20]) the number initiating/adhering to ART with the number who are not); 2) was performed in South Africa; and 3) reported in English. Although some equity criteria are social determinants of health, severity of disease is not and therefore we preferred to use the term 'equity criteria' which was put forward by WHO [19] and Tromp et al [20]. A study was excluded if it: 1) focused on prevention of mother to child transmission (PMTCT), death during follow up, barriers for accessing care or tuberculosis (TB) services for HIV infected patients; 2) was a qualitative study, comment, editorial, economic evaluation or conference abstract; 3) was a duplicate reference from different databases; and 4) reported only differences in groups by a simple comparison with the gross number of people initiating or adhering to ART. We only included studies that take into account the underlying need of a group for ART. For example, the mere fact that more women than men have access to ART does not necessarily indicate an inequity as more women than men may be infected in the country. There was no restriction for publication date for inclusion of studies. Following the Cochrane guidelines grey literature was excluded due to expected low methodological quality of studies [15].

Study selection, data extraction and quality evaluation

Two independent reviewers (CM and EM) assessed if the studies from the database search satisfied the inclusion criteria. First, all studies were screened on the basis of title and abstract, and subsequently on the basis of full-text. Reference lists of the retrieved articles were screened for additional studies (snowballing). The reviewers used a data collection form (Appendix B) to extract relevant information (study characteristics, results per equity criteria, and study limitations) from the articles. Both reviewers evaluated the quality of studies using a quality-grading protocol (Appendix B) adapted from existing protocols [15,21,22]. The protocol covers 20 indicators and for each item 0–2 points are given and added up to get an overall quality score (ranging from 0 to 40 points). Studies were categorized as low-quality (< 20 points), medium-quality (20–29) or high-quality (≥ 30). During the study selection, data extraction and quality assessment, disagreements were resolved through discussion with a third researcher (NT) until consensus was reached.

Data synthesis and analysis

A matrix was developed that containing the study results per investigated equity criterion. We established the following categories to summarize the results for each equity criteria investigated in a study: 1) associated, differences reported in ART utilization between groups (e.g. men versus women for sex) were significant ($p < 0.05$, or when 1.0 does not fall in 95% confidence interval (95%CI)); 2) not associated differences reported in ART utilization between groups were not significant (p value > 0.05 or 1.0 falls in 95%CI; contradicting results, within

one study contradicting results were reported on differences in utilization between groups; and inconclusive results, differences in ART utilization between groups was investigated but the authors drew no conclusions due to small sample sizes.

We adhered to the PRISMA guidelines for reporting of this systematic review [23].

Results

Study inclusion

From the initial search (801 articles), 268 studies were duplicates, 483 studies were excluded on the basis of title/abstract and 39 on the basis of full-text screening. Screening of the references of the remaining 11 studies resulted in one extra article and added to a total of 12 studies that are included in this review (Figure 1, Table 2).

Characteristics of included studies

Seven studies assessed inequities in ART initiation (Table 3) and five studies in ART adherence (Table 4). All studies were based on primary data analysis from observational surveys, except for one study using secondary data [24] and one review [25]. Studies defined ART initiation differently, like 'at least 14 days on ART' [26] or 'visited the ART clinic at least once after testing HIV positive' [27]. Definitions of non-adherence also varied, and were measured in terms of patients' absence at the clinic for more than one [28] three [29,30] or six [31] months, or in terms of the number of pills not taken and brought back to the clinic (clinic-based pill counts) [32]. The outcome measure used for equity criteria varied widely among studies. For severity of disease, some compared the differences in utilization of ART by WHO disease stages [27–30,32], while others used CD4 cell count levels [27–32] or viral load [29,32]. For age, many different age categories were used. Fatti *et al* [30] only included children in the study population, and the oldest age group in that sample is younger than the youngest age group in for example Govindasamy *et al* [27] (who compared people below and above 30 years of age). Six studies, all using different databases, investigated urban and rural areas of the Western Cape province and two studies reported at the national level [24,25]. More than half of the articles (seven) [26–28,30–33] were of high-quality, three had medium-quality [29,34,35] and two were of low-quality [24,25]. Table 5 gives an overview of the quality scoring per study.

Equity in utilization of ART

For sex, two [25,28] out of ten studies [25–34] that reported on this equity criterion found an association between sex and utilization of ART. In both studies (high- and low-quality) men appear to have lower utilization of ART compared to women. The other eight studies (six high- and two medium-quality) found no association [26,27,29–34]. Four [31–34] (three high and one medium-quality) out of eight studies [27–34] reported that relatively young people have a lower utilization of ART. The other four studies (three high- and one medium-quality) that reported on age found no association [27–30].

Figure 1. Flow diagram showing study selection for systematic review of studies on access to antiretroviral therapy in South Africa

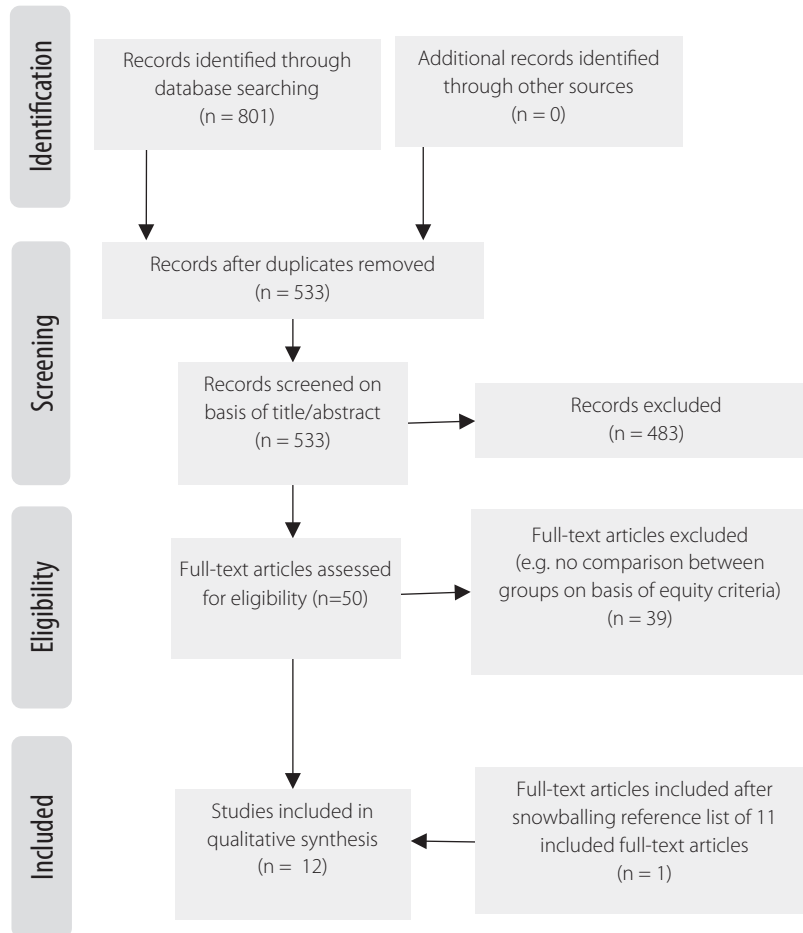


Table 2. Overview of reported findings per study on association between equity criteria and ART initiation or adherence

REFERENCE		EQUITY CRITERIA		
Name, year	Quality score	Sex	Age	Severity of disease
ART initiation (lower < higher likelihood to initiate)				
Cleary 2011 [26]	***	not associated men = women		
Cooke 2010 [33]	***	not associated men = women	associated younger (15-19 yrs) < older (>19 yrs)	
Govindasamy 2011 [27]	***	not associated men = women	not ≤ 30 yrs = ≥ 30 yrs	contradicting results, CD4 cell count: associated, CD4 >350 < ≤350, WHO stages: not associated
Tsai 2009 [34]	**	not associated men = women	associated younger (18-30 yrs) < older (30-35 yrs)	
Adam 2009 [35]	**			
Muula 2007 [25]	*	associated ⁴ male < female		
Nattrass 2006 [24]	*			

Area of living	Socio-economic status (including education and employment)	Marital status	Ethnicity
not associated peri-urban = urban = rural	<p><i>SES: not associated</i>, SES distribution HIV+ in need = ART clinic patients</p> <p><i>SES: not associated</i>, index profile 1=2=3=4=5 (SES)</p> <p><i>education: not associated</i>, years of education as continuous variable</p> <p><i>education: not associated</i>, primary school completed = not completed</p> <p><i>employment: not associated</i>, employed<unemployed</p> <p><i>education: associated</i>, lower education (secondary) < higher education (matric/ tertiary)</p> <p><i>employment: associated</i>, non salaried employment < salaried employment, unemployed < employed</p>		Inconclusive population size too small to draw conclusions
associated⁴ unequal ART coverage between 9 provinces		associated never married < married or cohabiting	
associated⁴ unequal ART coverage between 9 provinces			

Table 2. Continued

REFERENCE		EQUITY CRITERIA		
Name, year	Quality score	Sex	Age	Severity of disease
ART adherence (poorer < better adherence)				
Boyles 2011 [31]	***	not associated men = women	associated younger (< 25 yrs) < older (25-50 yrs)	associated, CD4 cell count: CD4 ≥ 200 < <200
Orrell 2003 [32]	***	not associated men = women	associated younger < older, adherence group is older (34 yrs) than non- adherence group (31 yrs)	contradicting results, CD4 cell count: associated, patients that not adhere had lower CD4 level Viral load: associated, patients that not adhere had higher VL WHO stage: not associated
Kranzer 2010 [28]	***	associated men < women	not associated ≤ 30 yrs = > 30 yrs	contradicting results, CD4 cell count: associated, > 200 < ≤100 WHO stage: not associated
Fatti 2010 [30]	***	not associated men = women	not associated younger children (≤ 2 yrs) = older children (> 2 yrs)	contradicting results, CD4 cell count (severe immunodeficiency ¹): not associated, WHO stage (severe clinical status ²): associated
Cornell 2009 [29]	**	not associated men = women	not associated age as continuous variable	contradicting results, CD4 cell count: contradicting results, CD4 < 50 < 50-150, but CD4 <50 = >150 WHO stage: not associated Viral load: not associated

ART = antiretroviral therapy, LTFU = lost to follow up, VL = viral load, WHO = world health organization

- 1 defined according to WHO criteria, i.e. < 12 months old: CD4 percentage <25% or CD4 count <1500 cells/mm³; 12-35 months: <20% or CD4 count <750; 36-59 months: CD4 percentage <15% or CD4 count <350; 5 years and older: CD4 count <200
- 2 defined as a WAZ score of <-3 (severe underweight) or a WHO stage ≥3
- 3 rural/urban, urban/urban, rural/rural = first term indicates place of residence and second the area of accessing ART clinic
- 4 no significance was reported and authors concluded that ART utilization was different among groups that were compared

Area of living	Socio-economic status (including education and employment)	Marital status	Ethnicity
	<p>SES: not associated, % low SES in patient group that continued ART = that not continued</p>		
<p>associated rural/urban < urban/urban < rural/rural³</p>	<p>employment: associated, no income < income</p>		

Table 3. Overview of finding per study reporting on equity in ART initiation

STUDY, QUALITY SCORE, STUDY TYPE	STUDY OBJECTIVE	STUDY AREA, TYPE OF CLINIC/ PROGRAM	YEAR OF DATA COLLECTION
<p>Cleary 2011 *** Observational [26]</p>	<p>To evaluate whether the distribution of ART services in the public system reflects the distribution of people in need among adults in the urban population</p>	<p>Urban area: poor communities in Mitchells Plain (Cape Town, Western Cape province) and Soweto township (Johannesburg, Gauteng province), public clinics</p>	<p>National survey: 2008. Urban clinic data: unknown</p>
<p>Cooke 2010 *** Observational [33]</p>	<p>To investigate factors associated with uptake of ART through a primary health care system in rural South Africa</p>	<p>Rural, peri-urban and urban areas: Hlabisa sub-district, Umkhanyakude district, Northern Kwa-Zulu-Natal province, public clinics supported by NGOs</p>	<p>Aug 2004 – Dec 2008</p>

STUDY DESIGN (COMPARISON BETWEEN POPULATION A AND B), population sizes, sampling method/ inclusion criteria	STATISTICAL ANALYSIS	OUTCOME ON ASSOCIATION AS REPORTED PER EQUITY CRITERIA
<p>a. Population in need for ART (n=742): national survey (2008, HIV+ residents), sampling unknown</p> <p>b. ART patients in urban public clinics (n=635): data from ART users (>18 yrs, >14 days on treatment) in three clinics in Mitchells Plain (selected proportional to the number of ART patients in facility) and three in Soweto (stratified random sampling)</p>	<p>Comparison distribution of equity criteria (i.e. patients characteristics)</p>	<p>Sex (not associated): percentage of HIV+ women in national survey is same as in ART users in urban clinic; 67.4% [95%CI: 61.5-72.9] versus 65.7% [95%CI: 60.6-70.7], $p > 0.05$. Socio-economic status (not associated): no significant differences in SES distribution between HIV+ in need for ART and ART patients in urban clinics; independence partition Pearson's chi-square test: 8 [$p = 0.43$] Race/ethnicity (inconclusive): percentage of non-African is 2.5% in population HIV+ in need versus 4.3% of ART users in urban clinics, authors state that sample size of non-African is too small to draw conclusions on equity</p>
<p>a. HIV+ residents not on ART (n = 1,003): population-based surveillance in 6 catchment areas</p> <p>b. HIV+ residents on ART (n = 1,251): population based 2008 cohort (HIV+, > 15 yrs, on ART)</p>	<p>Multivariate logistic regression</p>	<p>Sex (not associated): no significant association between gender and receiving treatment: aOR men 0.875 [95%CI: 0.708-1.081, $p = 0.216$] Age (associated, younger (15-19 yrs) < older (>19 yrs)): compared to age 15-19 (reference) all higher 5-year-age-groups [20-24, 25-29, 30-34, 35-40, 40-45, 45-50, 50-54, 55-60, >60] have significant higher aOR [ranging between 4.9-14.0, $p < 0.05$] for receiving treatment Area of living (not associated): no significant differences in aORs between peri-urban [1.042, 95%CI: 0.699-1.554, $p = 0.838$], rural [0.941, 95%CI: 0.628-1.410, $p = 0.768$] and urban (reference) areas for receiving treatment Socioeconomic status (not associated): no significant differences in aORs between index profiles 1 (reference), 2 [0.932, 95%CI: 0.688-1.262, $p = 0.649$], 3 [0.842, 95%CI: 0.624-1.135, $p = 0.258$], 4 [0.829, 95%CI: 0.607-1.131, $p = 0.237$] and 5 [0.984, 95%CI: 0.702-1.379, $p = 0.927$] for receiving treatment Education (not associated): no significant association between years of education and receiving treatment; aOR years of education: 1.022 [95%CI: 0.995-1.063, $p = 0.128$]</p>

Table 3. Continued

STUDY, QUALITY SCORE, STUDY TYPE	STUDY OBJECTIVE	STUDY AREA, TYPE OF CLINIC/ PROGRAM	YEAR OF DATA COLLECTION
Govindasamy 2011 *** Observational [27]	To assess the proportion and characteristics of individuals who accessed HIV care after testing HIV+ in a mobile testing unit	Rural area: Cape Metropolitan region, Western Cape province, type of clinic not clearly reported	Tested HIV+: 2008-2009. Interviewed: Apr-Jun 2010.
Tsai 2009 ** Observational [34]	To assess differences in socioeconomic profiles between those who access HIV-related clinical services and the HIV-infected individuals living in the wider community	Rural area: Limpopo province, public hospital	Community survey: 2004-2005. Clinic survey: Jan 2003 – Nov 2005

STUDY DESIGN (COMPARISON BETWEEN POPULATION A AND B), population sizes, sampling method/ inclusion criteria	STATISTICAL ANALYSIS	OUTCOME ON ASSOCIATION AS REPORTED PER EQUITY CRITERIA
<p>Patients tested HIV+ in mobile testing units that</p> <p>a. linked to ART care (i.e. receiving CD4 test result)</p> <p>b. not linked</p> <p>A random sample of patients tested HIV+ between August 2008 – December 2009, ≥18 yrs, CD4 <350, received CD4 test results, available socio-demographic variables was selected using mobile testing unit records (n=77)</p>	<p>Binomial univariate and bivariate regression analysis</p>	<p>Sex (not associated): same likelihood to link to care for female as male patients; **RR female: 1.18 [95%CI: 0.81-1.72, p = not reported, 1.0 falls within CI] Age (not associated): same likelihood to link to care for younger (≤30 years) as older patients (≥30 years) to link to care; **RR ≥30 years: 1.21 [95%CI: 0.83-1.77, p = not reported, 1.0 falls within CI] Severity of disease (contradicting results): significantly lower likelihood to link to care for patients with high (>350) compared to low (≤350) CD4 cell count; *RR CD4>350: 0.49 [95%CI: 0.27-0.87, p = 0.014] / same likelihood to link to care for patients in WHO stage I as WHO stage II, III or IV; **RR WHO clinical stage I: 0.88 [95%CI: 0.65-1.18, p = not reported, 1.0 in CI] Education (not associated): same likelihood to link to care for patient completed primary school as patients that have not; **RR completed primary school: 1.17 [95%CI: 0.66-2.08, p = not reported, 1.0 falls within CI] Employment (not associated, employed<unemployed): likely lower likelihood to link to care for employed compared to unemployed patients; **RR employed: 0.72 [95%CI: 0.51-1.01, p = 0.056].</p> <p>* = univariate ** = bivariate analysis</p>
<p>a. community sample, HIV+ not on ART (n =242): household survey, random sampled from eight rural villages in the province (14-35 yrs, HIV+)</p> <p>b. clinical sample, HIV+ on ART (n = 534): convenience sample of patients (18-35 yrs) in primary HIV/AIDS provider hospital, referred by 45 primary health care clinics.</p> <p>Note: samples were not taken from identical sub-districts</p>	<p>Uni-variate comparison and multiple regression</p>	<p>Sex (not associated): no significant difference percentage women in the community vs. clinic sample: 79% vs. 79% [p = 0.78] Age (associated, younger (18-30 yrs) < older (30-35 yrs)): significant difference in age distribution between community and clinic sample: 18-20 yrs: 13% vs 3.6%; 21-25 yrs: 33% vs. 16%; 26-30 yrs: 36% vs 33%; 31-35 yrs: 18% vs. 47%; X² = 85 [p<0.001*] Education (associated, higher education > lower education): significant difference in distribution educational attainment between community and clinic sample: in clinic less likely to completed secondary education [p<0.001], but more likely to completed matric or tertiary education [p = 0.04] X² 42 [p<0.001*] Employment (associated, not having salaried employment < having salaried employment, unemployed < employed): significant difference percentage having salaried employment between community and clinic sample: 6.2% vs. 11%, X² 3.8 [p = 0.05] and in percentage unemployed and able to work: 57% vs. 37%; X² 26 [p < 0.001*]</p>

Table 3. Continued

STUDY, QUALITY SCORE, STUDY TYPE	STUDY OBJECTIVE	STUDY AREA, TYPE OF CLINIC/ PROGRAM	YEAR OF DATA COLLECTION
Tsai 2009 ** Observational [34]			
Adam 2009 ** Observational [35]	To quantify the coverage in South Africa up to the middle of 2008, according to various definitions of antiretroviral treatment eligibility	Rural and urban: National/ nine provinces, public clinics	2008
Muula 2007 * Systematic review [25]	To describe the gender distribution of patients accessing ART in Southern Africa	Rural and urban: National (1999-2004), Khayelisha township in Capetown (2001-2), Eastern cape province 2001-4), Northern cape province (2001-5), public clinics	2000 – 2006
Nattrass 2006 * Critical assessment [24]	To compare ART roll-out in public sector between provinces in 2003-2005	Rural and urban: National (nine provinces), public clinics	2003 - 2005

CI = Confidence Interval, aOR = adjusted odds ratio, ART = antiretroviral therapy, WHO = world health organization

STUDY DESIGN (COMPARISON BETWEEN POPULATION A AND B), population sizes, sampling method/ inclusion criteria	STATISTICAL ANALYSIS	OUTCOME ON ASSOCIATION AS REPORTED PER EQUITY CRITERIA
		<p>Marital status (associated, never married < married or cohabiting): significant difference distribution marital status between community and clinic sample: never married: 78% vs. 43%; married/ cohabiting: 16% vs. 30%; $\chi^2_{83} [p < 0.001^*]$</p> <p>*also significant after multivariable regression</p>
<p>For nine provinces</p> <p>a. number of HIV+ in need for ART: Markov model on HIV progression using different CD4 count compartments</p> <p>b. number of HIV+ on ART: estimates of patients starting ART in public health facilities using Department of Health unpublished internal report (7 May 2009)</p>	Comparison ART coverage data	<p>Area of living (associated, but significance not reported, unequal coverage among nine provinces): unequal ART coverage in 2008 among 9 provinces: Eastern Cape 32.4%, Free State 25.8%, Gauteng 43.5%, KwaZulu-Natal 39.4%, Limpopo 32.2%, Mpumalanga 31.2%, Northern Cape 61.1%, North West 35.4%, Western Cape 71.1%</p>
<p>a. National HIV+ prevalence female/ male ratio in 2005</p> <p>b. access to ART female/male ratio</p> <p>Sampling methods not reported</p>	Comparison female/male ratios	<p>Sex (associated, but significance not reported, male < female): female have higher access than men to ART: HIV prevalence female/male ratio = 1.2, while 4 studies report access to ART female/male ratio of 1.9, 2.3, 1.8 and 1.5</p>
<p>For nine provinces</p> <p>a. number of HIV+ in need for ART</p> <p>b. number of HIV+ on ART estimates of ART coverage based on ASSA2003 demographic model (includes public, NGOs and private sector providers)</p>	Comparison ART coverage data	<p>Area of living (associated, but significance not reported, unequal coverage among 9 provinces): unequal ART coverage at the end of 2005 among 9 provinces: Eastern Cape 21.8%, Free State 21.0%, Gauteng 29.6%, KwaZulu-Natal 20.0%, Limpopo 27.3%, Mpumalanga 20.9%, Northern Cape 32.3%, North West 24.5%, Western Cape 55.7%</p>

Table 4. Overview of findings per study reporting on equity in ART adherence

STUDY, QUALITY SCORE, STUDY TYPE	STUDY OBJECTIVE	STUDY AREA, TYPE OF CLINIC/ PROGRAM	YEAR OF DATA COLLECTION
Boyles 2011 *** Observational [31]	To determine the factors predicting loss to follow-up and mortality in a public-sector HIV and ART programme in rural South Africa	Rural area: Elliotdale/Xora area of Mbhashe sub-district in Eastern Cape province, combined public/donor program	Jan 2005 – Sept 2009
Orrell 2003 *** Observational [32]	To determine adherence of an indigent African HIV-infected cohort initiating ART to identify predictors of incomplete adherence and virologic failure	Urban area: Cape Town, Western Cape province, university of Cape Town clinic	Jan 1996 – May 2001

STUDY DESIGN (COMPARISON BETWEEN POPULATION A AND B) Population sizes, sampling method and inclusion criteria	STATISTICAL ANALYSIS	MAIN OUTCOME OF ANALYZED EQUITY CRITERIA
<p>a. HIV+ patients that loss to follow up (n = 117 (6.5%))</p> <p>b. HIV+ patients that do not loss to follow up (n = 1686)</p> <p>Both groups are patients enrolled in clinics of Madwaleni HIV well-ness and ART program including adherence counseling and home visits (i.e. Madwaleni Hospital, its 7 primary healthcare feeder clinics and a community based outreach program): tested HIV+, ART naïve at time of study enrollment, >19 years, initiated ART (CD4 < 200 CD4), could be follow for at least 3 months (n=1803)</p>	<p>Multiple Cox proportional hazard regression</p>	<p>Sex (not associated): females and males have same risk of being loss-to-follow-up: HR female: 1.42 [95%CI 0.90-2.23, p = 0.134] Age (associated, younger (<25 yrs) < older (25-50 yrs)): younger people have significant higher risk to loss-to-follow-up: HR <25 yrs (compared to 25-50 yrs): 1.87 [95%CI: 1.15-3.05, p = 0.012] Severity of disease (associated, ≥ 200 CD4 < <200 CD4): higher CD4 cell count significantly increases risk to loss-to-follow-up: 50-199 CD4 (referent); HR 0-49 CD4: 1.00 [95%CI: 0.61-1.64, p = 0.019]; HR ≥ 200 CD4: 1.74 [95%CI 1.09-2.78, p = 0.019]</p>
<p>a. Patients discontinued 48 weeks of ART (n=47)</p> <p>b. Patients that completed 48 weeks of ART (n=242)</p> <p>Both groups are from Cape Town AIDS Cohort (CTAC): HIV+ patients, presenting at University of Cape Town HIV clinics (referred by health care workers in the public sector of the wider Cape town area, mainly serving indigent populations), were ART naïve and eligible for adherence monitoring</p>	<p>T-test (age, VL, CD4 cell count), X2 test (gender, socio-economic status)</p>	<p>Sex (not associated): no significant difference in percentage female between those discontinued (40.4%) and completed (43.4%) 48 weeks of ART [p = 0.7] Age (associated, younger < older): those discontinued ART before 48 weeks were significantly younger (31 yrs) than those completed (34.1 yrs) [p <0.005] Severity of disease (contradicting results): those discontinued ART before 48 weeks had significantly lower mean CD4 cell count (197) than those completed (268) [p<0.01] / those discontinued before 48 weeks ART had a significantly higher VL (5.71 log10) than those completed (5.49 log10) [p <0.05] / no significant difference in percentage WHO stage 3 or 4 between those discontinued (49.2%) and completed (38.2%) 48 weeks of ART [p = 0.2] Socio-economic status (not associated): no significant difference in the percentage of patients with low socio-economic status in the group that discontinued (36.2%) and completed (43.6%) 48 weeks of ART [p = 0.4]</p>

Table 4. Continued

STUDY, QUALITY SCORE, STUDY TYPE	STUDY OBJECTIVE	STUDY AREA, TYPE OF CLINIC/ PROGRAM	YEAR OF DATA COLLECTION
Kranzer 2010 *** Observational [28]	To investigate the frequency and risk factors of defaulting treatment and identify factors associated with subsequent return to care in a long-term treatment cohort in South Africa	Peri-urban: township in Cape Town, Western Cape province, public clinic	Mar 2004 - Dec 2009
Fatti 2010 *** Retrospective cohort study [30]	To compare clinical, immunological and virological outcomes between rural and urban children on ART in a large cohort from multiple public health facilities in four provinces of South Africa	Rural and urban: areas in Western Cape, KwaZulu-Natal, Eastern Cape and Mpumalanga province, public clinics supported by NGOs	Nov 2003 – Mar 2008

STUDY DESIGN (COMPARISON BETWEEN POPULATION A AND B) Population sizes, sampling method and inclusion criteria	STATISTICAL ANALYSIS	MAIN OUTCOME OF ANALYZED EQUITY CRITERIA
<p>a. HIV+ patients that defaulted ART (n = 291)</p> <p>b. HIV+ patients that not defaulted ART (n = 863)</p> <p>Both groups are from patients presenting at public-sector primary care clinic (single ART server in the area), >15 years, started ART (until 2007 < 350 CD4 cells (NIH research study), after 2007 <200 CD4 cells (provincial ART program) (n= 1154)</p>	<p>Multivariate Poisson regression</p>	<p>Sex (associated, men < women): compared to women, men have a significant increased risk to default ART treatment, HR men: 1.51 [95%CI: 1.18-1.93, p < 0.01] Age (not associated): no significant association between age and defaulting treatment, compared to younger age (≤30 years), HR > 30 years: 0.90 [95%CI: 0.70-1.15, p = 0.40] Severity of disease (contradicting results): higher CD4 cell count increases significantly risk for defaulting treatment, ≤100 CD4 (referent); 101-200 CD4: HR 1.32 [95%CI: 0.99-1.76, p = 0.06], CD4 >200 HR: 1.39 [95%CI 1.02-1.91, p = 0.04]. No significant difference in the risk of defaulting treatment being in WHO stage 3/4 or 1/2, HR stage 3/4: 1.14 [95%CI: 0.85-1.53, p = 0.37]</p>
<p>a. Children on ART that loss to follow up (n = 179)</p> <p>b. Children on ART that do not loss to follow up (n = 2153)</p> <p>Both from retrospective cohort of children, (<16 yrs, ART naïve), enrolled in 44 routine public healthcare facilities (7 rural, 33 urban/12 secondary level hospitals, 32 primary health care clinics) supported by a NGO, used electronic data collection systems for patient monitoring Children were divided in 3 groups a) urban residence and urban ART facility attended (urban group, n = 1727); rural residence and rural facility attended (rural group, n = 228); and rural residents attending urban facilities (rural/urban group, n = 377)</p>	<p>Multivariable Cox proportional hazards regression</p>	<p>Sex (not associated): gender is not associated with risk of LTFU: HR male: 1.1 [95%CI: 0.82-3.12, no p value reported, 1.0 falls within CI] Age (not associated): younger children (<2yrs) are as likely to LTFU than older children (>2 yrs): > 2yrs (referent); HR 1-2 yrs: 1.61 [95%CI: 0.96-2.68, no p value reported, 1.0 in CI]; HR < 1yr: [1.81, 95%CI: 0.94-3.64, no p value reported, 1.0 in CI] Severity of disease (contradicting results): severe clinical status was associated with risk LTFU: HR severe clinical status: 1.47 [95%CI: 1.03-2.12, no p value reported, 1.0 not in CI]/ severe immunodeficiency was not associated with risk LTFU: HR severe immunodeficiency: 0.81 [95%CI: 0.52-1.24, p value not reported, 1.0 in CI] Area of living (associated, rural/urban < urban/urban < rural/rural): patient in rural areas visiting clinics in urban areas are more likely to LTFU than patients from rural areas visiting rural clinics and patients in urban areas visiting urban clinics: rural (referent); HR urban: 1.14 [95%CI: 0.57-2.24]; HR rural/urban 2.85 [95%CI, 1.41-5.79] [p = 0.004]</p>

Table 4. Continued

STUDY, QUALITY SCORE, STUDY TYPE	STUDY OBJECTIVE	STUDY AREA, TYPE OF CLINIC/ PROGRAM	YEAR OF DATA COLLECTION
Cornell 2009 ** Observational [29]	To investigate the impact of gender and income on survival and retention in a South African public sector ART programme	Urban: Nyanga township, outskirts of Cape Town, Western Cape province, public clinics supported by NGOs	Sept 2002 – Apr 2007

CI = confidence interval, HR = hazard ratio, ART = antiretroviral therapy, WHO = world health organization, LTFU = loss to follow up, VL = viral load

STUDY DESIGN (COMPARISON BETWEEN POPULATION A AND B) Population sizes, sampling method and inclusion criteria	STATISTICAL ANALYSIS	MAIN OUTCOME OF ANALYZED EQUITY CRITERIA
<p>a. HIV+ patients that loss to follow up (n = 137)</p> <p>b. HIV+ patients that do not loss to follow up (n = 2059)</p> <p>Both groups from Gugulethu clinic patient cohort that receive adherence counseling including home visits, >15 years, ART naïve, WHO stage IV or CD4 <200 (n = 2196)</p>	<p>Proportional hazards regression models</p>	<p>Sex (not associated): gender is not associated with risk to LTFU: HR men: 1.38, [95%CI: 0.94-2.03, p = 0.100] Age (not associated): no significant difference between age and risk to LTFU: HR age: 0.98 [95%CI 0.96-1.00, p = 0.102]</p> <p>Severity of disease (contradicting results): patients with CD4 cell count <50 have higher risk to LTFU than CD4 cell count 50-150, but a similar risk as CD4 >150: CD4 <50 (referent); HR CD4 51-100: 0.62 [95%CI: 0.37-1.05, p = 0.077]; HR CD4 101-150 [0.57, 95%CI: 0.33-1.00, p = 0.049]; HR CD4 > 150: 1.01 [95%CI: 0.64-1.59, p = 0.971]/ WHO stage has no association with risk to LTFU: WHO stage I & II (referent); HR stage III: 0.78 [95%CI: 0.50-1.21, p = 0.274] HR stage IV: 0.75 [95%CI 0.75 (0.44-1.28), p = 0.294] /VL was not significantly associated with risk to LTFU: HR RNA level <5 log10 copies/ml (referent); >5 log: 1.13 [95%CI: 0.78–1.64, p= 0.520] Employment (associated, no income < income): patient with no income have a increased risk to LTFU: HR with income: 0.53 [95%CI: 0.37-0.77, p = 0.002]</p>

Table 5. Overview of quality rating scoring per study

TOTAL SCORE (out of 40 points)	
1	Study design (peer reviewed = 2, other = 0)
2	Well-defined hypothesis/objective/research question? (fully = 2, partial = 1, not at all = 0)
3	Clear motivation research question? (fully = 2, partial = 1, not at all = 0)
4	Concept clearly defined (e.g. access, equity) (fully = 2, partial = 1, not at all = 0)
5	Methods well described? (fully = 2, partial = 1, not at all = 0)
6	Main outcomes clearly described? (fully = 2, partial = 1, not at all = 0)
7	Potential sources of bias taken into account? (fully = 2, partial = 1, not at all = 0)
8	Population and sampling method clearly defined? (fully = 2, partial = 1, not at all = 0)
9	Type of information used (i.e sample size, time period) clearly described? (fully = 2, partial = 1, not at all = 0)
10	Primary data used for key analyses? (yes = 2, no = 0)
11	Survey (household/provider level) data used? (yes = 2, partial = 1, no = 0)
12	Research/subquestion(s) answered? (fully = 2, partial = 1, not at all = 0)
13	Results based on evidence derived from the data analysis? (fully = 2, partial = 1, not at all = 0)
14	Results credible given the methods, data, and analysis used? (fully = 2, partial = 1, not at all = 0)
15	Robustness of findings and limitations of method discussed? (fully = 2, partial = 1, not at all = 0)
16	Findings discuss within context of existing evidence base? (fully = 2, partial = 1, not at all = 0)
17	Missings clearly described? (fully = 2, partial = 1, not at all = 0)
18	Generalizable to rest of the country? (given sample size) (fully = 2, partial = 1, not at all = 0)
19	Study subjects asked representative of entire population recruited from? (yes = 2, no = 0)
20	Study subjects prepared to participate representative of entire population recruited from? (yes = 2, partial = 1, no = 0)

'For severity of disease, five [27–30,32] out of six studies [27–32] reported contradicting results. In four [27–29,32] out of these five studies an association was found between ART utilisation and a person's CD4 cell level while no association was found with a patient's WHO status. Of these studies, one ART initiation [27] and one on adherence [28] (both high quality) reported that higher CD4 cell counts are associated with lower utilization of ART. On the contrary, two other studies on adherence (one high- and one medium-quality) reported that lower CD4 cell count is associated with less utilization [29,32]. In one other study (high quality) that reported contradicting results for severity of disease among children, an association was found with

	High (30-40 points)						Medium (20-29 points)			Low (<20 points)		
	Kranzer, 2010 [28]	Cooke, 2010 [33]	Fatti, 2010 [30]	Govindasamy, 2011 [27]	Boyles, 2011 [31]	Cleary, 2011 [26]	Orrell, 2003 [32]	Cornell, 2009 [29]	Tsai, 2009 [34]	Adam, 2009 [35]	Muula, 2007 [25]	Nattrass, 2006 [24]
	37	34	34	33	32	31	30	26	26	26	19	12
	2	2	2	2	2	2	2	2	2	2	2	2
	2	2	2	2	2	2	1	2	2	2	2	1
	2	2	2	2	1	2	2	2	2	2	2	1
	2	1	1	2	2	1	2	0	1	2	0	0
	2	2	2	2	2	2	1	1	2	2	2	0
	2	2	2	2	1	2	2	2	1	2	2	1
	2	2	2	2	2	2	1	0	0	2	0	0
	2	2	2	2	2	2	2	1	1	0	0	0
	2	2	2	2	1	2	2	1	2	1	1	1
	2	0	2	2	2	0	2	2	0	0	0	0
	2	2	2	2	2	1	2	2	0	2	0	0
	1	2	2	1	2	2	1	1	2	2	2	1
	2	2	2	2	2	1	2	2	2	0	0	1
	2	2	2	2	2	1	1	1	2	2	0	1
	2	2	2	1	1	2	2	1	2	1	2	0
	2	2	2	2	2	2	2	2	2	2	2	1
	2	2	1	0	2	1	1	2	0	0	0	0
	2	1	2	1	1	0	0	0	1	2	2	2
	0	0	0	0	0	2	2	2	0	0	0	0
	2	2	0	2	1	2	0	0	2	0	0	0

WHO stage but not with CD4 cell count level [30]. The sixth study (high quality) reporting for severity of disease, only looked at CD4 cell count levels and found that patients with a higher CD4 cell count level adhered less to ART [31].

For area of living, three [24,30,35] out of the four studies [24,30,33,35] that reported on this criterion found an association between area of living and ART utilization. Two studies (high- and medium-quality) reported that people in certain provinces have lower utilization of ART (see Table 4) [24,35]. One of the studies (high-quality) reported that children living in rural areas

and who visit ART clinics in urban areas, have lower utilization than children that visit clinics in their own area of living (urban or rural area) [29]. The fourth study (high-quality) that reported on area of living found no association between ART utilization and area of living (peri-urban, urban or rural area) [33].

Socioeconomic status was found to be associated with ART utilization in two [29,34] (both medium-quality) out of the six studies [26,27,29,32–34] that reported on this criterion, which showed that those unemployed have lower utilization of ART. One of these studies also reported that those with lower education utilize less [34]. Of the four studies that found no association, one (high-quality) found no differences on the basis of employment and education [27]. The other three (all high-quality) found no differences in ART utilization between those with differences in SES [26,32,33]. One of these also found no association between educational level and ART utilization [33].

For marital status only one study (medium-quality) was included in this review and reported that being unmarried is associated with lower ART utilization [34]. For ethnicity only one study (high-quality) was found, and it reported inconclusive results due to a small sample size [26]. None of the included studies had at the ART utilization by religion or sexual orientation.

Discussion

This is the first systematic review that examines equity in utilization of ART in South Africa and identified 12 studies. It seems that men, young people, those living in certain provinces or rural areas, people who are unemployed or with low educational level, or those who are unmarried have less access to ART. For severity of disease, most studies used more than one outcome measure for disease stage and reported within their study contradicting results. No evidence of inequity in ART utilization by ethnicity, religion and sexual orientation was found. There were large heterogeneities in both context (study area, type of program, time period) and methodology of the studies in this review.

Only one high- and one low-quality study reported a significant difference in utilization of ART among men and women, and eight other studies found no differences. Although it is encouraging that access to ART seems mostly equal for both genders, the studies in our review failed to take the timing of ART initiation into account. Observational studies from South Africa recently showed that case-fatality rates among HIV-infected men were substantially higher compared to women in South Africa, most likely related to late entry into care [36,37]. Late entry by men can be explained as ART is mainly provided through primary health care services, and its antenatal care services frequently serve as an entry-point for HIV treatment for women.

The findings in some studies which showed that young age is associated with low utilization raises concerns. Young people may face more barriers to treatment (like lack of knowledge about treatment possibilities and benefits and fear for stigma and discrimination) [33]. Yet, this relationship may be confounded by eligibility, as older people are more likely to be eligible because of more advanced disease stages. In addition, many studies did not cover all ages. As the HIV epidemic in South Africa is ageing [38,39] it will become increasingly important to determine ART utilization among elderly, a group previously neglected in research on ART utilization.

Both area of living and SES did not seem to be associated with ART utilization. However, the studies looking at area of living were mostly of low-quality. The studies by Nattrass et al [24] and Adam et al [35] reported coverage levels for different provinces. However, these studies used a simple Markov-model to estimate the need for ART, and it is difficult to determine whether the model projections are valid. The study by Fatti et al [30] reports on children in four different areas. Lower utilization for children living in rural areas and accessing clinics in urban areas can be explained by financial and non-financial barriers such as the monetary cost of transportation or the opportunity cost of accessing health care services [34]. Nevertheless, more research is needed in order to generalize these findings to other areas and population groups. Finally, Tanser et al [40] showed that self-reported visiting of health clinics in a rural South African area was significantly associated with the distance between the clinic and home, with greater distance resulting in lower utilization, yet we did not include this study because it didn't specifically concern ART utilization.

Studies on SES and area of living will likely measure the same inequities as people in deprived areas might have lower SES. However, Tsai et al [34] found significant evidence of socioeconomic inequities in the uptake of ART services within a rural and deprived part of South Africa during the early years of the public sector scaling up of ART (2003–2005). Poorer households in South Africa and in sub-Saharan Africa generally have less access because they face various barriers like cost for transport to the clinic, knowledge of the benefit of ART treatment and a lower propensity to seek formal sector treatment for illness [41,42]. Cleary et al [26] reported no differences in SES distribution between those in need and those accessing ART in urban areas in 2008. This is in line with the 'inverse equity hypothesis' which predicts a paradoxical worsening of health inequities as effective new public health interventions first diffuse among the well-to-do but later also among the poor. Last years ART has been scaled-up drastically (and now reaches about 80% of those in need) barriers to access might have been reduced and those least able to overcome those initial barriers are now able to use the services [26]. Yet, still about 20% lacks access to treatment and this group likely faces most barriers. In addition, if South Africa adopts the new WHO guidelines and further expands its ART program new inequities might appear.

We found contradicting results for severity of disease as within studies differences in ART utilization were reported for HIV-infected people with different CD4 cell count levels but not for different WHO disease stages. Also some studies some studies reported lower utilization for healthier patients while other studies for the more severely ill. One of the studies by Govindasamy et al [27] addressed ART initiation and concluded that those with a CD4 cell count of >350 are less likely linked to care after testing HIV positive than those ≤ 350 . This can be explained by the fact that these patients were not yet eligible for ART and only needed to enrol in the clinic to monitor their CD4 level, or because they feel less need for care as they do not suffer from symptoms. The other five studies addressed ART adherence. Boyles et al [31] and Kranzer et al [28] both found that those with higher CD4 cell count ($CD4 > 200$) adhere less to ART and this may also be explained by the fact that individuals who default do so because they feel better on treatment [43,44]. In contrast, Fatti et al [30] and Orrell et al [32] found that most severely ill patients were more likely to lost of follow-up. One explanation could be that patients perceived a lack of effectiveness of treatment when ill or not being able to take the medicine because of symptoms [43]. However, the status of patients who are lost to follow-up is difficult to assess, and it is also likely that many of those are unregistered deaths, thus explaining the higher rates among those with advanced disease.

Only one of the studies looked at marital status and reported less access for unmarried people. However, this study was of medium quality as it compared socio-economic characteristics of a community sample with a clinic sample which were taken from different areas. For ethnicity, religion and sexual orientation no evidence was available and more research is needed to determine inequities in ART utilization by these criteria. It is likely that inequities exist on the basis of ethnicity, as the history of apartheid caused differences in access between black and white South Africans [45]. Also, among black Africans differences in access between ethnic groups like Zulu-speakers, French speaking Cameroonians and Xhosa speakers likely exist, partly due to differences in language barriers that they may face when accessing care [46,47]. Although HIV-prevention services for men who have sex with men (MSM) are expanding across the country, there are still several gaps [48,49]. This group may face barriers in ART access due to fear of provider stigma and social isolation [50,51]. Low HIV testing rates are reported among Muslim people in predominantly Muslim residential areas in Cape Town [52] and different religions might face different levels of HIV-related stigma which might cause inequities in ART utilization [53].

After analyzing the findings of the included studies we found no patterns of equities or inequities that may be explained by differences in program design (e.g. NGO or university supported, public program, availability adherence counsellor), time period (e.g. before or after scale up of ART), target population (e.g. indigent populations, children) and study area (e.g. townships, rural areas). On the other hand, patterns might have been identified if the number of studies were higher.

We found only 12 studies which looked at equity criteria for ART utilization, and two of these were of low- quality. In addition, all studies differed in context (year of study, area, study population), methodology, and outcome measured. Access to ART in South Africa has evolved quickly over the past decade [54] and inequities that were reported at the start of the ART scale-up might no longer be relevant now. Given the incomplete and mixed evidence base, we call for more rigorous analysis on equity of ART treatment in South Africa, and beyond. We flag three important domains. First, reviewed studies were based on different samples and this made any comparison or generalisation difficult to achieve. A national monitoring system on ART initiation and adherence, which also registers key criteria such as severity of disease, gender, age, SES and area of living could fill in this gap. To measure those in need for ART we recommend using the definition ‘eligible for ART on the basis of the country guidelines’ as not all HIV-infected people might be already eligible for ART. Yet, the challenge remains to identify HIV-infected patients who are in need of treatment but have not yet been linked to care. Second, most studies only assessed a few equity criteria. This could be explained by the emphasis in strategic ART plans worldwide to reduce gender, SES and area of living inequities [1]. In addition, the recent health equity monitor launched by the WHO uses a list of indicators to present a country’s equity profile, but recommends to differentiate groups on the basis of SES, gender, area of living and education level only [55]. We therefore recommend getting similar insights in inequalities between groups that differ in age, severity of disease, marital status, ethnicity, sexual orientation and religion for ART utilization. Third, studies employed a variety of definitions of both ART initiation and adherence measures, but also of equity criteria measures, indicating the need to develop standardized measures in this area of study.

Conclusions

On the basis of 12 studies identified in this review it seems that men, young people, those living in certain provinces or rural areas, those who are unemployed or with a low educational level, and those who are unmarried are disadvantaged from utilization of ART. For severity of disease, most studies used more than one outcome measure for disease stage and reported within their study contradicting results. For ethnicity, religion and sexual orientation there was no evidence available to draw conclusions. As studies stem from different contexts and use different methods, findings cannot be generalized and conclusions should be taken with caution. In order to better inform policy makers, we call for improved guidance in equity research on ART, addressing the need to develop national monitoring of inequity of utilization of ART and employing standardized measures of utilization and equity criteria. ■

References

1. UNAIDS (2013) Global report: UNAIDS global report on the global AIDS epidemic 2013. Geneva: UNAIDS.
2. UNAIDS (2012): World AIDS Day Report - Results 2012. Geneva: UNAIDS.
3. Department of Health Republic of South Africa (2013) The South African Antiretroviral Treatment Guidelines 2013. Cape Town: Department of Health Republic of South Africa. Available: <http://www.sahivsoc.org/upload/documents/2013%20ART%20Guidelines-Short%20Combined%20FINAL%20draft%20guidelines%2014%20March%202013.pdf>. Accessed 17 September 2014.
4. Cleary SM, Mooney GH, McIntyre DE (2010) Claims on health care: a decision-making framework for equity, with application to treatment for HIV/AIDS in South Africa. *Health Policy Plan* 26: 464–470.
5. SANAC: South Africa National AIDS Council. National Strategic Plan 2012 – 2016. South Africa; 2011. Available: http://www.sanac.org.za/resources/cat_view/2-nsp. Accessed 17 September 2014.
6. Bor J, Herbst AJ, Newell M-L, Bärnighausen T (2013) Increases in adult life expectancy in rural South Africa: valuing the scale-up of HIV treatment. *Science* 339: 961–965.
7. Mills EJ, Bakanda C, Birungi J, Mwesigwa R, Chan K, et al. (2011) Mortality by baseline CD4 cell count among HIV patients initiating antiretroviral therapy: evidence from a large cohort in Uganda. *AIDS* 25: 851–855.
8. Tanser F, Bärnighausen T, Grapsa E, Zaidi J, Newell M-L (2013) High coverage of ART associated with decline in risk of HIV acquisition in rural KwaZulu-Natal, South Africa. *Science* 339: 966–971.
9. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, et al. (2011) Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med* 365: 493–505.
10. Eaton JW, Johnson LF, Salomon JA, Bärnighausen T, Bendavid E, et al. (2012) HIV treatment as prevention: systematic comparison of mathematical models of the potential impact of antiretroviral therapy on HIV incidence in South Africa. *PLoS Med* 9: e1001245.
11. Hontelez JAC, de Vlas SJ, Tanser F, Bakker R, Bärnighausen T, et al. (2011) The impact of the new WHO antiretroviral treatment guidelines on HIV epidemic dynamics and cost in South Africa. *PLoS One* 6: e21919.
12. Hontelez JAC, Lurie MN, Bärnighausen T, Bakker R, Baltussen R, et al. (2013) Elimination of HIV in South Africa through expanded access to antiretroviral therapy: a model comparison study. *PLoS Med* 10: e1001534.
13. Eaton JW, Menzies NA, Stover J, Cambiano V, Chin-delevitch L, et al. (2014) Health benefits, costs, and cost-effectiveness of earlier eligibility for adult antiretroviral therapy and expanded treatment coverage: a combined analysis of 12 mathematical models. *lancet Glob Heal* 2: e23–34.
14. World Health Organization (2013) Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection. Geneva: World Health Organization.
15. Higgins J, Green S (2011) *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0. Oxford: The Cochrane Collaboration.
16. World Health Organization (2010) Monitoring equity in access to AIDS treatment programmes: a review of concepts, models, methods and indicators. Geneva: World Health Organization. Available: [http://whqlibdoc.who.int/publications/2010/9789241564120_eng.pdf]. Accessed 17 September 2014.
17. Andersen RM (1995) Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav* 36: 1–10.
18. Starfield B (2011) The hidden inequity in health care. *Int J Equity Health* 10: 15.
19. Norheim OF, Baltussen R, Johri M, Chisholm D, Nord E, et al. (2014) Guidance on priority setting in health care (GPS-Health): the inclusion of equity criteria not captured by cost-effectiveness analysis. *Cost Eff Resour Alloc* 12: 18.
20. Tromp N, Baltussen R (2012) Mapping of multiple criteria for priority setting of health interventions: an aid for decision makers. *BMC Health Serv Res* 12: 454. Available:
21. Centre for Reviews and Dissemination (2008) *Systematic reviews: CRD's guidance for undertaking reviews in health care*. York: Center for Reviews and Dissemination.

22. Van de Voorde C, Léonard C (2007) Search for evidence and critical appraisal: health services research. Brussels: Belgian Health Care Knowledge Centre (KCE).
23. Moher D, Liberati A, Tetzlaff J, Altman DG (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 6: e1000097.
24. Nattrass N (2006) South Africa's "rollout" of highly active antiretroviral therapy: a critical assessment. *J Acquir Immune Defic Syndr* 43: 618–623.
25. Muula AS, Ngulube TJ, Siziya S, Makupe CM, Umar E, et al. (2007) Gender distribution of adult patients on highly active antiretroviral therapy (HAART) in Southern Africa: a systematic review. *BMC Public Health* 7: 63.
26. Cleary S, Silal S, Birch S, Carrara H, Pillay-van Wyk V, et al. (2011) Equity in the use of antiretroviral treatment in the public health care system in urban South Africa. *Health Policy* 99: 261–266.
27. Govindasamy D, van Schaik N, Kranzer K, Wood R, Mathews C, et al. (2011) Linkage to HIV care from a mobile testing unit in South Africa by different CD4 count strata. *J Acquir Immune Defic Syndr* 58: 344–352.
28. Kranzer K, Lewis JJ, Ford N, Zeinecker J, Orrell C, et al. (2010) Treatment interruption in a primary care antiretroviral therapy program in South Africa: cohort analysis of trends and risk factors. *J Acquir Immune Defic Syndr* 55: e17–23.
29. Cornell M, Myer L, Kaplan R, Bekker L-G, Wood R (2009) The impact of gender and income on survival and retention in a South African antiretroviral therapy programme. *Trop Med Int Health* 14: 722–731.
30. Fatti G, Bock P, Grimwood A, Eley B (2010) Increased vulnerability of rural children on antiretroviral therapy attending public health facilities in South Africa: a retrospective cohort study. *J Int AIDS Soc* 13: 46.
31. Boyles TH, Wilkinson LS, Leisegang R, Maartens G (2011) Factors influencing retention in care after starting antiretroviral therapy in a rural South African programme. *PLoS One* 6: e19201.
32. Orrell C, Bangsberg DR, Badri M, Wood R (2003) Adherence is not a barrier to successful antiretroviral therapy in South Africa. *AIDS* 17: 1369–1375.
33. Cooke GS, Tanser FC, Bärnighausen TW, Newell M-L (2010) Population uptake of antiretroviral treatment through primary care in rural South Africa. *BMC Public Health* 10: 585.
34. Tsai AC, Chopra M, Pronyk PM, Martinson NA (2009) Socioeconomic disparities in access to HIV/AIDS treatment programs in resource-limited settings. *AIDS Care* 21: 59–63.
35. Adam MA, Johnson LF (2009) Estimation of adult antiretroviral treatment coverage in South Africa. *S Afr Med J* 99: 661–667.
36. Cornell M, Schomaker M, Garone DB, Giddy J, Hoffmann CJ, et al. (2012) Gender differences in survival among adult patients starting antiretroviral therapy in South Africa: a multicentre cohort study. *PLoS Med* 9: e1001304.
37. Druyts E, Dybul M, Kanfers S, Nachega J, Birungi J, et al. (2013) Male sex and the risk of mortality among individuals enrolled in antiretroviral therapy programs in Africa: a systematic review and meta-analysis. *AIDS* 27: 417–425.
38. Hontelez JAC, Lurie MN, Newell M-L, Bakker R, Tanser F, et al. (2011) Ageing with HIV in South Africa. *AIDS* 25: 1665–1667.
39. Hontelez JAC, de Vlas SJ, Baltussen R, Newell M-L, Bakker R, et al. (2012) The impact of antiretroviral treatment on the age composition of the HIV epidemic in sub-Saharan Africa. *AIDS* 26 Suppl 1: S19–30.
40. Tanser F, Gijsbertsen B, Herbst K (2006) Modelling and understanding primary health care accessibility and utilization in rural South Africa: an exploration using a geographical information system. *Soc Sci Med* 63: 691–705.
41. Castro-Leal F, Dayton J, Demery L, Mehra K (2000) Public spending on health care in Africa: do the poor benefit? *Bull World Health Organ* 78: 66–74.
42. Filmer D (2005) Fever and its treatment among the more and less poor in sub-Saharan Africa. *Health Policy Plan* 20: 337–346. A
43. Brinkhof MWG, Pujades-Rodriguez M, Egger M (2009) Mortality of patients lost to follow-up in antiretroviral treatment programmes in resource-limited settings: systematic review and meta-analysis.

PLoS One 4: e5790.

44. Miller CM, Ketlhapile M, Rybasack-Smith H, Rosen S (2010) Why are antiretroviral treatment patients lost to follow-up? A qualitative study from South Africa. *Trop Med Int Health* 15 Suppl 1: 48–54.
45. Coovadia H, Jewkes R, Barron P, Sanders D, McIntyre D (2009) The health and health system of South Africa: historical roots of current public health challenges. *Lancet* 374: 817–834.
46. Ndlovu M (2009) The accessibility of translated Zulu health texts: an investigation of translation strategies. Pretoria: University of South Africa. Available: http://uir.unisa.ac.za/bitstream/handle/10500/3400/thesis_ndlovu.pdf?sequence=1. Accessed 17 September 2014.
47. Cain D, Schensul S, Mlobeli R (2011) Language choice and sexual communication among Xhosa speakers in Cape Town, South Africa: implications for HIV prevention message development. *Health Educ Res* 26: 476–488.
48. McIntyre JA, Struthers H (2013) HIV and men who have sex with men in South Africa. *AIDS Behav* 17 Suppl 1: S1–3.
49. McIntyre J, Jobson G, Struthers H, De Swardt G, Rebe K: Rapid Assessment of HIV Prevention, Care and Treatment Programming for MSM in South Africa (2013) Assessment report 2013. Johannesburg: Anova Health Institute. Available: http://heids.org.za/site/assets/files/1227/anova_ejaf_msm_assessment_full_report_v5.pdf. Accessed 17 September 2014.
50. Batist E, Brown B, Scheibe A, Baral SD, Bekker L-G (2013) Outcomes of a community-based HIV-prevention pilot programme for township men who have sex with men in Cape Town, South Africa. *J Int AIDS Soc* 16 Suppl 3: 18754.
51. Jobson G, de Swardt G, Rebe K, Struthers H, McIntyre J (2013) HIV risk and prevention among men who have sex with men (MSM) in peri-urban townships in Cape Town, South Africa. *AIDS Behav* 17 Suppl 1: S12–22.
52. Kagee A, Toefy Y, Simbayi L, Kalichman S (2005) HIV prevalence in three predominantly Muslim residential areas in the Cape Town metropole. *S Afr Med J* 95: 512–516.
53. Van Breda AD (2012) Stigma as “othering” among Christian theology students in South Africa. *SAHARA J* 9: 181–191.
54. UNAIDS (2014) AIDSinfo for South Africa. Geneva: UNAIDS. Available: <http://www.unaids.org/en/data-analysis/datatools/aidsinfo/>. Accessed 17 September 2014.
55. World Health Organization (2013) Health Equity Monitor - Compendium of Indicator Definitions. Available: http://www.who.int/gho/health_equity/outcomes/health_equity_compendium.pdf. Accessed 17 September 2014.

Appendix A

Database search strategies for systematic review on equity in utilization of ART in South Africa

Table A. Pubmed database search on 18 February 2013

SEARCH CATEGORY	SYNTAX	RESULTS
ART	antiretroviral therapy, highly active[MeSH Terms] OR ART[title/abstract] OR HAART[title/abstract] OR ARV[title/abstract] OR ARVs[title/abstract] OR Anti-Retroviral Agents[Mesh] OR antiretroviral[title/abstract] OR anti retroviral[title/abstract] OR anti-retroviral[title/abstract] OR antiviral[title/abstract] OR therapy[title/abstract]	1.251.418
HIV	acquired immunodeficiency syndrome[MeSH Terms] OR acquired immunodeficiency syndrome[title/abstract] OR aids[title/abstract] OR hiv[MeSH Terms] OR hiv[title/abstract] OR human immunodeficiency virus[title/abstract] OR hiv infections[MeSH Terms]	318.414
South Africa	(south africa[MeSH Terms] OR (south[title/abstract] AND africa*[title/abstract]))	41.343
Equity	(equity[title/abstract] OR equities[title/abstract] OR inequity[title/abstract] OR inequities[title/abstract] OR equality[title/abstract] OR equalities[title/abstract] OR Equal[title/abstract] OR Equitable[title/abstract] OR inequality[title/abstract] OR inequalities[title/abstract] OR unequal[title/abstract] OR disparity[title/abstract] OR disparities[title/abstract] OR vulnerability[title/abstract] OR fairness[title/abstract] OR unfair[title/abstract] OR social justice[MeSH Terms] OR social justice[title/abstract] OR justice[title/abstract] OR barrier[title/abstract] OR coverage[title/abstract] OR barriers[title/abstract] OR healthcare disparities[MeSH Terms] OR health services accessibility[MeSH Terms] OR health services accessibility[title/abstract] OR access to health care[title/abstract])	530.375
HIV AND ART AND Equity AND South Africa	Search: (equity[title/abstract] OR equities[title/abstract] OR inequity[title/abstract] OR inequities[title/abstract] OR equality[title/abstract] OR equalities[title/abstract] OR Equal[title/abstract] OR Equitable[title/abstract] OR inequality[title/abstract] OR inequalities[title/abstract] OR unequal[title/abstract] OR disparity[title/abstract] OR disparities[title/abstract] OR vulnerability[title/abstract] OR fairness[title/abstract] OR unfair[title/abstract] OR social justice[MeSH Terms] OR social justice[title/abstract] OR justice[title/abstract] OR barrier[title/abstract] OR coverage[title/abstract] OR barriers[title/abstract] OR healthcare disparities[MeSH Terms] OR health services accessibility[MeSH Terms] OR health services accessibility[title/abstract] OR access to health care[title/abstract]) AND (south africa[MeSH Terms] OR (south[title/abstract] AND africa*[title/abstract])) AND (acquired immunodeficiency syndrome[MeSH Terms] OR acquired immunodeficiency syndrome[title/abstract] OR aids[title/abstract] OR hiv[MeSH Terms] OR hiv[title/abstract] OR human immunodeficiency virus[title/abstract] OR hiv infections[MeSH Terms]) AND (antiretroviral therapy, highly active[MeSH Terms] OR ART[title/abstract] OR HAART[title/abstract] OR ARV[title/abstract] OR ARVs[title/abstract] OR Anti-Retroviral Agents[Mesh] OR antiretroviral[title/abstract] OR anti retroviral[title/abstract] OR anti-retroviral[title/abstract] OR antiviral[title/abstract] OR therapy[title/abstract])	297

Table B. EMBASE database search on 18 February 2013

SEARCH CATEGORY	SYNTAX	RESULTS
ART	exp highly active antiretroviral therapy/ OR ART.ti,ab. OR HAART.ti,ab. OR ARV.ti,ab. OR ARVs.ti,ab. OR exp antiretrovirus agent/ OR antiretroviral.ti,ab. OR anti retroviral.ti,ab. OR anti-retroviral.ti,ab. OR antiviral.ti,ab. OR therapy.ti,ab.	1.704.926
HIV	exp acquired immune deficiency syndrome/ OR "acquired immunodeficiency syndrome".ti,ab. OR aids*.ti,ab. OR exp Human immunodeficiency virus/ OR "hiv".ti,ab. OR "human immunodeficiency virus".ti,ab. OR exp Human immunodeficiency virus infection/	406.830
South Africa	Exp south africa/ OR (south.ti,ab. AND africa*.ti,ab.)	46.377
Equity	equity.ti,ab. OR equities.ti,ab. OR inequity.ti,ab. OR inequities.ti,ab. OR equality.ti,ab. OR equalities.ti,ab. OR "inequality".ti,ab. OR Equal.ti,ab. OR Equitable.ti,ab. OR "inequalities".ti,ab. OR "unequal".ti,ab. OR disparity.ti,ab. OR disparities.ti,ab. OR vulnerability.ti,ab. OR fairness.ti,ab. OR unfair.ti,ab. OR "social justice".ti,ab. OR "justice".ti,ab. OR barrier.ti,ab. OR barriers.ti,ab. OR "health services accessibility".ti,ab. OR "access to health care".ti,ab. OR "coverage".ti,ab. OR exp social justice/ OR exp health care disparity/ OR health care delivery/	620.062
HIV AND ART AND Equity AND South Africa		433

Table C. CENTRAL database search on 18 February 2013

SEARCH CATEGORY	SYNTAX	RESULTS
ART	(Antiretroviral Therapy, Highly Active OR Anti-Retroviral Agents OR ART OR HAART OR ARV OR ARVs OR antiretroviral OR anti retroviral OR anti-retroviral OR antiviral OR therapy):ti,ab,kw	183.638
HIV	(acquired immunodeficiency syndrome OR hiv OR hiv infections OR aids OR human immunodeficiency virus):ti,ab,kw	14.559
South Africa	(South Africa OR South Africa*):ti,ab,kw	1.163
Equity	(equity OR equities OR inequity OR inequities OR equality OR equalities OR Equal OR Equitable OR inequality OR inequalities OR unequal OR disparity OR healthcare disparities OR disparities OR vulnerability OR fairness OR unfair OR social justice OR justice OR barrier OR barriers OR health services accessibility OR health services accessibility OR access to health care OR coverage):ti,ab,kw	21.449
HIV AND ART AND Equity AND South Africa		13

Table D. PsycINFO database search on 18 February 2013

SEARCH CATEGORY	SYNTAX	RESULTS
ART	highly active antiretroviral therapy.ti,ab. OR ART.ti,ab. OR HAART.ti,ab. OR ARV.ti,ab. OR ARVs.ti,ab. OR antiretroviral.ti,ab. OR antiretroviral.ti,ab. OR anti-retroviral.ti,ab. OR antiviral.ti,ab. OR therapy.ti,ab.	182.687
HIV	Exp HIV/ OR hiv.ti,ab. OR human immunodeficiency virus.ti,ab. OR exp AIDS/ OR aids*.ti,ab. OR exp acquired immune deficiency syndrome/ OR acquired immunodeficiency syndrome.ti,ab.	44.968
South Africa	south africa or (south and africa*).ti,ab.	9.086
Equity	equity.ti,ab. OR equities.ti,ab. OR inequity.ti,ab. OR inequities.ti,ab. OR equality.ti,ab. OR equalities.ti,ab. OR Equal.ti,ab. OR Equitable.ti,ab. OR inequality.ti,ab. OR inequalities.ti,ab. OR unequal.ti,ab. OR disparities.ti,ab. OR vulnerability.ti,ab. OR fairness.ti,ab. OR unfair.ti,ab. OR social justice.ti,ab. OR justice.ti,ab. OR barrier.ti,ab. OR barriers.ti,ab. OR health services accessibility.ti,ab. OR access to health care.ti,ab. OR "coverage".ti,ab. OR exp social justice/ OR exp health disparities/ OR health care delivery/ equity.ti,ab. OR equities.ti,ab. OR inequity.ti,ab. OR inequities.ti,ab. OR equality.ti,ab. OR equalities.ti,ab. OR Equal.ti,ab. OR Equitable.ti,ab. OR inequality.ti,ab. OR inequalities.ti,ab. OR unequal.ti,ab. OR disparities.ti,ab. OR vulnerability.ti,ab. OR fairness.ti,ab. OR unfair.ti,ab. OR social justice.ti,ab. OR justice.ti,ab. OR barrier.ti,ab. OR barriers.ti,ab. OR health services accessibility.ti,ab. OR access to health care.ti,ab. OR exp social justice/ OR exp health disparities/ OR health care delivery/	166.097
HIV AND ART AND Equity AND South Africa		58

Appendix B

Data extraction and quality assessment form for systematic review on equity in utilization of ART in South Africa

Table A. Data extraction sheet

SUBJECT	QUESTION	ANSWERS	
General Information	Name of person performing data extraction	1. CM	2. EM
	Date of data extraction		
	Author(s)		
	Title article		
	Journal		
	Type of publication	1. Journal Article, 2. Dissertation, 3. Other: ...	
	Date/Year of publication		
	Geographical study area		
	Source of funding		
	Inclusion criteria study		
	Exclusion criteria study		
	Quality assessment score		
Study Characteristics	Research question / Objective of the study		
	Study design	1. Observational 2. Review, 3. Other:	
	Total duration of the study		
	Source of data and year of data collection?	1. Demographic health survey 2. Other: ... 3. Unclear	
	Area of interest	1. Initiation of ART 2. Adherence to ART 3. Other: ...	
	How were participants recruited?		
	Which sampling procedure was used to create a representative sample of the population?		
	Number of participants enrolled in the study (sample size)		
	In what manner was data collected?	1. Face-to-face interview, 2. Questionnaire, 3. Other...	

Table A. Continued

SUBJECT	QUESTION	ANSWERS	
Study Characteristics	Compared groups / Number of participants allocated in each group		
	Where was the intervention implemented? (e.g. country level/ hospital/ community clinic/other)?		
	Type of data	1. Primary, 2. Secondary, 3. Not Clear	
	What statistical method(s) was used for analysis?		
	Is informed consent correctly handled?	1. No, 2. Yes, 3. Not mentioned	
Equity criteria	Area living (location / setting / place of residency)	1. Not reported	2. Reported
	Race/ethnicity	1. Not reported	2. Reported
	Occupation	1. Not reported	2. Reported
	Age	1. Not reported	2. Reported
	Education	1. Not reported	2. Reported
	Gender	1. Not reported	2. Reported
	Socio economic status (SES)	1. Not reported	2. Reported
	Geographical region	1. Not reported	2. Reported
	Religion	1. Not reported	2. Reported
	Severity of disease (CD4 count / Viral load)	1. Not reported	2. Reported
	Other equity criteria	1. Not reported	2. Reported
	Description of equity criteria used		
Intervention	Initiation of ART	1. Not reported	2. Reported
	Adherence to therapy	1. Not reported	2. Reported
	Frequency in use ART	1. Not reported	2. Reported
	Possible / potential care providers		
	By whom was the intervention implemented?	1. Primary care, 2. Secondary care, 3. Tertiary care	
	For who was the intervention aimed at?	1. Urban population 2. Rural population 3. Poor 4. Rich 5. General population	6. Sex workers 7. PWID 8. MSM 9. Other: ... 10. No specific aim
	Was the use of ART free?	1. Yes, 2. No, 3. Not mentioned	
Equity criteria	Equity criterion		
	Definition of criteria mentioned in the study	1. Not mentioned	2. Mentioned
	Number of participants allocated to each group		

Table A. Continued

SUBJECT	QUESTION	ANSWERS	
Miscellaneous	Summary data for each intervention group		
	Notes characteristics equity criterion		
	Conclusion about access to ART		
	Comments on equity	e.g. comments on model of care or recommendations authors	
	Is the outcome generalizable/external vailidity?	1. Not mentioned	2. Mentioned
	Missing participant / Drop outs handled correctly?	1. Not mentioned	2. Mentioned
	Mentioned limitations of the study (like bias etc)	1. Not mentioned	2. Mentioned
	References to other relevant studies		
	Miscellaneous comments by study authors		
	Comments on equity by reviewers (EM / CM)		
	Miscellaneous comments by review authors (EM / CM)		

Table B. Quality assessment form

SUBJECT	QUESTIONS	SCORE
Type of publication	Type of study design	Peer-reviewed: 2 /Other: 0
Research question	Does the study have a clear and well-defined hypothesis/aim/objective/research question?	Fully: 2, Partial: 1, Not at all: 0
	Does the study motivate its research question?	Fully: 2, Partial: 1, Not at all: 0
Concepts	Does the study clearly define concepts including definitions like access, equity, ART and outcome measures?	Fully: 2, Partial: 1, Not at all: 0
Methods	Does the study clearly describe the methods that are used to answer the analytical question(s)?	Fully: 2, Partial: 1, Not at all: 0
	Are the main outcomes to be measured clearly described in the Introduction or Methods section?	Fully: 2, Partial: 1, Not at all: 0
	Does the study take potential sources of bias into account?	Fully: 2, Partial: 1, Not at all: 0
	Does the study clearly define the population and sampling method used?	Fully: 2, Partial: 1, Not at all: 0
	Is the type of information used in the study in terms of source, sample size, time period, levels etc. clearly described?	Fully: 2, Partial: 1, Not at all: 0
	Does the study make use of primary (survey) data for its key analyses?	Yes: 2, Not at all: 0
	Does the study make use of survey (household/provider level) data?	Yes: 2, Partial: 1, Not at all: 0
Data	Does the study answer (all of) the research (sub)question(s)?	Fully: 2, Partial: 1, Not at all: 0
	Are results based on evidence derived from the data analysis of the study?	Fully: 2, Partial: 1, Not at all: 0
	Are the results credible given the methods, data, and analysis used?	Fully: 2, Partial: 1, Not at all: 0
Goal achievement	Does the study critically discuss the robustness of findings, potential sources of bias, and possible limitations of the approaches of choice?	Fully: 2, Partial: 1, Not at all: 0
Findings	Does the study discuss findings within the context of existing evidence base?	Fully: 2, Partial: 1, Not at all: 0
	Are the missings / lost to follow up patients clearly described?	Fully: 2, Partial: 1, Not at all: 0
	Are the results generalizable* given size of the sample of study units? *Generalizability defined as generalizable to the rest of the country	Fully: 2, Partial: 1, Not at all: 0
Discussion / conclusion	Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	Yes: 2, Not at all: 0
Generalizability	Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	Yes: 2, Partial: 1, Not at all: 0
Total points		(max 40)

- **Sub-question 4**
Can the integrated MCDA-AFR approach be used to support strategic planning processes in HIV/AIDS control?

CHAPTER 8

Development of programmatic guidance for priority setting in HIV/AIDS control in South Africa: the integrated multi criteria decision analysis and accountability for reasonableness approach

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Balancing efficiency, equity, feasibility of HIV treatment in South Africa – development of programmatic guidance

Cost Effectiveness and Resource Allocation (2013) 11(1)

Abstract

South Africa, the country with the largest HIV epidemic worldwide, has been scaling up treatment since 2003 and is rapidly expanding its eligibility criteria. The HIV treatment programme has achieved significant results, and had 1.8 million people on treatment per 2011. Despite these achievements, it is now facing major concerns regarding (i) efficiency: alternative treatment policies may save more lives for the same budget; (ii) equity: there are large inequalities in who receives treatment; (iii) feasibility: still only 52% of the eligible population receives treatment. Hence, decisions on the design of the present HIV treatment programme in South Africa can be considered suboptimal. We argue there are two fundamental reasons to this. First, while there is a rapidly growing evidence-base to guide priority setting decisions on HIV treatment, its included studies typically consider only one criterion at a time and thus fail to capture the broad range of values that stakeholders have. Second, priority setting on HIV treatment is a highly political process but it seems no adequate participatory processes are in place to incorporate stakeholders' views and evidences of all sorts. We propose an alternative approach that provides a better evidence base and outlines a fair policy process to improve priority setting in HIV treatment. The approach integrates two increasingly important frameworks on health care priority setting: accountability for reasonableness (A4R) to foster procedural fairness, and multi-criteria decision analysis (MCDA) to construct an evidence-base on the feasibility, efficiency, and equity of programme options including trade-offs. The approach provides programmatic guidance on the choice of treatment strategies at various decisions levels based on a sound conceptual framework, and holds large potential to improve HIV priority setting in South Africa.

Background

With 5.7 million HIV-positive people, South Africa is the country with the largest HIV epidemic worldwide [1]. In recent years, the country has gradually expanded its eligibility criteria for treatment initiation in line with the World Health Organization (WHO) guidelines [2–6]. It is now rapidly scaling up its treatment programme aiming to cover all HIV-infected people with a CD4 cell count of $\leq 350 \mu\text{l}$ patients with a TB co-infection, and HIV-infected pregnant women irrespective of CD4 cell count [4,7]. The treatment programme has achieved significant results: it is the largest programme of its kind in the world, with approximately 1.8 million people on HIV treatment [8]. Despite these achievements, the present HIV programme is not optimal in three important areas. First, there are concerns about whether the current treatment strategy is most efficient. Research suggests that alternative policies such as universal testing and immediate treatment of all HIV-infected patients (UTT) [9] and targeting specific risk groups [10,11], would be more efficient than the present programme. Second, concerns exist regarding the equity of the distribution of ART across population groups – recent reviews show that e.g. men and children have less access to treatment than women [8,12]. Third, there are concerns about the programme feasibility given the severely limited capacity of the health system. In 2011, 3.4 million people were eligible for treatment in South Africa, and despite the achievements in scaling up the treatment programme, yet only 52% of them received it [8]. This “treatment gap” is related to funding constraints, but also due to staff shortages [13], and it will increase with more people surviving on treatment [13,14]. National health authorities acknowledge these concerns [4] but have not yet developed and implemented treatment guidelines that address these. This results in ad-hoc priority setting practices (where some clinicians treat patients on a first-come first-serve basis while others give preference to the most severely ill) and waiting lists in parts of the country [15].

In this paper, we argue that the above observations are related to suboptimal decisions on the design of the present HIV treatment programme. We argue there are two fundamental reasons to this. First, while there is a rapidly growing evidence-base to guide priority setting decisions on HIV treatment, its included studies typically consider only one criterion at a time and thus fail to capture the broad range of values that stakeholders have. Second, priority setting on HIV treatment is a highly political process but it seems no adequate participatory processes are in place to incorporate stakeholders’ views and evidences of all sorts.

In the paper, we first outline the scientific evidence base on HIV treatment priority setting in South Africa, in terms of efficiency, equity and feasibility. We continue by proposing an alternative approach based on the combination of two innovative and increasingly important frameworks for health care priority setting: accountability for reasonableness (A4R) to foster fair priority setting processes, and multi-criteria decision analysis (MCDA) to foster rational priority setting. The WHO has recently also recognised the need to trade-off the mentioned efficiency, equity and feasibility concerns [16], resulting in “Programmatic guidelines on HIV treatment”

issued in July 2013 [17]. This paper contributes to these guidelines by providing a practical lead way for making these difficult priority setting decisions at various decision levels, based on a firm conceptual framework.

Present approaches to HIV treatment priority setting

Present studies on HIV treatment in South Africa priority setting typically focus on one of the following criteria.

Efficiency

Lately, a wide range of mathematical modelling studies have analysed the population health effects as well as costs and cost-effectiveness (or efficiency) of early versus late onset of treatment, many incorporating the transmission benefits of ART [11,18–30]. Although models agree that HIV incidence can be substantially reduced through expanded access to ART, models differ substantially on predicted impact and cost-effectiveness of such an intervention [9,31]. In addition, there is a growing interest in tailoring HIV treatment guidelines to most efficiently target programmes [10,11].

Equity

Generally speaking, equity in health care pertains to judgements about distributive equality and the notion that every individual should have a “fair chance to live a full healthy life” [32]. Yet, with severely constrained resources as in HIV treatment in South Africa, difficult ethical choices need to be made on whom is prioritized for treatment. Only a few studies give normative guidance on this subject. More specifically, Cleary et al. use the concept of “communitarian claims” in which an individual is viewed as having a claim on health care due to being a member of a community or society—and by extension, society has some obligation to provide the care [33]. Claim strength is said to be affected by the severity of disease (sicker patients would be prioritized for moral reasons) or the individual capacity to benefit patients with a better prognosis would be prioritized as this would lead to better clinical outcomes). Another claim stems from the impact of the programme on population health (patients would be prioritized whose treatment contributes most to reduction of the epidemic). Obviously, these above factors lead to conflicting recommendations on treatment initiation, particularly regarding whether this should be early or late in the course of disease. Other factors influencing claims include the “social context” of those in need. Kimmel et al., [15] showed that professionals in South Africa support prioritizing individual patients based on treatment adherence, pregnancy status, and severity of illness. Scholars take different positions when it comes to claim strength in the use of antiretrovirals for treatment or for prevention. Brock and Wikler argue that “the strongest moral imperative directs us to giving priority to saving the most lives (..) even if this means lowering the priority given to the goal of universal access to treatment, to provide maximum protection from HIV infection” [34]. In response, Macklin and Cowan reason that “it is unethical to deliberately watch patients with treatable

HIV/AIDS worsen and die (..) if medication for treatment are diverted to preexposure prophylaxis" [35]. Alternatively, Singh proposes that a state's "minimum core obligation" be used as a guiding principle in HIV programmes. This would protect the interest of all people, and as a consequence, antiretrovirals should not be exclusively used for treatment but also for prevention of HIV among, e.g. vulnerable young women [36].

Feasibility

Feasibility refers to constraints at the personal and health system level that may impede the implementation of HIV treatment programmes. A recent study in South Africa assessed the human and financial resources requirement for different HIV treatment strategies [14] but overall there is little systematic guidance on how these constraints can be considered.

Fundamental weaknesses of present approaches

The above overview shows a rapidly growing evidencebase on the efficiency, equity and feasibility of HIV treatment in South Africa. Yet, we argue there are two fundamental weaknesses to the current approaches that hamper policy makers in their ability to guide priority setting decisions.

Firstly, the HIV treatment programme in South Africa is not fully rational, with rational referring to "evidencebased allocation decisions in health taking into account all relevant decision-making criteria" [37]. The current programme is largely based on international guidelines and does not adequately account for aspects of efficiency, equity, and feasibility – these are not well documented, difficult to trade-off and therefore typically considered one at a time. For example, cost-effectiveness analyses consistently show that UTT is a highly efficient intervention but thereby ignore the severe health system capacity constraints of such a strategy, other than the budget [14]. As another example, the use of pre-exposure prophylaxis (PrEP) has shown to be effective and costeffective to prevent HIV acquisition, but the community may prioritise to treat those people who are in greatest need of ART for their own health (even when this is less cost-effective). It is obvious that studies that fail to simultaneously consider efficiency, equity and feasibility concerns also fail to fully inform priority setting decisions [37]. Underlying reason is that studies are typically not multidisciplinary (they stem from either clinical medicine, epidemiology, health economics or ethics), nor interdisciplinary (little effort has been made to take into account community views) [37].

Second, HIV treatment priority setting is a highly political process but in the seemingly absence of fair participatory processes, stakeholders' views are typically not incorporated. The legitimacy of decision-making in health refers to the use of "generally considered fair conditions for distributive decision-making in health" [38–40] corresponding to "the belief that authorities, institutions, and social arrangements are appropriate, proper, and just" [40]. Experience shows that there is often justifiable disagreement among stakeholders on which values to use

in priority setting decisions [41,42]. Ethicists have realized there are no absolute truths on principles to guide priority setting decisions, and argue that decision-makers must rely instead on a fair process (i.e. procedural fairness) to establish fair decisions [43,44]. In contrast, the studies – as referred to above – typically rely on the assumption of ideal policy-makers, and that the mere provision of quantified evidence to policy makers leads to justified priority setting decisions. The resulting picture is that of an ad-hoc priority setting process on HIV treatment (Figure 1, left panel).

An alternative approach

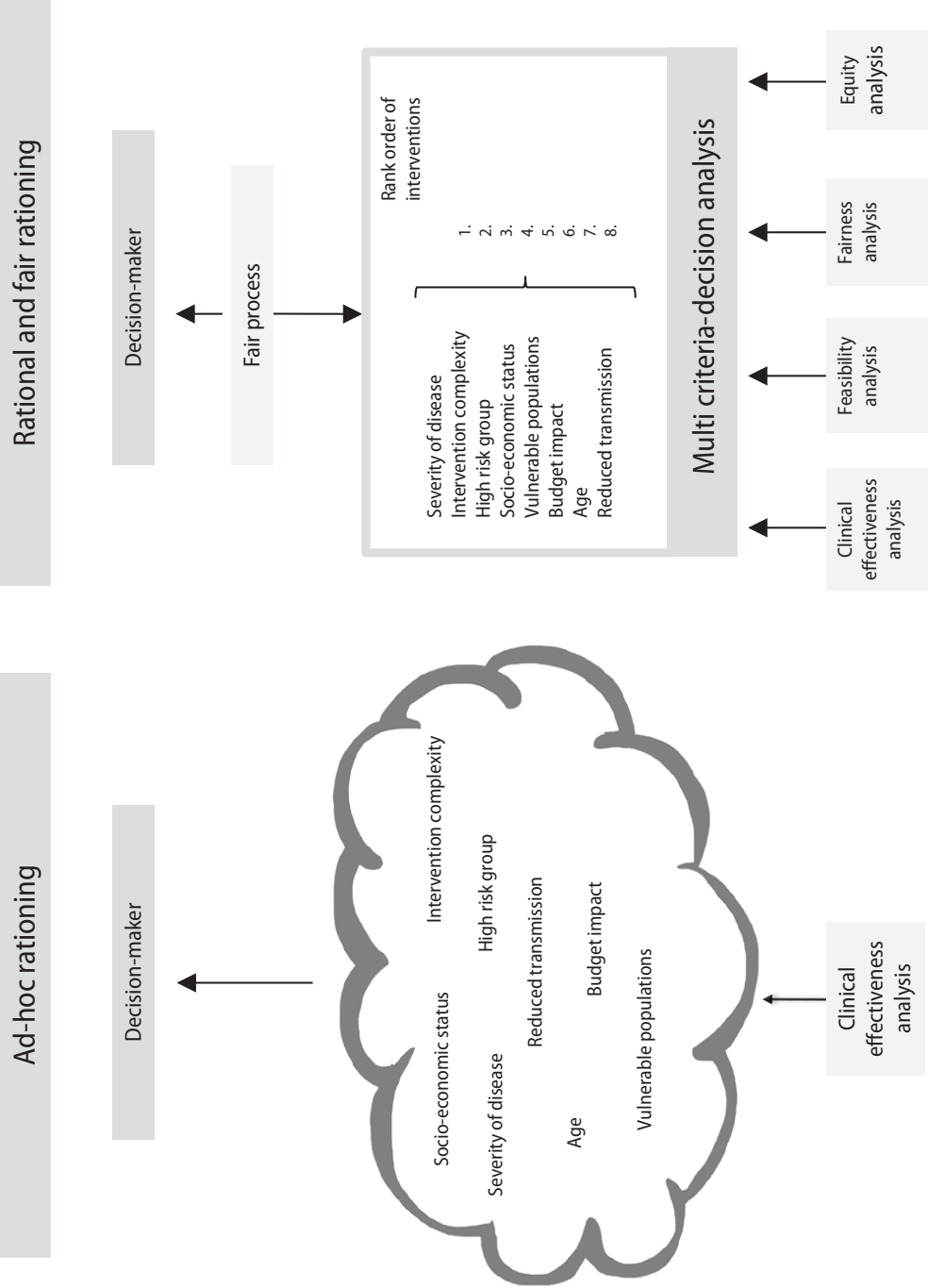
In this chapter we propose an alternative approach to provide a better evidence base and include a fairer policy process to improve HIV treatment rationing. It is based upon two innovative and increasingly important frameworks to health care rationing: the ethical framework on *accountability for reasonableness (AFR)* that fosters fair rationing, and *multi-criteria decision analysis (MCDA)* that fosters rational rationing [37,45–56]. We believe that the integration of the two frameworks in a single approach holds large potential to improve fair and rational rationing [57]. Pilot studies show that decision makers in low-income countries support the principles of both frameworks [54,58].

Accountability for Reasonableness

AFR is generally considered as a leading conceptual framework on the ethics of health care rationing. Based on justice theories of democratic deliberation, it aims to strengthen the fairness of rationing decisions [43,44]. Central to the framework is the acceptance that people may justifiably disagree on what reasons to consider when priorities are made. In order to narrow the scope of controversy, AFR relies on “fair deliberative procedures that yield a range of acceptable answers” [43]. Therefore, AFR provides structure for decision-makers to establish priorities for their specific contexts, while taking into account limited resources and regulatory conditions. Its central notion of democratic learning presumes that a continuous participatory process will lead to better knowledge and consensus building on criteria for decisions, and thus also strengthening agreement on - or at least acceptance of - decisions. AFR does not replace any other guideline, planning or decision making process, but adds procedural principles to support their implementation. The AFR framework consists of four conditions.

- **Relevance.** Priority-setting decisions should be based on evidence, reasons and principles accepted by the stakeholders as relevant for meeting health needs fairly in their contexts. Closely linked to this condition is the inclusion of a broad range of stakeholders in the decision-making process. Having a wide range of stakeholders participating in the deliberation would help include the full range of relevant reasons and facilitate the implementation of the decisions made.
- **Publicity.** Decision makers should make the process of priority-setting transparent including the reasons behind the decisions. This gives the general public an opportunity to under-

Figure 1 Ad-hoc versus rational and fair rationing (based on [37])



stand the values of the choices involved and a possibility to assess whether the relevant procedures are being followed. Publicity is important because it facilitates comparison from case to case to ensure consistency; it invokes appeal and may improve trust.

- **Appeals/Revision.** The appeals condition is a mechanism that provides the public with an opportunity to dispute and challenge decisions. Thus, it also offers the decision makers an option to revise decisions in the light of further arguments. An appeals mechanism enriches decision-making process because initial agreement on reasons can be reassessed in light of new evidence.
- **Leadership/enforcement.** There must be public or voluntary regulation of the decision-making process to ensure that relevance, publicity and appeals mechanisms are enforced and that decisions are considered as fair. Proper enforcement of fairness in decision making will ensure that decisions are acceptable and can be supported by all concerned. Activities based on such decisions are also likely to be more effective and sustainable.

Many authors propose AFR as a guiding framework on the fairness of HIV treatment [33,35,41,42]. Yet, it has been criticised for being of limited practical use, i.e. for not detailing the 'Relevance conditions', and how to include relevant evidence in the deliberation process [57,59]. Given the importance of AFR as conceptual framework in health care rationing, there is an urgent need to put it into operation.

Multi-criteria decision analysis (MCDA)

MCDA is theoretically grounded in multi-attribute utility theory [60] and sets programme priorities by referring to a comprehensive set of explicit criteria and guides decision makers in understanding the trade-offs between values that may be conflicting [37]. As such, it could be used in studies on rationing of HIV treatment, to simultaneously consider feasibility, efficiency and equity concerns.

MCDA is routinely used in other disciplines like agriculture [61,62], as a response to the observed inability of people to effectively analyze multiple streams of dissimilar information, but knows relatively few applications in health. An example of the use of MCDA, in HIV treatment is a study by Cleary et al [41] in South Africa – who used mathematical programming techniques to trade-off equity and efficiency concerns. They estimated the health effects at different budget levels in the absence of any equity constraint ("health maximization"), and in the presence of two equity constraints: "equal treatment to all", and "decent minimum". The conclusion was that "health maximization" could achieve sizeable health gains but this would leave a quarter of those eligible for treatment without care. "Equal treatment" and a "decent minimum" would be more equitable but lead to less profound health gains. Another study has used MCDA to set priorities in HIV/AIDS control in Thailand [51,53] and Indonesia [63,64].

Table 1. Hypothetical and simplified MCDA for HIV treatment in South Africa

HIV TREATMENT PROGRAMME OPTION	FEASIBILITY [†]		EFFICIENCY [†]	EQUITY [†]	OTHER	TOTAL [‡]
programme option	Health system constraints	Acceptability	Costs per health gain	Fair distribution of health gains	
How to deliver treatment						
Hospital-based treatment	••	••	••	••		••
Facility-based treatment	•••	•••	•••••	••••		••••
Mobile clinic-based treatment	•	••••	••	•••••		•••
Transport subsidies	••	••••	••	•••••		•••
When to initiate treatment						
Treatment CD4 < 200 cells/μl	•••••	•••	••	••••		•••
Treatment CD4 < 350 cells/μl	•••	•••	••••	•••		•••
Universal test and treat	•	••	•••••	•		••
Who gets targeted for treatment						
Discordant couples ^{††}	•••	••	•••••	••		•••
Compliant patient groups ^{††}	•••	••	•••••	•		•••
Pregnant women ^{††}	•••	••••	•••	•••		••••
Productive adults	•••	•••	•••	•		••
First-come first-serve	•••	•	••	•		••
Weights	20	20	30	30		

[†] The performance of interventions on feasibility, efficiency and equity is hypothetical and for illustrative purposes only. Criteria are example criteria only. The scoring ranges from • to ••••• respectively representing a very weak to very strong performance of an intervention on a certain criteria. [‡]The total is calculated as the weighted scores on all criteria and rounded-off; ^{††} Irrespective of CD4 cell count.

A core component of any MCDA is the performance matrix which scores all programme options in terms of their performance on relevant criteria. Table 1 shows a hypothetical performance matrix for the evaluation of HIV treatment programmes. Each row describes a programme option (on how to deliver HIV treatment, when to initiate treatment, and who gets targeted for treatment) and each column describes the performance of the options against the criteria “feasibility”, “efficiency”, and “equity”. For example, mobile-clinic based treatment does not perform well on “efficiency” (as mobile clinics are relatively costly), but good on “equity” (as it is a way to reach remote areas and provide treatment to all). The matrix in Table 1 is highly simplified — in reality, more criteria may be included which makes it adjustable to context. The matrix also quantifies the detailed performance on all criteria as well as trade-offs. For example, per programme option, the matrix may detail the number of life-years averted, among which population groups these occur, the expected costs, and required health system

capacity — this allows a quantification of the trade-offs. In addition, in a real life application, the programme options in the performance matrix include coverage levels and can be combined.

There are several ways to interpret the performance matrix. In a qualitative inspection, any decision maker simply makes implicit judgments on the weights of the various criteria. Alternatively, in a quantitative inspection, any decision maker weighs the different criteria on the basis of their relative importance, and multiplies the scores by the weights to obtain weighted averages for all programmes. Programmes can subsequently be rank-ordered according to these weighted averages, somehow representing social welfare [53]. Table 1 shows hypothetical criteria weights at the bottom row, and weighted averages in the utter right column, to illustrate the latter; here facility-based treatment would be ranked first in the choice on 'how to deliver treatment' [37].

The contours of an alternative approach

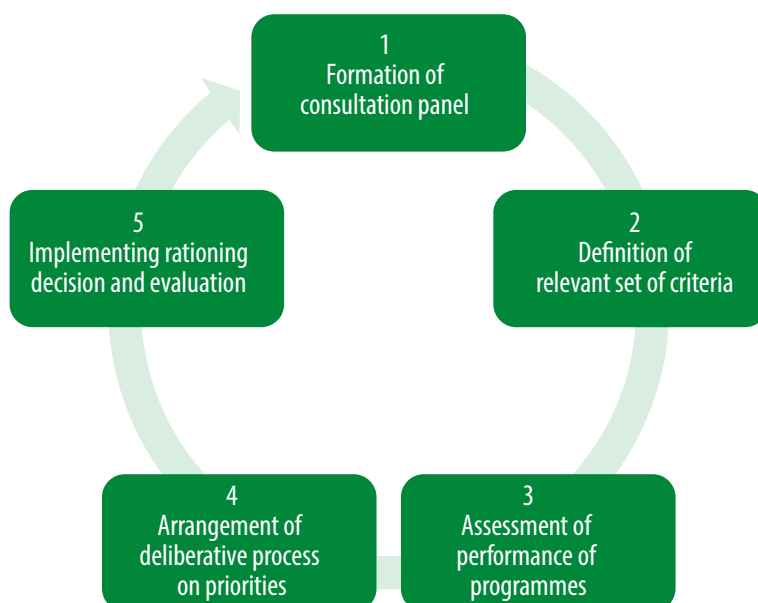
The integration of the two frameworks in a single approach (Figure 1) holds large potential to improve fair and rational rationing [57]. While important frameworks on themselves, AFR should be informed by better evidence, and MCDA could be very useful in this regard if implemented in an accountable and transparent way.

The contours of an alternative approach, including five steps, are shown in Figure 2. A first step involves the formation of a consultation panel consisting of all relevant stakeholders and this may include representatives from a broad range of parties, such as decision makers, community representatives, people living with HIV/AIDS, health professionals, etc [48,53]. The formation of this panel can be a gradual process starting with the present decision-making body.

In a second step, the panel identifies the decision-making criteria on the basis of local values. This involves a deliberative process in which panel members put forward relevant criteria (reasons) for rationing and discuss reasons, principles, and evidence that each view as relevant to making fair decisions about priorities. These criteria are discussed, and ultimately approved or rejected, by other panel members. The aim is to reach acceptance on a set of criteria that are considered reasonable by all panel members. Sometimes this will be through consensus or through democratic voting but other times through hierarchical decision making. Even these cases can be compatible with AFR when all values and criteria have been deliberated in a fair way, the rationales for the decisions are made available and appeals can be made when the rationing decision is implemented.

This paper proposes the use of criteria under the general headings of "feasibility", "efficiency" and "equity", but these criteria are obviously not predetermined. Instead, these specific criteria should be defined by the consultation panel as an outcome of stakeholders' discussions on which values they find most important for HIV priority setting.

Figure 2. The health care rationing process of HIV treatment programmes - an alternative approach



A third step concerns the construction of the performance matrix, and this is the core component of any MCDA. In this step, all programme options are scored in terms of their performance on the selected criteria. In a fourth step, the panel interprets the performance matrix. This may or may not involve the weighing of the relevant criteria. The AFR framework stipulates that this step always includes a component of deliberation to discuss these weights, to identify any other criteria (that may have been ignored in the previous steps or that cannot be quantified), and to address the reasonability of the final ranking ordering. Step five is the phase of evaluating the rationing decision arrived at, and relates to the transparency, appeal and enforcement conditions of AFR (as described above).

Health care rationing is a continuous process, where ethical dilemmas and programme priorities may regularly need to be updated in the light of changes of available programme options, of programme characteristics in terms of efficiency, equity and feasibility, or of stakeholders' preferences. Health care rationing is therefore represented here as a cyclical process. The cycle also reflects that health care rationing is a (democratic) interactive learning process, in which the consultation panel constantly refines the participatory process of identifying, elaborating and deciding on the inclusion of further relevant stakeholders, criteria and evidence.

Discussion

Balancing feasibility, efficiency and equity in HIV priority setting is a major challenge, and we have shown that present approaches fall short. We propose an alternative approach that integrates two existing frameworks, and believe this provides a better evidence base and outlines a fairer policy process to improve HIV treatment rationing.

This approach is innovative in a number of ways. Most importantly, the programme integrates separate disciplines of thought on health care rationing in a single framework. The scientific literature of health care rationing – whether it is in low-, middle- or high-income countries – typically does not go beyond the boundaries of traditional disciplines like medicine, epidemiology, health economics and ethics. Our suggested approach unites insights and methods from these disciplines, and merges disease modelling, cost-effectiveness analysis, equity analysis and procedural fairness in one single approach. The potential of merging approaches from different disciplines has been named before by Peacock et al, who proposed a novel interdisciplinary framework combining MCDA, AFR, Participatory Action Research (PAR) and Programme Budgeting and Marginal Analysis (PBMA) [59]. However, to the best of our knowledge, this novel framework has not been explicitly put in practice. Yet, at the same time, PBMA is reported to routinely take care of many of the aspects raised above [65].

The approach can be implemented at different political levels including national, province, district and community level. Here it provides support for management and a strategy for quality improvement in regard to health care rationing, including a heretofore-missing evidence-base for these decisions. By combining the MCDA and AFR, the approach incorporates many elements that bring a large capacity for considerations. Its implementation results in policies that are grounded on evidence-based research and that encourage involvement from all stakeholders. More importantly it may lead to a greater understanding and acceptability also from those directly affected by policy changes [57].

The use of our proposed approach in different decision-making contexts may lead to the inclusion of different stakeholders, identification of different criteria and ultimately to the selection of different interventions. While this may reflect the presence of different values in these different contexts, it may possibly also reflect differences in the rigor of implementation of the approach. The development of checklists on stakeholders and criteria (as proposed by [66] to consider may reduce these latter differences. The use of a standardized approach including a priori defined criteria (and possibly even criteria weights) would ignore differences in values in different contexts, and the importance of the deliberative process.

The integration of AFR and MCDA also poses a number of challenges. First, whereas AFR can be considered as a continuous democratic governance approach based on reasons that any stakeholders brings into play, MCDA requires a higher level of competence for its interpreta-

tion. This may run the risk of leaving out some stakeholders and limit the influence of others. Yet, first experiences on the use of MCDA did not identify this as a barrier in the process [48]. Second, the development of rigour evidence for health care rationing, through MCDA, requires innovative research. Quantitative measures of equity and feasibility need to be developed, and measures of impact and efficiency need refinement. Also, mathematical models need to be developed that reflect the performance of treatment programmes in terms of efficiency and equity - these models could include measures of feasibility (as e.g. health workers availability) as health system capacity constraints. Yet, if the latter would be necessary in any health care rationing process, MCDA runs the risk of needing a high level of expertise to provide credible evidence to the rationing process. One way of addressing this is to allow, at least in the beginning of a process, more reliance on qualitative analysis within the consultation panel [67,68]. ■

References

- UNAIDS (2012) UNAIDS report on the global aids epidemic. Geneva.
- SANAC (2007) SANAC South African National AIDS Council: National strategic plan for HIV & AIDS and STI. 2007–2011.
- SANAC (2012) South African National AIDS Council: The South African antiretroviral treatment guidelines 2010. Available: <http://www.sanac.org.za/resources/art-guidelines>.
- SANAC (2011) South African National AIDS Council: National Strategic Plan for HIV and AIDS, STIs and TB, 2012–2016.
- SANAC (2011) South African National AIDS Council: Statement by the presidency on the SANAC meeting. South Africa.
- Matsoso M (2012) Accelerating access to ART services and uptake. Development DoHaS: Cape Town Director General Health Republic of South Africa.
- Department of Health Republic of South Africa (2013). The South African Antiretroviral Treatment Guidelines 2013. Available: <http://www.sahivsoc.org/upload/documents/2013%20ART%20Guidelines-Short%20Combined%20FINAL%20draft%20guidelines%2014%20March%202>.
- Johnson LF (2012) Access to antiretroviral treatment in South Africa, 2004–2011. *South African J HIV Med* 2012, 13(1):22–27.
- Hontelez JCLM, Bärnighausen T, Bakker R, Baltussen R, Tanser F, Hallett TB, Newell ML, De Vlas SJ (Forthcoming, *PLoS Med*) Expanded access to antiretroviral therapy leads to elimination of HIV in South Africa, even without universal test and treat.
- Delva W, Eaton JW, Meng F, Fraser C, White RG, et al. (2012) HIV treatment as prevention: optimising the impact of expanded HIV treatment programmes. *PLoS medicine* 9: e1001258.
- Hallett TB, Baeten JM, Heffron R, Barnabas R, de Bruyn G, et al. (2011) Optimal uses of antiretrovirals for prevention in HIV-1 serodiscordant heterosexual couples in South Africa: a modelling study. *PLoS medicine* 8: e1001123.
- Tromp N, Michels C, Mikkelsen E, Hontelez J, Baltussen R (2014) Equity in utilization of antiretroviral therapy for HIV-infected people in South Africa: a systematic review. *Int Journal Equity Health* 13: 60.
- Bärnighausen T, Bloom DE, Humair S (2007) Human resources for treating HIV/AIDS: needs, capacities, and gaps. *AIDS patient care and STDs* 21: 799–812.
- Hontelez JA, Newell M-L, Bland RM, Munnely K, Lessells RJ, et al. (2012) Human resources needs for universal access to antiretroviral therapy in South Africa: a time and motion study. *Human resources for health* 10: 39.
- Kimmel AD, Daniels N, Betancourt TS, Wood R, Prosser LA (2012) Decision maker priorities for providing antiretroviral therapy in HIV-infected South Africans: a qualitative assessment. *AIDS care* 24: 778–792.
- World Health Organization (2012) WHO Consultation on the Strategic Use of Antiretrovirals (SUA). 2nd Expert Panel towards Programmatic Guidance.
- World Health Organization (2013) Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection. Geneva.
- Bendavid E, Brandeau ML, Wood R, Owens DK (2010) Comparative effectiveness of HIV testing and treatment in highly endemic regions. *Archives of internal medicine* 170: 1347–1354.
- Baggaley RF, Garnett GP, Ferguson NM (2006) Modelling the impact of antiretroviral use in resource-poor settings. *PLoS Med* 3: e124.
- Dodd PJ, Garnett GP, Hallett TB (2010) Examining the promise of HIV elimination by “test and treat” in hyperendemic settings. *AIDS* 24: 729–735.
- Kretzschmar MEE, van der Loeff MFS, Coutinho RA (2012) Elimination of HIV by test and treat: a phantom of wishful thinking? *AIDS* 26: 247–248.
- Powers KA, Ghani AC, Miller WC, Hoffman IF, Pettifor AE, et al. (2011) The role of acute and early HIV infection in the spread of HIV and implications for transmission prevention strategies in Lilongwe, Malawi: a modelling study. *Lancet* 378: 256–268.
- Wagner BG, Kahn JS, Blower S (2010) Should we try to eliminate HIV epidemics by using a “Test and Treat” strategy? *AIDS* 24: 775–776.
- Walensky RP, Paltiel AD, Losina E, Morris BL, Scott CA, et al. (2010) Test and treat DC: forecasting the impact of a comprehensive HIV strategy in Washington DC. *Clinical infectious diseases: an official publication of the Infectious Diseases Society of*

- America 51: 392–400.
25. Granich R, Kahn JG, Bennett R, Holmes CB, Garg N, et al. (2012) Expanding ART for treatment and prevention of HIV in South Africa: estimated cost and cost-effectiveness 2011–2050. *PLoS one* 7: e30216.
 26. Granich RM, Gilks CF, Dye C, De Cock KM, Williams BG (2009) Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model. *Lancet* 373: 48–57.
 27. Hontelez JAC, de Vlas SJ, Tanser F, Bakker R, Bärnighausen T, et al. (2011) The impact of the new WHO antiretroviral treatment guidelines on HIV epidemic dynamics and cost in South Africa. *PLoS one* 6: e21919.
 28. Rosen S, Long L, Sanne I, Stevens WS, Fox MP (2011) The net cost of incorporating resistance testing into HIV/AIDS treatment in South Africa: a Markov model with primary data. *Journal of the International AIDS Society* 14: 24.
 29. Walensky RP, Wood R, Ciaranello AL, Paltiel AD, Lorenzana SB, et al. (2010) Scaling up the 2010 World Health Organization HIV Treatment Guidelines in resource-limited settings: a model-based analysis. *PLoS medicine* 7: e1000382.
 30. Walensky RP, Wood R, Fofana MO, Martinson NA, Losina E, et al. (2011) The clinical impact and cost-effectiveness of routine, voluntary HIV screening in South Africa. *Journal of acquired immune deficiency syndromes* (1999) 56: 26–35.
 31. Eaton JW, Johnson LF, Salomon JA, Bärnighausen T, Bendavid E, et al. (2012) HIV treatment as prevention: systematic comparison of mathematical models of the potential impact of antiretroviral therapy on HIV incidence in South Africa. *PLoS medicine* 9: e1001245.
 32. Whitehead M (1992) The concepts and principles of equity and health. *International journal of health services: planning, administration, evaluation* 22: 429–445.
 33. Cleary SM, Mooney GH, McIntyre DE (2011) Claims on health care: a decision-making framework for equity, with application to treatment for HIV/AIDS in South Africa. *Health policy and planning* 26: 464–470.
 34. Brock DW, Wikler D Ethical challenges in long-term funding for HIV/AIDS. *Health affairs (Project Hope)* 28: 1666–1676.
 35. Macklin R, Cowan E (2012) Given financial constraints, it would be unethical to divert antiretroviral drugs from treatment to prevention. *Health affairs (Project Hope)* 31: 1537–1544.
 36. Singh JA (2013) Antiretroviral resource allocation for HIV prevention. *AIDS* 27: 863–865.
 37. Baltussen R, Niessen L (2006) Priority setting of health interventions: the need for multi-criteria decision analysis. *Cost Eff Res Alloc* 4: 14.
 38. Daniels N (2000) Accountability for Reasonableness. *BMJ* 321: 1300–1301.
 39. Daniels N, Sabin J (1997) Limits to health care: fair procedures, democratic deliberation, and the legitimacy problem for insurers. *Philosophy & public affairs* 26: 303–350.
 40. Tyler TR (2006) Psychological perspectives on legitimacy and legitimization. *Annual review of psychology* 57: 375–400.
 41. Cleary S, Mooney G, McIntyre D (2010) Equity and efficiency in HIV-treatment in South Africa: the contribution of mathematical programming to priority setting. *Health economics* 19: 1166–1180.
 42. Singh J (2012) How to strategically roll out antiretroviral-based interventions for HIV treatment and prevention ethically and judiciously. Presentation at WHO Consultation on the Strategic Use of Antiretrovirals. 2nd Expert Panel. Geneva
 43. Daniels N, Sabin J (2000) Setting limits fairly: Can we learn to share medical resources? Oxford: Oxford University Press.
 44. Klein R (2000) Setting priorities: What is holding us back - inadequate information or inadequate institutions? In: *The Global Challenge Health Care Rationing*. Coulter, Angela; Ham, Chris. Open University Press.
 45. Baeten SA, Baltussen RMPM, Uyl-de Groot CA, Bridges J, Niessen LW (2010) Incorporating equity-efficiency interactions in cost-effectiveness analysis—three approaches applied to breast cancer control. *Value Health* 13: 573–579.
 46. Baltussen R, Stolk E, Chisholm D, Aikins M (2006) Towards a multi-criteria approach for priority setting: an application to Ghana. *Health economics* 15: 689–696.

47. Baltussen R, ten Asbroek AHA, Koolman X, Shrestha N, Bhattarai P, et al. (2007) Priority setting using multiple criteria: should a lung health programme be implemented in Nepal? *Health policy and planning* 22: 178–185.
48. Baltussen R, Youngkong S, Paolucci F, Niessen L (2010) Multi-criteria decision analysis to prioritize health interventions: Capitalizing on first experiences. *Health policy* 96: 262–264.
49. Chitama D, Baltussen R, Ketting E, Kamazima S, Nswilla A, et al. (2011) From papers to practices: district level priority setting processes and criteria for family planning, maternal, newborn and child health interventions in Tanzania. *BMC women's health* 11: 46.
50. Jehu-Appiah C, Baltussen R, Acquah C, Aikins M, d'Almeida SA, et al. (2008) Balancing equity and efficiency in health priorities in Ghana: the use of multicriteria decision analysis. *Value Health*. 11: 1081–1087.
51. Youngkong S, Baltussen R, Tantivess S, Koolman X, Teerawattananon Y (2010) Criteria for priority setting of HIV/AIDS interventions in Thailand: a discrete choice experiment. *BMC health services research* 10: 197.
52. Youngkong S, Kipiriri L, Baltussen R (2009) Setting priorities for health interventions in developing countries: a review of empirical studies. *Tropical medicine & international health* : TM & IH 14: 930–939.
53. Youngkong S, Teerawattananon Y, Tantivess S, Baltussen R (2012) Multi-criteria decision analysis for setting priorities on HIV/AIDS interventions in Thailand. *Hea Res Policy System* 10: 6.
54. Youngkong S, Baltussen R, Tantivess S, Mohara A, Teerawattananon Y Multicriteria decision analysis for including health interventions in the universal health coverage benefit package in Thailand. *Value Health* 15: 961–970.
55. Mirelman A, Mentzakis E, Kinter E, Paolucci F, Fordham R, et al. (2012) Decision-making criteria among national policymakers in five countries: a discrete choice experiment eliciting relative preferences for equity and efficiency. *Value Health* 15: 534–539.
56. Guindo LA, Wagner M, Baltussen R, Rindress D, van Til J, et al. (2012) From efficacy to equity: Literature review of decision criteria for resource allocation and healthcare decisionmaking. *Cost Eff Res Alloc* 10: 9.
57. Baerøe K, Baltussen R (2014) Legitimate Healthcare Limit Setting in a Real-World Setting: Integrating Accountability for Reasonableness and Multi-Criteria Decision Analysis. *Public Health Ethics*.
58. Kipiriri L, Martin DK (2010) Successful priority setting in low and middle income countries: a framework for evaluation. *Health Care Anal* 2010 18 (2) 129–147.
59. Peacock S, Mitton C, Bate A, McCoy B, Donaldson C (2009) Overcoming barriers to priority setting using interdisciplinary methods. *Health Policy* 92: 124–132.
60. Peacock SJ, Richardson JRJ, Carter R, Edwards D (2007) Priority setting in health care using multi-attribute utility theory and programme budgeting and marginal analysis (PBMA). *Social science & medicine* (1982) 64: 897–910.
61. LPNMS (Land and Plant Nutrition Management Service) (2005) MCDA - Multi-Criteria Decision Analysis techniques, using the Aspiration-Led Decision Support (ALDS) approach. Website: <http://www.fao.org/ag/agl/agll/infotech.htm> Accessed 22 December 2005.
62. Linkov I, Varghese A, Jamil S, Seager T, Kiker G, Bridges T (2004) Multi-criteria decision analysis: a framework for structuring remedial decisions at contaminated sites. In: *Comparative risk assessment and environmental decision making* 15–54. Edited by Linkov I, Ramadan ABK.
63. Tromp N, Prawiranegara R, Siregar A, Sunjaya D, Baltussen R (Unpublished results) Priority setting in HIV/AIDS control in Indonesia: the importance of multiple criteria perceived by multiple stakeholders.
64. Tromp N, Prawiranegara R, Riparev Subhan H, Siregar A, Sunjaya D, et al. (2014) Priority setting in HIV control in West Java Indonesia: an evaluation based on the accountability for reasonableness framework. *Health Policy and Planning*.
65. Gibson J, Mitton C, Martin D, Donaldson C, Singer P (2006) Ethics and economics: does programme budgeting and marginal analysis contribute to fair priority setting? *Journal of health services research*

- & policy 11: 32–37.
66. Tromp N, Baltussen R (2012) Mapping of multiple criteria for priority setting of health interventions: an aid for decision makers. *BMC health services research* 12: 454.
 67. Patten S, Mitton C, Donaldson C (2006) Using participatory action research to build a priority setting process in a Canadian Regional Health Authority. *Social science & medicine* (1982) 63: 1121–1134.
 68. Dionne F, Mitton C, Macdonald T, Miller C, Brennan M (2013) The challenge of obtaining information necessary for multi-criteria decision analysis implementation: the case of physiotherapy services in Canada. *Cost Effect Res Alloc* 11: 11.

- **Sub-question 4**
Can the integrated MCDA-AFR approach be used to support strategic planning processes in HIV/AIDS control?

CHAPTER 9

Priority setting in HIV/AIDS control in Indonesia: implementation of the integrated multi criteria decision analysis and accountability for reasonableness framework

Submitted as:

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Priority setting in HIV/AIDS control in Indonesia: implementation of the integrated multi criteria decision analysis and accountability for reasonableness approach.

Abstract

Various methods have been used to guide priority setting in health but have been criticized for being rather technocratic, not sufficiently pragmatic and not process oriented. Recently, an integrated approach was proposed that combines the Multi Criteria Decision Analysis (MCDA) and Accountability for Reasonableness (AFR) frameworks for priority setting of health interventions. We describe the first time implementation of the MCDA-AFR approach to develop the five-years (2014-2018) HIV/AIDS strategic plan for West Java province in Indonesia. A project team (n=5) was formed that implemented the following steps between January and October 2013:

1) formation of a stakeholders' consultation panel, 2) definition of criteria for priority setting, 3) assessment of performance of interventions, 4) arrangement of a deliberative process on priorities, 5) implementation of rationing decisions and evaluation.

First, a consultation panel (n=23) was formed of policy-makers, West Java AIDS commission's program managers, community organizations' staff, health care workers and researchers. Second, the panel selected four criteria for priority setting:

an intervention's 1) impact on the epidemic, 2) impact on reducing stigma in society, 3) cost-effectiveness, and 4) contribution to universal access. Third, the panel proposed 50 interventions and data was collected on their performance on the four criteria. Fourth, after a deliberative process the panel agreed that HIV testing and treatment packages were the most attractive intervention to scale while mitigation activities were least attractive. Fifth, funding and implementation agencies were identified for the most attractive interventions. Compared to previous processes, this approach improved the transparency, the use of evidence and stakeholder engagement in priority setting in HIV/AIDS control. Main challenges were the availability of data and existing structures like the influence of donors and a missing direct link to funding of the prioritized interventions. To further improve the combined MCDA-AFR approach we propose to incorporate a situational analysis, to select context specific appeal and publicity mechanisms and to develop better methodological guidelines for its application.

Background

Indonesia (243 million inhabitants) has one of Asia's fastest growing HIV/AIDS epidemic with an estimated 610,000 people living with HIV/AIDS (PLWHA) in 2012 [1]. While at the start the epidemic was spread mainly through people who inject drugs (PWID), now sexual transmission causes most new HIV infections with increasing numbers among men having sex with men (MSM), female sex workers (FSWs) and their clients, and sero-discordant couples [1]. In a resource constrained environment, priority setting of HIV/AIDS interventions is crucial: in 2010 only US\$ 69 million was spent on HIV/AIDS control in Indonesia while an estimated US\$ 152 million was required to effectively control the epidemic [2,3].

While AIDS commissions in Indonesia are established at the national, provincial and district levels to coordinate the HIV/AIDS response, an evaluation by Tromp et al. [4] revealed weaknesses in strategic planning. Strategic plans typically contained a long list of activities and criteria to prioritize these were not stated explicitly and neither were they transparent for stakeholders. Although many stakeholders were involved in the development of the five year strategic plan for HIV/AIDS control their engagement could be improved. Furthermore, formal measures to give stakeholders an opportunity to appeal against decisions are not yet established.

In both developed and developing countries processes of setting priority for public spending are challenging [5]. The limited use of systematic evidence often results in historical based and ad-hoc decisions [6]. Decisions are often made without public participation and hence are not always fully legitimate [7,8]. Particularly in low resource settings, contextual influences may be greater, information more scarce and capacity more limited [5]. However, in high-income countries effective priority setting is becoming more important as well, now that populations live longer, expectations of good health raise and technical solutions to health problems expand, whilst resources become increasingly limited. Better priority setting processes would lead to better acceptance of policy decisions by the public, more rational funding decisions and ultimately to improved health [5,9,10].

Various methods have been introduced to guide priority setting but there is little consensus on which is the most optimal one and until today no single method can be recommended [5]. Recently, Baltussen et al. [11] put forward an integrated approach that combines elements of the Multi Criteria Decision Analysis (MCDA) and Accountability for Reasonableness (AFR) frameworks for priority setting in health. The MCDA framework explicitly identifies criteria for priority setting and collects an evidence-base to guide decisions. Yet, it has been criticized for being too technocratic and not sufficiently focused on the decision making process [5,12]. The AFR framework outlines four conditions to ensure fair priority setting processes but these have been criticized for being conceptually abstract, difficult to implement and the framework lacks practical guidance for policy makers to set priorities [5,10,13–16]. An integration of both frameworks may therefore improve priority setting in health.

In this paper we describe the first time application of the integrated AFR-MCDA approach to develop the five-years (2014-2018) HIV/AIDS strategic plan for West Java province in Indonesia. In this article we describe the implementation steps, the results, the challenges and recommendations for further development of the approach.

Methods

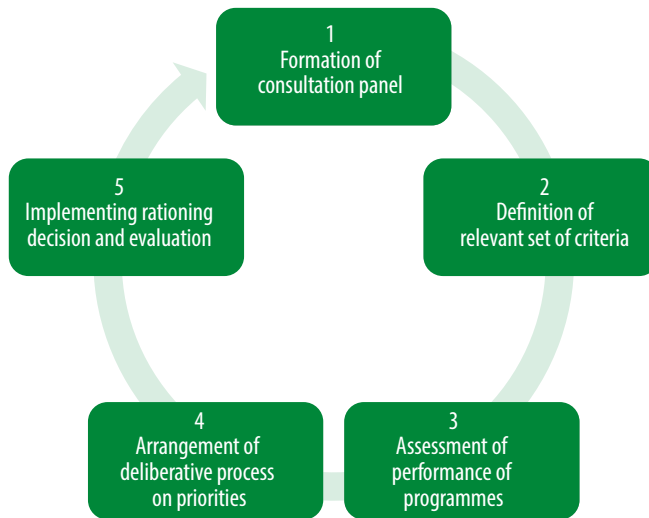
Context of HIV/AIDS in Indonesia

West Java (43 million inhabitants) is among the provinces with the highest HIV/AIDS burden in Indonesia with an estimated 59 thousand PLWHA in 2013 [17]. The epidemic is concentrated in high-risk groups, with estimated HIV prevalence rates of 23.2% among people who inject drugs (PWID), 6.3% among female sex workers (FSWs) and 8.4% among men having sex with men (MSM) in 2013. However, it has started shifting towards the general population with an estimated HIV prevalence of 0.18% in 2013. West Java has implemented a wide range of HIV/AIDS activities, including harm reduction programs for PWID, voluntary counseling and testing and ART provision at hospital and community clinics, condom distribution and a school-based education program in Bandung city. However program coverage remains low, with 18% of those in need of treatment (CD4 cell count <350) actually receiving ART, 39% for needle exchange programs for PWID, and <1% for most mitigation programs like microfinance programs for female sex workers [18].

Formation of the project team

In September 2012, the West Java provincial AIDS commission, Padjadjaran University Bandung Indonesia and Radboudumc The Netherlands established an agreement to implement the integrated MCDA-AFR approach for priority setting in the context of the development of the five-years (2014-2018) HIV/AIDS strategic plan for West Java. These parties formed a project team (n=5; NT, RP, RW, AL and RB) that coordinated the implementation. The West Java provincial AIDS commission, which coordinates the development and implementation of the strategic plan, has a multi-sectorial design. The commission comprises representatives of various government offices (i.e. health, education, social tourism, law, and religious affairs), non-governmental organizations (including community-based organizations) and health care facilities. The daily staff of the AIDS commission is responsible for the coordination of HIV activities in the province and provides support to the various government and non-government agencies that implement HIV/AIDS control activities [4]. In order to implement the integrated MCDA-AFR approach, the project team followed the five steps proposed by the Baltussen et al. [11]. Hereafter we will describe the implementation of each step (also presented in Figure 1).

Figure 1. The health care priority setting process based the integrated AFR and MCDA frame works as proposed by Baltussen et al. [11]



The priority setting process: five steps

Step 1. Formation of a consultation panel

In step one, a consultation panel (n=23) was established that involved members from Tim Asistensi (a working group of HIV/AIDS experts established at national and provincial AIDS commissions in Indonesia), which consists of retired government staff (n=1), current government staff (n=3, health office, labour office and coordinating body for family planning) and a representative of a NGO on family planning (n=1). This team was complemented with government staff working on HIV/AIDS (health office, education office n=2), NGO staff (n=3) (representing PLWHA and high at risk groups), AIDS commission secretariat staff (n=2) program managers (n=5) and researchers (n=6) with backgrounds in economics and epidemiology from Padjadjaran university.

To stimulate participation, the consultation panel agreed that those not attending meetings could not influence the decisions that would be taken. An information bulletin was developed on request of the panel to keep all members and other relevant persons informed about the process and any decisions taken. The consultation panel agreed on a schedule of meetings (facilitated by the project team) for the development of the strategic plan.

Step 2. Definition of relevant set of criteria

A focus group discussion (FGD) was held with the consultation panel (attendance rate: 43%) to select criteria for priority setting. Four different sources were used to guide the discussion: 1) results of a survey on the importance of HIV criteria for priority setting rated by health care workers, policy makers, PLWHA and general population in West Java [19], 2) criteria implicitly

used during the development of the West Java HIV/AIDS strategic plan 2009-2013 [4] 3) considerations stated in Indonesia's national HIV/AIDS strategic plan 2010-2014 [2], and 4) criteria proposed by the World Health Organization (WHO) for programmatic guidance of ART [20]. An overview of the criteria is presented in Table 1. The criteria were separated into two categories, i.e. whether criteria are related to the WHO health systems' goals or to the building blocks.

During the focus group discussion the panel agreed to select four criteria related to the health system goals for inclusion of HIV/AIDS interventions in the strategic plan: 1) its impact on the epidemic (in terms of new HIV infections averted), 2) its impact on reducing in society, 3) its cost-effectiveness, and 4) its contribution to universal access. Together these criteria reflect stakeholders' preferences for the health system goals that HIV/AIDS intervention would need to contribute to. In addition, four feasibility criteria were selected, related to some of the health

Table 1. Sources used during focus group discussion to define criteria for priority setting of interventions in 5 years HIV/AIDS strategic plan for West Java province

SOURCE	CRITERIA
Survey among health care workers, policy makers, people living with HIV/AIDS and general population in West Java (top 10 criteria of each stakeholder group was included) [19]	Impact on HIV epidemic
	Stigma reduction
	Quality of care
	Individual effectiveness
	Service requirement
	Health care workers requirements
	Information requirements
	Political acceptability
	Legal rules
	Sustainable financing
	Unit costs
	Prevention versus treatment
	Products requirements
	Individual effectiveness
	Level at risk individual
West Java planning process for 2009-2013 HIV/AIDS strategic plan (criteria implicitly used in discussions) [4]	Current HIV/AIDS epidemic
	Guidelines from national AIDS commissions (four areas of intervention)
	Previous experiences of programs effectiveness
	Mix of local political, cultural, and religious values
	Feasibility related to current health system infrastructure
	Feasibility of reaching target groups
	Likelihood of receiving local budget funding
	Current program coverage
	Programs enacted in the past (but no longer relevant)
	Focus on high risk groups
Indonesia's national HIV/AIDS strategic plan 2010-2014 (considerations stated in document) [2] WHO's programmatic guidance for ART [20]	Programs applicable in all cities in province
	Impact on reducing spread of HIV epidemic
	Cost-effectiveness
	Cost-effectiveness
	Equity
	Feasibility

system building blocks: 1) health workforce capacity, 2) infrastructure capacity, 3) sustainability of funding, and 4) cultural, political and religious acceptability. Together, these criteria reflect stakeholders' opinions on the most important barriers for implementation of HIV/AIDS interventions in West Java province. A survey was held among 19 out of the 26 members (response rate 73.1%) of the consultation panel to measure their perception on the relative importance (also called weights) of the goals criteria. The members were asked to divide 100 points among the four criteria to indicate its relative importance.

Step 3. Assessment of performance of interventions

The performance matrix is a key feature of MCDA and presents the scores obtained for each HIV/AIDS intervention on the selected criteria, which can then be systematically compared and ranked [6]. During the implementation process the project team decided to only include the criteria related to the health systems goals in the performance matrix as the feasibility criteria might only be relevant on the short term and should therefore not determine long term strategies. Hereafter, the steps are described that were taken to establish the performance matrix.

Identification of interventions

The consultation panel established a wider list of 70 stakeholders (including West Java and national government institutions, NGOs and eight private sector parties) who proposed interventions for the strategic plan during six focus group discussions. The FDGs were categorized according to the working groups established in most AIDS commissions in Indonesia and the attendance rate differed per group: prevention sexual transmission 60% (6/10), care support treatment 2% (3/18); harm reduction 100% (11/11); mitigation 39% (7/19); media 67% (12/18) and workplace 41% (7/17). The proposed interventions were divided into core and support interventions, with the latter referring to advocacy, policy and coordination activities. Only core interventions were included in the performance matrix as the project team reasoned that supporting interventions could only be implemented for prioritized core interventions. For example, advocacy activities to reduce cultural and religious barriers related to condom use to ensure effective implementation are required only if condom interventions are prioritized for the new five-year plan. In addition, the project team added interventions that already existed in West Java province and intervention options related to international debates, for example alternative ART strategies. Some interventions were combined, for example a treatment package that included outreach, testing, treatment, adherence counseling and peer support. This was done in the understanding that it would be unrealistic to evaluate treatment interventions without taking into account the testing. In total 50 interventions were identified of which 10 were hypothetical ones put forward by stakeholders and not yet established and implemented in West Java.

Scoring of interventions

To establish scores on the performance of interventions per criterion we first consulted a database with Indonesian HIV/AIDS peer-reviewed literature up to June 2013 (described in detail

elsewhere [21]) and the Indonesian HIV/AIDS grey-literature inventory 1995-2009 (National AIDS commission 2009). From both sources two studies on cost-effectiveness of a Methadone Maintenance Treatment (MMT) [22] and Voluntary Counseling and Testing (VCT) program [23] could directly inform on the scores of interventions in the performance matrix. Due to the limited Indonesian evidence base, we performed an additional non-systematic search in Pubmed to find evidence on the cost-effectiveness and impact on stigma reduction of interventions. We identified no articles that could inform on the impact of stigma reduction of the included interventions, and one comprehensive review on the impact on the epidemic and cost-effectiveness on a wide range of HIV/AIDS interventions in Asia [24].

Due to scarce availability of literature the project team decided to consult Indonesian experts to score the performance of interventions. A relatively simple three level 'low', 'moderate' and 'high' performance scoring system was used to make the performance matrix understandable for the consultation panel.

For the criterion 'impact on the epidemic' a panel of three experts (a health economist, a public health expert and WHO country office staff member) scored all interventions on the basis of discussion. The panel was informed with the available literature on the effectiveness and cost-effectiveness of HIV/AIDS interventions and the latest projections of the HIV/AIDS epidemic with use of the Asian Epidemic Model version 3.2 (described in detail elsewhere [17]). For the criterion 'cost-effectiveness', the project team calculated first the budget impact of each intervention using current coverage data, population size estimations from local monitoring data and local experts and the intervention unit cost estimations obtained from the national inventory of the National AIDS commission [25], scientific literature for Indonesian setting [26], the Futures international literature database [27] and expert opinion of local program managers from the West Java AIDS commission, governments, and NGOs. For each intervention the budget impact was calculated for 5 years (2014-2018) assuming a scale up coverage of 50% among target population and 43% additional programs costs based on the latest NASA/UNGASS reporting in 2011 [3].

To score the cost-effectiveness of interventions the budget impact was then divided by the project team into four categories: low, middle, high and very high budget impact. The project team determined the overall cost-effectiveness scores by combining the impact on the epidemic and budget impact scores. The results are presented in Table 2.

For the criterion 'stigma reduction', one anthropologist and one psychologist/HIV counselor formed an expert panel. The panel decided to rate first the impact of interventions on 'self-enacted' and 'societal stigma' and then agreed on an overall score. For the criterion 'universal coverage', the project team gave 'moderate' scores for all interventions because they reasoned that the coverage target set for 2018 and not the current coverage (in 2013) determines the

Table 2. Categories used to determine the cost-effectiveness of HIV/AIDS interventions

BUDGET IMPACT	IMPACT ON THE EPIDEMIC	COST-EFFECTIVENESS
very high	moderate	moderately cost-effective
moderate	low	not cost-effective
moderate	moderate	moderately cost-effective
low	moderate	cost-effective
moderate low	moderate	cost-effective
moderate low	low	not cost-effective
very high	high	moderately cost-effective
very high	low	not cost-effective

performance of an intervention. At this stage of the strategic planning process coverage targets for 2018 were not yet defined and therefore the performance of interventions on achieving universal coverage did not differ.

Quality of evidence

To indicate the quality of evidence for the scores of interventions a three star rating system was used. Three stars indicated 'high quality' when based on scientific literature, two stars meaning 'moderate quality' when based on experts opinion given for existing interventions and one star meaning 'low quality' when based on expert opinion given for hypothetical interventions.

Step 4. Arrangement of deliberative process on priorities

The consultation panel participated during a full day meeting (participation rate 54% (13/24)) in an interactive exercise to critically assess and build consensus on the scores. For each intervention an A1 size poster was developed that presented the intervention description, performance scores and quality of evidence (Figure 2). All participants received 50 comment cards and were asked to walk around to look at the intervention performance and indicate on the comment card if they agreed or disagreed with the scores (Figure 3). In case of disagreement the participant was asked to provide an alternative score and related rationale. The comments were entered in a excel sheet on the spot and the consultation panel agreed to use a cut-off point of 19% disagreement (an average disagreement percentage for the four scores) in order to discuss the scores of a programs. In total all scores of 7 programs were discussed and 10 scores were adapted (Table 3)

For each intervention a rank order was calculated by the sum of the weights times the scores per criterion. The performance matrix (Table 4, p212) was then presented to the consultation panel and they were given the opportunity to move interventions up or down in the rank order on the basis of additional reasons that were not captured by the four criteria for priority setting. Meeting participants proposed changes in the rank order of five interventions but the reasoning was not always rational (according the view of the project team) and only partly

corrected by other members (Table 5). The consultation panel mainly commented on the low rank order of harm reduction and mitigation interventions and proposed to split up the interventions into the following categories: prevention, treatment and mitigation.

Step 5. Implementation of rationing decision and evaluation

Because the reasoning during the deliberative process for changing the rank order was not always rational the project team decided to present the original rank order again to the consultation panel in a two-day meeting (70% participation rate at day one and 61% at day). This meeting was organized to discuss the draft document for the strategic plan and the implementation of interventions. After an extensive explanation by the project team on the development of the performance matrix, the consultation panel agreed on the rank order but proposed a division of interventions on the basis of the UNAIDS goals: 1) zero new infections, 2) zero AIDS related death and 3) zero discrimination.

Table 3. Overview of changes made in an intervention’s score on the criteria during the deliberative process in step 4

INTERVENTION/CRITERIA	CRITERIA SCORES		INTERVENTION TOTAL SCORE		INTERVENTION RANK ORDER	
	old	new	old	new	old	new
Outreach stand alone						
Impact on the epidemic	1	2	100	159	6	2
Stigma reduction	1	2				
Post exposure prophylaxes						
Stigma reduction	1	0	48	23	12	13
Microloans						
Impact on the epidemic	1	0	82	23	9	13
Stigma reduction	1	0				
Transport subsidies for ART patients						
Stigma reduction	1	0	48	23	12	13
World AIDS day						
Impact on the epidemic	0	1	23	82	13	9
Stigma reduction	0	1				
AIDS ambassador						
Stigma reduction	0	1	23	48	13	12
IEC on televisions in minimarkets						
Cost-effectiveness	1	0	100	82	6	9

ART = antiretroviral treatment, IEC = information, education and communication

Figure 2. Example a scoring card that presents the performance of an intervention (in this case school based education) on the four criteria

38	Information, Communication and Education																				
	School Based Education																				
<table border="1"> <thead> <tr> <th colspan="3">PERFORMANCE</th> </tr> <tr> <th>Criteria</th> <th>Score</th> <th>Evidence</th> </tr> </thead> <tbody> <tr> <td>Impact on the Epidemic</td> <td>2</td> <td>★★</td> </tr> <tr> <td>Stigma Reduction</td> <td>2</td> <td>★★</td> </tr> <tr> <td>Cost-Effectiveness</td> <td>2</td> <td>★★</td> </tr> <tr> <td>Universal Access</td> <td>1</td> <td>n.a.</td> </tr> </tbody> </table>				PERFORMANCE			Criteria	Score	Evidence	Impact on the Epidemic	2	★★	Stigma Reduction	2	★★	Cost-Effectiveness	2	★★	Universal Access	1	n.a.
PERFORMANCE																					
Criteria	Score	Evidence																			
Impact on the Epidemic	2	★★																			
Stigma Reduction	2	★★																			
Cost-Effectiveness	2	★★																			
Universal Access	1	n.a.																			
Description Sexual and drug related education is provided to children in junior high school in order to decrease their risk behavior, reduce stigma in society and to prevent new HIV infections.																					
Target groups Children in 1st grade of junior high school (SMP) (13-14 year old)																					
Differences between target groups? ! n.a.																					

Figure 3. Example of a comment card used by the consultation panel to comment on performance of and intervention (in this case school based education)

38	School based education		
Criteria:	Agree/ Disagree:	Comment:	New score:
Impact on the epidemic	<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/>
Stigma reduction	<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/>
Cost-effectiveness	<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/>
Universal coverage	<input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/>
Other comments:			

Table 4. Performance matrix used for priority setting of HIV/AIDS interventions for West Java's HIV/AIDS strategic plan 2014-2018

			CRITERIA					
No.	Category	Intervention	Impact on the epidemic	Stigma reduction	Cost-effectiveness	Universal Coverage	Total score	Rank
		Weights	34	25	18	23		
1a-h	Treatment	Option A-H: HIV testing and treatment package ^a	2 ^b	2	2	1	177 ^c	1
2	Prevention	School Based Education	2	2	2	1	177	1
3	Prevention	<i>IEC during Moslem Friday Prayers</i>	2	2	2	1	177	1
4	Prevention	Websites and Social Media	2	2	2	1	177	1
5	Prevention	Outreach Stand Alone	2	2	1	1	159	2
6	Prevention	Citizen's AIDS Program	2	2	1	1	159	2
7	Prevention	Work Place Programs	2	2	1	1	159	2
8	Prevention	Condom Distribution and Promotion	2	0	2	1	127	3
9	Prevention	<i>Condom Sold with Energy Drinks in Hotspot</i>	2	0	2	1	127	3
10	Prevention	PMTCT – Component 1: IEC for Women in Reproductive Age	1	2	1	1	125	4
11	Prevention	Radio - Talk shows	1	2	1	1	125	4
12	Prevention	Television - Talk shows	1	2	1	1	125	4
13	Prevention	Printed media - HIV columns	1	2	1	1	125	4
14	Prevention	VCT stand alone	1	1	2	1	118	5
15	Prevention	PMTCT – Component 2: Family and Reproductive Health Counseling for HIV-infected Women	1	1	2	1	118	5
16	Prevention	PMTCT – Component 3: PMTCT B+	1	1	2	1	118	5
17	Mitigation	Probation Program for Prisoners	1	1	2	1	118	5
18	Prevention	<i>PMTCT – Component 1: Opt-out Testing for Pregnant Women</i>	1	1	1	1	100	6
19	Prevention	Universal Precautions	1	1	1	1	100	6
20	Prevention	Training for Journalists	1	1	1	1	100	6
21	Prevention	Printed IEC (Leaflets, Stickers, Posters)	1	1	1	1	100	6
22	Prevention	Radio - adlibs	1	1	1	1	100	6
23	Prevention	Radio – HIV Public Service Announcements	1	1	1	1	100	6
24	Prevention	Blood Screening	1	0	2	1	93	7
25	Prevention	STI Testing & Treatment	2	0	0	1	91	8
26	Mitigation	Vocational Training	1	1	0	1	82	9
27	Prevention	Television – HIV Public Service Announcements	1	1	0	1	82	9

Table 4. Continued

			CRITERIA					
No.	Category	Intervention	Impact on the epidemic	Stigma reduction	Cost-effectiveness	Universal Coverage	Total score	Rank
28	Prevention	World AIDS day	1	1	0	1	82	9
29	Prevention	<i>IEC on Televisions in Minimarkets</i>	1	1	0	1	82	9
30	Mitigation	Community-based Rehabilitation	0	2	0	1	73	10
31	Mitigation	Stigma Reduction Training for Police Men & Law Enforcers	0	2	0	1	73	10
32	Mitigation	Stigma Reduction Training for Health Care Workers	0	2	0	1	73	10
33	Prevention	Needle Exchange and Medical Waste Management	1	0	0	1	57	11
34	Prevention	Methadone + Peer support	1	0	0	1	57	11
35	Prevention	<i>VCT for pre marriage couples</i>	0	1	0	1	48	12
36	Mitigation	PMTCT – Component 4: Milk Program	0	1	0	1	48	12
37	Prevention	<i>Functional Cure Experiments</i>	0	1	0	1	48	12
38	Mitigation	Education Scholarships for HIV-infected People	0	1	0	1	48	12
39	Mitigation	<i>Support for Government Insurance Application (Jamkesmas)</i>	0	1	0	1	48	12
40	Mitigation	Psychological Counselling	0	1	0	1	48	12
41	Mitigation	Legal support for stigmatized children in schools	0	1	0	1	48	12
42	Prevention	Edutainment Concerts	0	1	0	1	48	12
43	Prevention	<i>AIDS Ambassador</i>	0	1	0	1	48	12
44	Prevention	Post Exposure Profylaxes (PEP)	0	0	0	1	23	13
45	Treatment	Opportunistic Infections (OI) Treatment	0	0	0	1	23	13
46	Mitigation	Microloans	0	0	0	1	23	13
47	Mitigation	Social Support for Widows (Group Discussion)	0	0	0	1	23	13
48	Mitigation	Day Care for Children	0	0	0	1	23	13
49	Mitigation	Transport Subsidies for ART patients	0	0	0	1	23	13
50	Mitigation	In patient rehabilitation	0	0	0	1	23	13

Italics and bold = hypothetical intervention, does not yet exist in West Java

*a The package consist of: outreach, voluntary counseling and testing, antiretroviral treatment, adherence counseling and peer support ; b The scores indicate the performance of an intervention on the criteria: 2 = high, 1 = moderate, 0 = low. ; c The total score per intervention is calculated by the sum of the weights times the score per criterion, $2*34+2*25+2*18+2*23 = 177$; IEC = information, education and communication; PMTCT = prevention of mother to child transmission; VCT = voluntary counseling and testing, ART = antiretroviral treatment*

Table 5. Overview of proposed changes in rank order of interventions in the performance matrix and the rationale given

	OLD RANK	PROPOSED RANK	RATIONALE GIVEN BY MEETING PARTICIPANT
Needle exchange and medical waste management	11	1	"The PWID epidemic might go up again, programs have been proven successfully in West Java to suppress the epidemic, this is the reason why the epidemic goes down'. This was challenged by another meeting participant who said: "But the National AIDS commission is not prioritizing on harm reduction programs anymore, because of the declining epidemic among PWID, they focus now more on sexual transmission of HIV"
STI testing and treatment	8	1	"STI should have higher priority because it covers the low at risk groups, it therefor can have a wide coverage and great impact on the epidemic"
Blood screening	7	1	"This is like the same for the STI program, the blood screening program focuses on low at risk groups and therefor has a wide coverage and therefor great impact on the epidemic"
IEC during Muslim Friday prayer's	1	1	"Those that are at high-risk and need information on HIV never attend Friday prayers." Another participant challenged this and said: "The prevalence in low risk population (mainly women) is now increasing and that's why National AIDS Commission focuses not anymore on PWID but also on general population, and therefor Friday prayers are useful."

IEC = information, education and communication, STI = sexual transmitted infections, PWID = people who inject drugs

Due to the proposed division of interventions into prevention, treatment and mitigation categories in step four, the project team prepared and held an exercise in which the consultation panel was split up in three groups on the basis of these categories to discuss coverage targets and funding and implementing parties for top interventions. For the treatment category the testing and treatment package was discussed and for prevention and mitigation the top five interventions with the highest rank order.

During the meeting the consultation panel was also asked to comment on the draft document (written by the project team) but no major comments were made. In a follow up meeting with the consultation panel, no comments were made on the updated strategic document. Thereafter, the West Java provincial planning board (BAPPEDA) invited representatives of different government offices to discuss the development of proposals for HIV/AIDS activities for submission to the Musrenbang. The Musrenbang is an annual event where government offices hand in proposals to the provincial planning board in order receive funding from the local government budget (APBD). Then, the strategy was offered to the West Java governor for approval.

We compared the priority setting process on the basis of the AFR-MCDA approach with the previous strategic planning process in 2008 in West Java province (described by Tromp et al. [4] using the framework introduced by Sibbald et al. [28]. This framework outlines five process elements (stakeholder engagement, explicit process, clear and transparent information management, consideration of values and context, revision or appeal mechanism) and five outcome elements (stakeholder understanding, shifted resources, decision making quality, stakeholder acceptance & satisfaction, positive externalities) for successful priority setting. After reviewing various options for evaluation of priority setting processes, the framework by Sibbald et al seemed most comprehensive and has been successfully applied [29,30].

Results

Table 4 presents the performance matrix for West Java that shows for 50 selected HIV/AIDS interventions the scores per criterion, the overall score and rank order. The average criteria weights on a scale from 0 to 100 were: 34 for impact on the epidemic, 25 for stigma reduction, 18 for cost-effectiveness and 23 for universal coverage. The performance scores were mainly based on expert opinion as scientific literature was scarce and the available Asian Epidemic Model version was not detailed enough to evaluate the impact on the epidemic and cost-effectiveness of most proposed interventions. Overall the consultation panel agreed that the Test and Treatment Package (including outreach, voluntary counseling and testing, partner notification, antiretroviral treatment and adherence counseling) is the most attractive intervention to implement and scale up in West Java. These interventions are followed by prevention interventions as School Based Education, HIV Information Education and Communication (IEC) during Moslem Friday Prayers, Websites and Social Media and the Citizens AIDS program. Mitigation and Harm Reduction interventions for PWID were considered to be relative unattractive interventions as they performed less on the four criteria for priority setting. Harm reduction interventions were less effective as the Asian Epidemic Model projections showed a stabilization of the PWID epidemic and an increase of HIV incidence among MSM and low at risk women.

Process evaluation

With regard to the process elements, the installment of the consultation panel may have improved stakeholder engagement, as compared in the previous development of the five-year (2009-2013) strategic plan for HIV/AIDS control in West Java there was no explicit selection of stakeholders for participation. However, dominance was still observed by the project team in meetings and some stakeholders did not attend meetings. It may also require time and patience to set up democratic learning processes and before local stakeholders are committed to participate. The use of the MCDA-AFR approach and its five steps contributed to a more explicit process on which the consultation panel agreed and the development of the performance matrix contributed to more clear and transparent information management

by explicitly incorporating evidence into the priority setting process. Consideration of values and context is now taken into account with establishment of the consultation panel that identified explicit and context specific criteria and interventions and in the deliberative process opportunity was given to adapt the rank order with use of ethical and context specific values. However, considering the occasional non-rational reasoning that was observed by the project team during the deliberative process (Table 5), it is questionable whether stakeholders were able to express all values. Moreover, in the end the initial performance matrix determined the priorities in the strategic plan. As to Revision and appeals mechanisms, the process included a continuous involvement of the consultation panel that was given opportunity to appeal to the process and results at all times in meetings. More specifically, the interactive exercise as part of the deliberative process gave the opportunity to appeal on the scores of interventions and the rank order. However, it is unclear whether the exercise was accepted by the stakeholders and whether it was an effective mechanism for appeal [4].

Outcome evaluation

The outcome elements like Stakeholder understanding and Stakeholder acceptance and satisfaction are difficult to evaluate at this moment, as this requires independent interviews with the participants of the consultation panel. The AFR and MCDA frameworks are conceptually difficult and may be difficult to understand which may affect stakeholder acceptance and satisfaction. The implementation of the MCDA-AFR approach was institutionalized in the West Java AIDS commission and improved their decision-making quality. In particular, the use available evidence is improved and the consistency of reasoning is enhanced compared to the previous process that used no explicit criteria for priority setting. At this moment, we cannot report on the shifted resources but the fragmented funding system on HIV/AIDS control, the missing direct link between the priorities set by the AIDS commission and the allocation of local government budget, and the high amount of donor funding for HIV/AIDS may hinder reallocation of resources based on the priorities. Parallel to the implementation of the integrated MCDA-AFR approach, the West Java AIDS commission was asked by the provincial planning board (BAPPEDA) to give input on the priorities for HIV/AIDS control for the overall government plan for 2014-2018 for West Java province which may influence resource allocation. To respond to the request of the provincial planning board the project team informed the West Java AIDS commission with insights from the latest Asian Epidemic Model (AEM) projections of the HIV/AIDS epidemic for West Java as at that time the performance matrix was not yet finalized. At the same time, the local planning board of West Java allocated funding to the provincial AIDS commission for the coordination of HIV/AIDS activities on the basis of the draft document of the strategic plan. The MCDA-AFR approach and outcomes were documented in the 5-years strategic document for HIV/AIDS control in West-Java that was approved by the governor. This official acknowledgement by the governor may also influence local funding streams for HIV/AIDS control. A Positive externality noted by the project team was the strengthened collaboration between the local Padjadjaran University Bandung, embodying vast scientific knowl-

edge on HIV/AIDS control, and the West Java AIDS commission. In addition, the National AIDS commission and UNAIDS Indonesia was informed about our project and showed interest to scale up the approach at district level to further improve decision-making in HIV/AIDS control.

Discussion

The integrated MCDA-AFR approach for priority setting in health was implemented during the 5 year (2014-2018) HIV/AIDS strategic planning for West Java province. A consultation panel was established, criteria for priority setting were selected, a performance matrix was developed and in a deliberative process the stakeholders agreed that overall the test and treatment package is the most attractive intervention to implement and scale up in West Java, followed by prevention interventions as School Based Education, IEC during Moslem Friday Prayers, Websites and Social Media and the Citizens AIDS program. Mitigation and harm reduction interventions were considered less attractive interventions to scale up as they performed less on the four criteria used for priority setting.

Challenges to using the integrated MCDA-AFR approach

On the basis of the above evaluation and our observations throughout the process we see various challenges within the application of the MCDA-AFR approach that need attention.

First, for the assessment of the performance of interventions we relied mostly on expert opinions, as the available local scientific evidence was scarce. This challenge may be overcome when an international repository is established on the impact of HIV/AIDS interventions on various criteria. Also, installment of mathematical models (like the AEM) at local level may be warranted, as those could predict the impact of interventions on the epidemic and inform on the related feasibility challenges (like an intervention's budget impact and number of health care workers needed). In order to model the health impact of interventions studies on the individual effectiveness of HIV/AIDS interventions are key and need to be conducted at local level as at this moment there is little knowledge on this especially for behavioral interventions [31]. For hypothetical interventions proposed by the stakeholders the uncertainty on its performance remains challenging. However, incorporating stakeholders' ideas likely contributes to the acceptance of stakeholders on the process and its results and therefore hypothetical interventions should always be incorporated with notice on the uncertainty of the performance [32]. A local monitoring database owned by the local AIDS commissions (responsible for the coordination of activities) is needed to get insight in basic data like, population sizes, number of clinics and coverage of existing interventions. It is important that these monitoring systems incorporate formats and data requested by donors like Global Fund. In general, context specific research that is needed to inform HIV/AIDS control activities and can be stimulated through a joint effort of the local universities and governments.

Second, we observed during meetings that the approach is conceptually challenging and labor intensive. The understanding of the MCDA and AFR frameworks and the facilitation of deliberative process may require a certain educational background and that may not always be present. Extensive training of local government staff and researchers on the approach may overcome this challenge. Also more research is needed on interactive methods to communicate evidence and priority setting results to stakeholders. With the interactive exercise we have only set a first step in this direction. For further capacity building, the establishment of an Health Technology Assessment institute in line with HITAP in Thailand and NICE in the UK is recommendable. Such organization could function as a center of excellence in which researchers, government staff and other important actors collaborate and could help to further develop and support national and local decision-making [9,33]. Our process was labor intensive because eleven meetings were held, the performance of 50 interventions was evaluated and the entire process took almost one year. It is therefore necessary to see how this approach can be organized more efficiently without harming the democratic learning process.

Third, existing structures in the decision making context are a challenge. For example, we employed the Asian Epidemic Model following its frequent use by national and local health planners. However, the model has its limitations, as it is a deterministic model that could not yet evaluate the impact of ART and various prevention and mitigation interventions, and does not allow for context specific adaptations. A second challenge unique to Indonesia's decision making context is the country's dependence on donor funding. This was reflected in the stakeholder's attitudes, which showed a preference on working on implementation of donor interventions instead of taking own initiatives. According to the Paris declaration donors should align their aid to the countries' needs and the MCDA-AFR approach shows potential instigating a better dialogue between by including all relevant stakeholders into the process. A third challenge is the strong focus of donor and international organizations on health impact, and limited attention for other criteria like equity and feasibility constrains [34]. Hence, it is less common to consider and select multiple criteria for priority setting which may influence the acceptance of the MCDA-AFR approach [35]. A fourth challenging context factor is the missing direct link with local government funding and this stresses the need to inform and involve those in charge for resource allocation. Last, the high turnover of government staff in Indonesia also challenges proper engagement in the process and the effectiveness of the MCDA-AFR approach.

Recommendations for future application of the integrated MCDA-AFR approach

To further develop the MCDA-AFR approach we propose the following changes.

First, the MCDA-AFR approach should incorporate a step to conduct an extensive situational analysis of the context of priority setting. This was also recently recommended in the roadmap for priority setting by [5] who concluded that context specific understanding is key. It is

important to get insight in the existing priority setting processes, funding mechanisms, key actors, disease area, existing interventions and health systems barriers like political and cultural constraints. Existing frameworks as the health systems building blocks and the 'Know your epidemic, know your response' frameworks for the HIV/AIDS field may be used as supporting frameworks to conduct a situational analysis [35,36]. In this phase of the priority setting process it is also important to define the goal of the priority setting process as this could be on a broad level ('generalized priority setting'), like this study or at the margin on the reimbursement or implementation of a single intervention ('context specific priority setting') [12]. An extensive situational analysis is also important to decide on which interventions to include in the performance matrix as it predominately determines the priorities. In this study interventions to decriminalize the use of drugs and homosexuality were not included in the performance matrix, while this could be considered an important intervention to improve access to HIV testing and treatment for high at risk groups. It might be that we were not enough aware of the context of the HIV/AIDS field and missed these types of interventions.

Second, improved guidance and training materials are needed to support local government staff and researchers on the implementation of the MCDA-AFR approach. At this moment the approach as proposed by Baltussen et al. [11] still allows for much freedom and gives limited practical guidance. More explicit guidelines need to be developed on how to facilitate meetings, and respond to questions like which stakeholders to include, how to reduce dominance in discussions, how to guide a discussion for criteria selection, how to facilitate a deliberative process, and how to deal with irrational reasoning. In relation to this criteria need to be better operationalized. For example equity (i.e. universal coverage) and stigma reduction are hard to define measures. Although a map has been published that provides an overview of which criteria can be used in priority setting it does not yet provide indicators for operationalization

Third, the integrated approach does not yet explicitly pay attention to the most appropriate publicity and appeal mechanisms. We could reason that after implementation of the MCDA-AFR approach the transparency and opportunity for appeal automatically improves, however it is important to know whether stakeholders also consider this effective [4]. Therefore, we propose to include a specific step in the process to ask stakeholders about their opinion on the best mechanisms for appeal and publicity and to implement these accordingly as part of the approach [37].

Conclusions

The MCDA-AFR approach supported priority setting of interventions for the 5-year (2014-2018) strategic plan for HIV/AIDS control in West Java Indonesia. Overall the test and treatment package is the most attractive intervention to implement and scale up in West Java, followed by prevention interventions as School Based Education, IEC during Moslem Friday Prayers,

Websites and Social Media and the Citizens AIDS program. Mitigation interventions are overall least attractive to implement. Compared to previous strategic planning processes in West Java province, the integrated approach was able to set priorities in a systematic and transparent way with use of criteria for priority setting and use of available (scientific) evidence. Stakeholder engagement seemed to be improved and the approach and its results were incorporated in the final strategic document signed by the governor. Main challenges of the approach were the scarce availability of local evidence to make a performance matrix, the conceptual understanding of the frameworks and the existing decision context with donor influence and a missing direct link between the priorities and local government funding. The following adaptations were proposed to further develop the approach: inclusion of situational analysis on the current priority setting process and actors involved, more explicit guidance for local decision makers on how to implement the approach and more explicit definition and implementation of appeal and publicity mechanisms. On the basis of its first application, the MCDA-AFR approach shows potential to improve priority-setting processes in health and we invite others to discuss on its further application. ■

References

1. AIDSdatahub (2014) Indonesia country profile. Available: <http://www.aidsdatahub.org/en/country-profiles/indonesia>. Accessed 31 March 2014.
2. Indonesian National AIDS Commission (2009) Strategy of the National Action Plan for HIV/AIDS 2010-2014. Jakarta: Indonesian National AIDS Commission. Available: <http://www.aidsindonesia.or.id/strategidanrencana-aksi-nasionalpenanggulangan-hiv-dan-aids-tahun-2010-2014>. Accessed 17 September 2014.
3. Indonesian National AIDS Commission (2012) UN-GASS. Republic of Indonesia Country Report on the Follow up to the 35 Declaration of Commitment on HIV/AIDS. Reporting Period 2010–2011. Jakarta: Indonesian National AIDS commission.
4. Tromp N, Prawiranegara R, Riparev Subhan H, Siregar A, Sunjaya D, et al. (2014) Priority setting in HIV control in West Java Indonesia: an evaluation based on the accountability for reasonableness framework. *Health Policy Plan*: Epub ahead of print.
5. Hipgrave DB, Alderman KB, Anderson I, Soto EJ (2014) Health sector priority setting at meso-level in lower and middle income countries: Lessons learned, available options and suggested steps. *Soc Sci Med* 102: 190–200.
6. Baltussen R, Niessen L (2006) Priority setting of health interventions: the need for multi-criteria decision analysis. *Cost Eff Resour Alloc* 4: 14.
7. Bolsewicz Alderman K, Hipgrave D, Jimenez-Soto E (2013) Public Engagement in Health Priority Setting in Low- and Middle-Income Countries: Current Trends and Considerations for Policy. *PLoS Med* 10. doi:10.1371/journal.pmed.1001495.
8. Andersson N (2011) Building the community voice into planning: 25 years of methods development in social audit. *BMC Health Serv Res* 11 Suppl 2: S1.
9. Glassman A, Chalkidou K, Giedion U, Teerawattananon Y, Tunis S, et al. (2012) Priority-Setting Institutions in Health. *Glob Heart* 7: 13–34.
10. Maluka SO (2011) Strengthening fairness, transparency and accountability in health care priority setting at district level in Tanzania. *Glob Health Action* 4.
11. Baltussen R, Mikkelsen E, Tromp N, Hurtig A, Byskov J, et al. (2013) Balancing efficiency, equity and feasibility of HIV treatment in South Africa -- development of programmatic guidance. *Cost Eff Resour Alloc* 11: 26.
12. Baltussen R, Youngkong S, Paolucci F, Niessen L (2010) Multi-criteria decision analysis to prioritize health interventions: Capitalizing on first experiences. *Health Policy* 96: 262–264.
13. Hasman A, Holm S (2005) Accountability for reasonableness: opening the black box of process. *Health Care Anal* 13: 261–273.
14. Jansson S (2007) Implementing accountability for reasonableness--the case of pharmaceutical reimbursement in Sweden. *Health Econ Policy Law* 2: 153–171.
15. Maluka S, Kamuzora P, San Sebastián M, Byskov J, Ndawi B, et al. (2010) Improving district level health planning and priority setting in Tanzania through implementing accountability for reasonableness framework: Perceptions of stakeholders. *BMC Health Serv Res* 10: 322.
16. Maluka SO, Hurtig A-K, Sebastián MS, Shayo E, Byskov J, et al. (n.d.) Decentralization and health care prioritization process in Tanzania: from national rhetoric to local reality. *Int J Health Plann Manage* 26: e102–120.
17. West Java AIDS Commission (2013) West Java Asian Epidemic Model estimations. Bandung.
18. West Java AIDS commission (2013) Local monitoring data on coverage of various HIV/AIDS programs. Bandung.
19. Tromp N, Prawiranegara R, Siregar A, Sunjaya D, Baltussen R (2014) Priority setting in HIV/AIDS control in Indonesia: the importance of multiple criteria perceived by multiple stakeholders (Draft). Nijmegen: Radboudumc.
20. World Health Organization (2012) WHO Consultation on The Strategic Use of Antiretrovirals for Treatment and Prevention of HIV infection. 2nd Expert Panel 2-4 May 2012. Geneva: World Health Organization.
21. Pinxten J, Pinxten L (2014) Knowledge production trends and use in HIV/AIDS policymaking in Indonesia (Draft). Maastricht: Lucas Pinxten Global Health.
22. Wammes JGG, Siregar AY, Hidayat T, Raya RP, van Crevel R, et al. (2012) Cost-effectiveness of methadone

- maintenance therapy as HIV prevention in an Indonesian high-prevalence setting: a mathematical modeling study. *Int J Drug Policy* 23: 358–364.
23. Tromp N, Siregar A, Leuwol B, Komarudin D, van der Ven A, et al. (2013) Cost-effectiveness of scaling up voluntary counselling and testing in West-Java, Indonesia. *Acta Med Indones* 45: 17–25.
 24. Pattanaphesaj J, Teerawattananon Y (2010) Reviewing the evidence on effectiveness and cost-effectiveness of HIV prevention strategies in Thailand. *BMC Public Health* 10: 401.
 25. Indonesian National AIDS Commission (2012) HIV program unit costs repository for Indonesia. Jakarta: Indonesian National AIDS Commission.
 26. Siregar A, Tromp N, Baltussen R (2014) Cost of ART over time by CD4 cell group (Draft). Nijmegen: Radboudumc.
 27. Futures Institute (2014) HIV/AIDS Unit Cost Repository. Available: http://policytools.futuresinstitute.org/UC/unit_cost_db.aspx. Accessed 1 April 2014.
 28. Sibbald SL, Singer PA, Upshur R, Martin DK (2009) Priority setting: what constitutes success? A conceptual framework for successful priority setting. *BMC Health Serv Res* 9: 43.
 29. Kipiriri L, Martin DK (2010) Successful priority setting in low and middle income countries: a framework for evaluation. *Health Care Anal* 18: 129–147.
 30. Sibbald, Gibson J, Singer P, Upshur R, Martin D (2010) Evaluating priority setting success in healthcare: a pilot study. *BMC Health Serv Res* 10: 131.
 31. Bollinger LA (2008) How can we calculate the “E” in “CEA”? *AIDS* 22 Suppl 1: S51–7.
 32. Daniels N (2008) *Just Health: Meeting Health Needs Fairly*. Cambridge: Cambridge University Press.
 33. Chalkidou K, Marten R, Cutler D, Culyer T, Smith R, et al. (2013) Health technology assessment in universal health coverage. *Lancet* 382: e48–9.
 34. UNAIDS (2014) Coordination of National Responses to HIV/AIDS. Geneva: UNAIDS. Available: http://data.unaids.org/UNA-docs/coordination_national_responses_en.pdf. Accessed 17 September 2014.
 35. Wilson D, Halperin DT (2008) “Know your epidemic, know your response”: a useful approach, if we get it right. *Lancet* 372: 423–426.
 36. World Health Organization (2007) *World Health Organization: Everybody’s Business: Strengthening Health Systems to Improve Health Outcomes: WHO’s framework for Action*. Geneva: World Health Organization.
 37. Tromp N, Baltussen R (2012) Mapping of multiple criteria for priority setting of health interventions: an aid for decision makers. *BMC Health Serv Res* 12: 454.

CHAPTER 10

General discussion



This chapter responds to the main research question of this thesis:

“How can priority setting in HIV/AIDS control in Indonesia and South Africa be improved with use of multiple criteria and fair processes?”, and is organized alongside the four sub-questions. Furthermore, this chapter presents the limitations of this thesis and future research needs.

■ Sub-question 1:

What is the current priority setting process in HIV/AIDS control in Indonesia?

This thesis addresses the necessity to improve priority setting processes in HIV/AIDS control. Chapter 1 evaluated Indonesia’s situation and revealed that local HIV strategic plans do not explicitly prioritize activities, do not state criteria for selection of interventions and that the priority setting process is not fair due to poor stakeholder involvement and little transparency and opportunity for appeal. In addition, we learned from this evaluation that many stakeholders are involved in HIV/AIDS control in Indonesia, that funding for interventions is fragmented and that there is limited (inter-) national guidance for local priority setting processes. These lacunas and complex processes are also reported for HIV/AIDS control in other settings in Africa and Asia [1–5] where donors, political power and culture have a strong influence on HIV/AIDS resource allocation and there is lack of guidance for effective HIV/AIDS responses [4,5].

Challenges in improving priority setting in HIV/AIDS control

This complex picture leads to a number of special challenges that need to be addressed to improve priority setting in HIV/AIDS control. These challenges call for an approach that goes beyond the use of standard cost-effectiveness analysis (CEA) for priority setting [6].

First, a high number of stakeholders are related to HIV/AIDS control, partly due to the encouragement internationally to set up multi-sectorial AIDS commissions [7]. It is a challenge to elicit the values of each of them. In addition, problems in HIV/AIDS control have a highly political and religious nature in Indonesia, adding to the number of different values that play a role in priority setting processes [8]. It is therefore of key importance to bring all relevant stakeholders together in participatory processes and to elicit all values that are at stake.

Second, funding flows in HIV/AIDS control are often fragmented and decision spaces are unclear. Many donors (e.g. UNAIDS, World Health Organization (WHO), Worldbank, Pefar, Global Fund) provide funding for HIV/AIDS interventions and allocate these at multiple levels of the health system. This results in highly complicated distribution processes especially at sub-national levels [1,9,10]. In Indonesia, funding for HIV/AIDS is extremely fragmented across a broad range of stakeholders especially because more than ten different government institutions are involved. At sub-national levels, these offices all have their own HIV/AIDS activities and each request separately for funding from the local planning board (BAPPEDA) (Chapter 2). In such a situation, many stakeholders influence the funding and implementation of interventions and no single decision maker can be identified. To improve priority-setting processes

in real world setting it is therefore of key importance to understand the funding flows for HIV/AIDS control to determine the “decision space”. A stakeholder analysis to identify and subsequently involve those that are in charge of funding allocation in the priority setting process is essential in that respect.

Third, international guidelines for HIV/AIDS control provide little practical lead way for priority setting at sub-national levels [5]. In a situation where resources are scarce, broad guidelines without any guidance for priority setting likely results in ad-hoc practices that are not tailored to the local context [5]. Such ad hoc practices are reported in Indonesia’s Strategic use of anti-retrovirals (SUFA) program that promotes early testing and treatment. At this moment, no clear context specific targets are set per district while epidemics differ, e.g. in Cirebon district of West Java most HIV infections are seen among people who inject drugs (PWID) while in Indramayu district mostly female sex workers are infected [11]. Scientists, community activist and government officials have articulated a variety of ethical and feasibility questions as a response to worldwide trend to rapidly scale-up treatment as prevention [12]. Concerns are raised about the effectiveness in specific contexts on how to balance individual and population demands and on power relations within clinical practice and competing resource demands at local levels. We argue that guidance for decentralized level priority setting is a crucial and a missing component in HIV/AIDS control and methods need to be developed to respond to this.

■ Sub-question 2:

Which criteria are important for priority setting in HIV/AIDS control?

This thesis shows that in HIV/AIDS control in Indonesia the criteria ‘impact on the epidemic’, ‘stigma reduction’ and ‘feasibility’ are considered most important. On the other hand, ‘equity’ criteria are considered least important. Hereafter, we will reflect on the use of these criteria for HIV/AIDS priority setting.

Impact on the epidemic

An intervention’s ‘impact on the epidemic’ was used implicitly in the development of strategic plans for Bandung and West Java in 2008 and 2009 respectively, and was considered most important among all stakeholder groups surveyed in West Java (Chapter 4). It was also selected as most important criterion by the consultation panel during the development of West Java’s 5 years (2014-2018) strategic plan in 2013 (Chapter 9). The perceived importance of an intervention’s impact on the epidemic can be explained by the course of Indonesia’s HIV epidemic, which is still one of the fastest growing in Asia [13]. The importance of this criterion is also reflected in one of the three UNAIDS goals that aims for “zero new infections” (with the other two aiming for “zero aids related death” and “zero discrimination”) [14]. Furthermore, across the world the criterion impact or effectiveness is also considered important. A survey among 140 decision makers from 23 countries from five continents showed that ‘clinical efficacy/effectiveness’ was considered the most relevant criteria for healthcare decisions [15].

Stigma reduction

Stigma reduction was also considered highly important among stakeholders in Indonesia. This can be explained by the high prevalence of stigma in Indonesia's society [16], among health care workers [17,18] and HIV infected people [19,20]. In the HIV/AIDS field there is strong emphasis on the reduction of stigma, for example by the decriminalization of people who use drugs, sex work and same-sex relations [21]. At the same time, there is little evidence on which interventions are most effective for the reduction of stigma [22].

Feasibility criteria

Feasibility criteria were also considered important in HIV/AIDS control in Indonesia and we reason that these are key for priority setting of interventions in real world settings. The importance of feasibility concerns like political acceptability has been stressed by other researchers as well [8] and without inclusion of these considerations the interventions that have highest impact on the epidemic are not likely to be implemented. Some feasibility criteria overlap with the so-called critical enablers (e.g. political commitment) for an effective HIV/AIDS response and are put forward in the WHO and UNAIDS guidelines [23–25]. The WHO SUFA guidelines encourage to use feasibility criteria however it does not distinguish sub criteria and an underlying categorization like our map [26]. Our case study in West-Java province showed that feasibility criteria might only be relevant at district level or in specific contexts. Indonesia is now scaling up ART and the feasibility in terms of health care workers capacity and political commitment likely differs among districts. While improving priority setting processes it is debatable whether some feasibility criteria as 'religious and political acceptability' should be used to prioritize interventions. These criteria can also be perceived as critical enablers and indicate that measures are needed to overcome feasibility barriers for successful implementation of interventions.

Equity criteria

Equity criteria were considered least important for HIV/AIDS control in Indonesia (Chapter 4). Yet, this thesis also shows that the understanding and use of equity criteria in HIV/AIDS control is underdeveloped (Chapter 4, Chapter 7). The criteria map contributes to the definition of a range of equity criteria however the criteria are not yet operationalized for priority setting of interventions. In West Java, stakeholders selected universal coverage as a criterion for priority setting, but as it was defined as 80% coverage it could not differentiate between interventions. Recently, a more comprehensive and well-defined list of equity criteria (the GPS-health) is published and this could contribute to the improved use of equity criteria for priority setting in HIV/AIDS control [27].

In Chapter 4, stakeholders valued equity criteria least important and thereby did not prioritize certain populations in society on the basis of their social background characteristics. However, with the knowledge that some groups may be deprived from for example treatment, the

perception towards these criteria might differ. At this moment, it is unknown whether inequities in utilization of HIV/AIDS interventions actually exist in Indonesia. Yet, our cost analysis on ART (Chapter 5) shows that those patients that enter ART care late (with severe disease stage and therefore a bad prognosis) are relatively poorer and this may indicate that inequities in utilization of ART exist in Indonesia. In West Java, men having sex with men (MSM) may also have less access to HIV/AIDS interventions as their sexual orientation is not accepted in Islam, the predominant religion in the province. In addition, the government considers MSM as a hidden population [28].

Challenges in the use of multiple criteria for priority setting

The identification and selection of criteria for priority setting is challenging and also crucial for the choice of interventions. We observed several challenges in the use of multiple criteria and label these as areas for development.

First, the criteria map presented in this thesis is a step forward in listing criteria but is based on an underlying framework that determined the choice for criteria. Another disease specific underlying framework like the HIV investment framework [23] might have resulted in another set and use of criteria. For example, stigma reduction is presented in this thesis as a goal criterion in the category 'health system's responsiveness' and was perceived highly important among stakeholders in Indonesia (Chapter 4, Chapter 9). However, in the HIV investment framework it is seen as a critical enabler for effective HIV/AIDS responses. While the investment framework seems to encourage countries to implement at all times interventions that reduce stigma in order to improve the effectiveness of the HIV/AIDS response, we have used this criterion in West Java to differentiate between interventions. Those interventions that were not reducing stigma in society resulted with a lower ranking in the performance matrix and were perceived less attractive to implement and scale up in West Java province [23]. Therefore, we recommend using the criteria map only as a starting point for inclusion of multiple criteria in a priority setting process.

Second, although the criteria map provides guidance for local decision makers, it does not yet inform on indicators for criteria and these should be developed.

Third, while deliberative processes in MCDA provide room to incorporate ethical considerations that cannot be captured in a performance matrix, this was challenging in West Java and in other settings [29]. In West Java, the consultation panel members did not express any of these ethical considerations, possibly because they struggled to understand and articulate them. For example, a consultation panel member proposed a higher ranking for the HIV blood screening intervention but he could not well-explain the underlying reason. His preference might have been to 'do no harm' which implies that it is unacceptable that people might receive HIV contaminated donor blood. This could be a reason to prioritize the intervention for

HIV/AIDS control, although it was not prioritized based on the performance matrix. To improve the incorporation of these ethical considerations in deliberative processes we recommend to build capacity among the consultation panel members to understand and articulate their preferences.

Fourth, the consultation panel member proposed various changes for the rank order of interventions and some of their reasons might relate to criteria that could have been part of the performance matrix. For example, in the discussion stakeholders had a strong preference for a higher rank of mitigation interventions. Most of these interventions support vulnerable populations and focus on people affected by HIV/AIDS or the relatively poor (e.g. transport subsidies for poor HIV-infected people to access ART). This proposed change may therefore relate to equity criteria like ‘severity of disease’ or ‘socio-economic status’ and this could have been captured in the performance matrix. Explicit guidelines on which criteria can be part of the performance matrix and which should be addressed in deliberative processes may respond to this challenge.

Fifth, the integrated MCDA-AFR approach provides no room to reflect on the criteria used for priority setting. To encounter this, we recommend to put more emphasize on the participatory action research component of the AFR intervention as applied in the “Response to Accountable priority setting for trust” (REACT) for district level priority setting in Kenya, Tanzania and Zambia. In the REACT project a consultation panel was asked to continuously describe, evaluate and improve the priority setting process on the basis of the four conditions of the AFR framework. This method may empower the consultation panel to reflect on the criteria selected for the priority setting of interventions and may provide space for mutual learning among stakeholders involved [30,31].

■ Sub-question 3:

What is the performance of HIV/AIDS interventions on criteria for priority setting?

This thesis presents various evaluations of the performance of HIV/AIDS interventions and there are a number of challenges in the use of such studies to fill out a performance matrix in MCDA. While focusing on a specific priority setting question, existing studies likely differ in terms of intervention design, time frame of evaluation and characteristics of HIV epidemic at time of study. For example, the cost estimations for ART (Chapter 5) were conducted in a hospital instead of community clinic setting where ART is being up scaled now in Indonesia. The cost-effectiveness study on VCT (Chapter 6) did not include an ART component (due to model limitations) and was conducted for a time period in the past (2010-2014). The equity review in Chapter 7 focused on South Africa that has a generalized epidemic and the situation likely differs from a country with a concentrated epidemic like Indonesia.

Methods to collect data on the performance of interventions

As evidence is not always available at local level and time and capacity is not sufficient to conduct scientific research we propose several options to better understand the performance of HIV/AIDS interventions on multiple criteria. First, we propose to establish an international repository that includes evaluation studies on the performance of interventions for multiple criteria. Global evidence is considered to be a good starting point for judgments about effects, factors that modify these effects and insights into ways to approach and address problems [32]. Second, improved mathematical models can be used to evaluate the performance of interventions on multiple criteria, like impact on the epidemic but also feasibility criteria (e.g. number of health care workers needed) and equity criteria (e.g. intervention coverage of men as compared to women) [33,34]. For the development of mathematical models at decentralized level, data is required on the effectiveness of context specific interventions [34] and if scientific studies are not available experts could be consulted for such estimates. Third, when the repository and mathematical model estimates are insufficient we recommend using expert opinion for the scoring of the performance of interventions. To enhance the quality of such estimates, the experts should be carefully selected and may be informed with available data [35]. It remains challenging to evaluate the combination of various interventions as the (interaction) effects are largely unknown [36].

Knowledge translation

Although good quality evidence may not always be available, the integrated MCDA-AFR approach seems to contribute to knowledge translation and has potential to improve evidence informed health policy making (EIHP). In our West Java application the performance matrix results were included in the new 5 years strategic document. In recent years, knowledge translation has received much attention and various methods are available to communicate research findings [33,37]. Policies briefs are commonly used but exist in many forms, which leads to confusion and suboptimal use in policy making [38]. In general, the evidence base for effectiveness of methods to inform policy making is weak and current approaches need to be evaluated [39].

The MCDA-AFR approach fits in the category of exchange methods for knowledge translation, where relationships between researchers and policy makers are build [40,41]. Two other forms of knowledge translation are 'push' and 'pull' efforts, in the former the researchers undertake activities while in the latter the policy makers access and use research to inform decisions. The MCDA-AFR approach also has characteristics of knowledge translation platforms, which are partnerships between policymakers, stakeholders, and researchers are being established in LMICs to enhance EIHP. These networks contributed to increased awareness of the importance of EIHP and strengthened relationships among stakeholders [37].

■ Sub-question 4

Can the integrated MCDA-AFR approach be used to support strategic planning processes in HIV/AIDS control?

In chapter 8 we outlined the theoretical foundation for the integrated MCDA-AFR approach and illustrated for the South African setting. In Chapter 9, we tested the approach in the context of strategic planning for HIV/AIDS control at provincial level in Indonesia. We concluded that approach was feasible and that the strategic planning process seemed to have improved compared to the previous one in 2008. Preliminary results of an independent evaluation through interviews with consultation panel members revealed that our approach was considered useful, that stakeholders felt they were better involved and that the plan was considered more scientifically based. Consultation panel members also expressed that it was easier to give comments (especially during the interactive exercise) and all had learned from the process. Concerns were raised on the duration of the process, interval between meetings and the high turnover and low attendance of members in meetings. A lack of understanding and commitment to participate was also noticed and most members were concerned about the commitment of West Java district governments to act for HIV/AIDS. The consultation panel members also had concerns on the use of the strategic document for budget allocation decisions at provincial and district levels [42].

Challenges in the use of the MCDA-AFR approach

This thesis identified various challenges for using the MCDA-A4R approach to improve priority setting in HIV/AIDS control in Indonesia. Hereafter, we will discuss the main challenges together with possible remedies to overcome these.

Stakeholder involvement

During the implementation of the MCDA-AFR approach low attendance of meetings, replacement and lack of commitment of consultation panel members was observed. The explicit set up of a consultation panel makes a start to continuously involve a group of stakeholders throughout a priority setting process, however some relevant stakeholders like religious leaders, donors and the public were not explicitly included. A stakeholder analysis of those that are relevant in the context and a predefined checklist of possible stakeholders to involve may overcome this. Participation rates in meetings may be improved with government regulations for involvement in priority setting processes for HIV/AIDS control. Improved sensitization of the method may also contribute to commitment of consultation panel members as is reported in African settings [30]. Moreover, leadership for fair processes shown by for example the National AIDS commission, the new President Joko Widodo and local leaders like city majors may also contribute to commitment and participation of stakeholders [8]. In the meetings dominance of stakeholders during discussions was observed and methods are needed to ensure that stakeholders can express their views. Working with anonymous comment cards like in the interactive excise and nominal group techniques may contribute to resolve dominance [43,44].

Complexity of the approach

The integrated MCDA-AFR seems complex and this was also reported for the singular MCDA and AFR methods applied in other settings like Thailand [29] and Kenya, Tanzania and Malawi [30,45]. In the African settings, researchers encountered for the complexity by intensive and continuous training on the principles of the AFR method [30,45]. More emphasize in the integrated MCDA-AFR approach on participatory action research may also contribute to the learning of stakeholders in this respect [30,42]. It may also require time and patience before stakeholders are familiar with concepts of fair processes and using multiple criteria, especially because in Indonesia democracy has been introduced only less than two decades ago.

Lack of available data

A major challenge in the implementation of the integrated MCDA-AFR approach was the lack of data to fill out the performance matrix and this is also reported for the application of the singular MCDA method in Canada [35] and Thailand [29]. While more research is needed on the performance of interventions, on the short term this can be resolved by the use of global evidence, improved mathematical models and consultation of experts as is also noted above. For the application of the MCDA-AFR approach in even more constrained settings a predefined overview of the performance of HIV/AIDS interventions on multiple criteria can be outlined to support the priority setting process.

Comparison with other methods for priority setting

Hipgrave et al compared various methods (including the AFR, MCDA and program budgeting and marginal analysis (PMBA) frameworks) to improve meso-level priority setting processes and concluded that no single approach can be recommended [10]. Based on this thesis, we see advantages of the integrated MCDA-AFR approach compared to the application of the singular MCDA, AFR and CEA methods for priority setting. Compared to the singular AFR method the integrated approach systematically compared different interventions options and made the existing evidence-base explicit. Compared to the MCDA and CEA methods the involvement of a consultation panel in the integrated approach likely improved the participation of stakeholders in the process and facilitated the uptake of priority setting results in West Java's strategic document.

Adaptations to the original MCDA-AFR approach

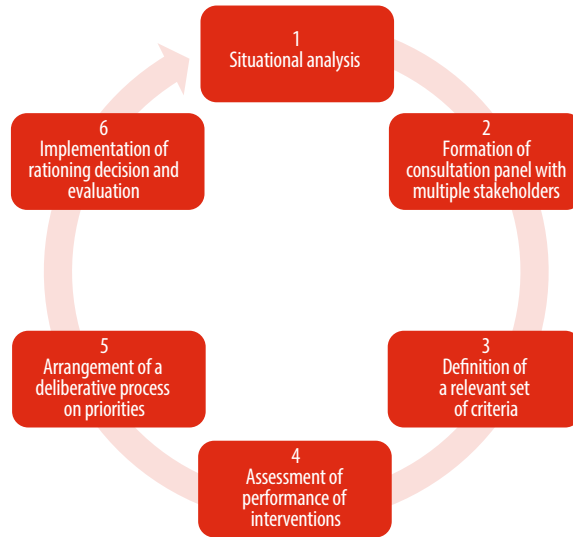
On the basis of this thesis we propose three adaptations of the original MCDA-AFR approach to use multiple criteria and fair processes in priority setting in HIV/AIDS control.

Situational analysis of the current priority setting context

A situational analysis (as was done in Chapter 1) before the start of the implementation is necessary to get insight in the existing priority setting process, funding mechanisms, key stakeholders, existing interventions and health systems barriers like political and cultural

acceptability. The available WHO's health systems building blocks and 'Know your epidemic, know your response' frameworks may be used to conduct such a situational analysis [46,47]. A revised version of the integrated MCDA/AFR approach is presented in Figure 1.

Figure 1. The revised version of the integrated MCDA-AFR approach for priority setting in health



Improved methodological guidance

More explicit methodological guidance is needed for those implementing the integrated MCDA-AFR approach. Amongst others, identification of stakeholders, reduction of dominance in discussions, facilitation of deliberative processes and the participatory action research component need to be addressed. This guidance could be provided as a checklist and is already available for research priority setting [48]. This checklist may be published by multilateral organizations (e.g. World Health Organization, UNAIDS) to ensure its credibility among involved stakeholders.

Selection of context based publicity and appeal mechanisms

On the basis of the AFR framework a fair process should be transparent and provide opportunity for appeal [49]. As the effectiveness of mechanism for appeal and publicity are likely cultural determined and the priority setting processes needs to be accepted by stakeholders we recommend that the consultation panel members select these mechanisms. This is line with the participatory action approach in the REACT program in Africa. Such approach, seems feasible in Indonesia as the consultation panel requested to develop an information bulletin to inform stakeholders within and outside the consultation panel on the process.

Institutionalization of the use of multiple criteria and fair processes

Learning from the example of West Java province, the Indonesian National AIDS commission is currently developing tools (with initial support of AusAID) to improve district level priority setting for HIV/AIDS control. The tool incorporates the MCDA and AFR frameworks for priority setting and also aims to increase domestic district funding for the HIV/AIDS response as donor money is phasing out [50]. Many initiatives to improve priority setting processes face difficulties in being brought to scale within national health systems [30]. In Indonesia, one of the key challenges for the institutionalization of the approach at district level will be the local capacity to understand and facilitate the use of multiple criteria and fair processes for priority setting of HIV/AIDS interventions. On the short term, the tool could be simplified with the use of a preliminary set of criteria and interventions and data could be provided on the performance of interventions on multiple criteria. Training of the consultation panel on the principles of multiple criteria and fair processes for HIV/AIDS priority setting may also contribute to implementation of the approach at district level. On the long term, improved mathematical models are required to understand local epidemics and to provide better information on the performance on interventions. We also strongly recommend Indonesia to set up a Health Technology Assessment (HTA) institute, following the example of HITAP in Thailand to increase country expertise in evaluation of health interventions and to improve priority setting with use of multiple criteria and fair processes [51].

Limitations of this thesis

We see three important limitations of this thesis. First, the research was conducted in the West Java province and findings should be generalized with caution. For example, the organization of HIV/AIDS control and the acceptance and stakeholders' understanding of the integrated MCDA-AFR approach may differ in other settings. Second, the researchers involved in the implementation of the MCDA-AFR approach may have influenced the findings in this thesis. As the approach allows for freedom, other researchers might have used different methods to facilitate discussions and to communicate the performance matrix results to the consultation panel. Some findings were based on observations during meetings and might have been different when other researchers were involved. The inclusion and categorization of criteria in the criteria map was also based on reasoning of the researchers. Third, although it was possible to implement the approach it could only be evaluated to a limited extent. We could mainly observe changes in the priority setting process while the long-term impact on for example funding streams could not yet be evaluated. In addition, the Sibbald framework [52] was used for evaluation of the priority setting process and this might not be applicable to Indonesia as it was developed based on interviews with stakeholders from high-income countries.

Recommendations for further research

In summary, we present three main research areas to further support the use of multiple criteria and fair processes to improve priority setting in HIV/AIDS control.

Improved evidence base on performance of HIV/AIDS interventions

As outlined before we recommend improving the evidence base for performance of HIV/AIDS interventions on multiple criteria with use of international repository and improved mathematical models. In addition, criteria should be operationalized and more knowledge is needed on equity in access to HIV/AIDS interventions in Indonesia. The later could be achieved with a national monitoring system and development of standard measures of equity criteria and utilization of HIV/AIDS interventions.

Evaluation of priority setting methods

Evidence on the effectiveness of methods to improve priority setting processes remains scarce. According to a World Bank report most participatory initiatives are still driven more by ideology than by systematic analysis to understand the particular challenges entailed in inducing participation or to learn from the failures of past programs [53]. A review of more than 500 studies on participatory development and decentralization found that often the most vulnerable populations are not included, that incentives for participatory approaches dissolve after projects are finished and that community engagement alone has little impact on health-related outcomes [53]. In addition, in various approaches to improve priority setting processes dominance of stakeholders is reported [30,45,54]. Also the costs of such approaches are largely unknown. Therefore, for the application of the integrated MCDA-AFR approach more knowledge is required on how to avoid dominance discussions, how to involve all relevant stakeholders including the public in the process, and how to communicate evidence such as in the performance matrix to stakeholders.

In response to this, we will conduct between 2015-2018 in West Java province a randomized controlled trial to evaluate the effectiveness of the integrated MCDA-AFR method. In this trial, half of the districts will use the integrated approach for priority setting of HIV/AIDS interventions while the other half remains current practice. Both groups will be compared in terms of process improvements, funding allocations patterns and ultimately the utilization of HIV/AIDS interventions and the impact on health.

Implementation sciences

This thesis outlines several challenges for the implementation of the MCDA-AFR integrated method to improve priority setting in HIV/AIDS control and remedies to overcome these. However, this is only a start and a more systematic analysis of the barriers and enablers for implementation of priority setting methods is needed. These barriers and enablers likely differ among settings across the world. For example, in some LMICs stakeholders might be less familiar with criteria for priority setting (e.g. cost-effectiveness) yet in high-income coun-

tries this is more commonly used. While in some settings there is leadership for fair priority setting processes in others this might not be the case. As a next step, research is required on various implementation strategies that address these barriers and that can tailor priority setting methods to the local setting. Understanding of the barriers and enablers and development of implementation strategies for the use of multiple criteria and fair processes will be key to improve priority setting and to make a difference in real world settings. ■

References

1. Malvankar-Mehta MS, Xie B (2012) Optimal incentives for allocating HIV/AIDS prevention resources among multiple populations. *Health Care Manag Sci* 15: 327–338.
2. Lasry A, Richter A, Lutscher F (2009) Recommendations for increasing the use of HIV/AIDS resource allocation models. *BMC Public Health* 9 Suppl 1: S8.
3. Kevany S, Benatar SR, Fleischer T (2013) Improving resource allocation decisions for health and HIV programmes in South Africa: Bioethical, cost-effectiveness and health diplomacy considerations. *Glob Public Health* 8: 570–587.
4. Jenniskens F, Tiendrebeogo G, Coolen A, Blok L, Kouanda S, et al. (2012) How countries cope with competing demands and expectations: perspectives of different stakeholders on priority setting and resource allocation for health in the era of HIV and AIDS. *BMC Public Health* 12: 1071.
5. Shayo EH, Mboera LEG, Blystad A (2013) Stakeholders' participation in planning and priority setting in the context of a decentralised health care system: the case of prevention of mother to child transmission of HIV programme in Tanzania. *BMC Health Serv Res* 13: 273.
6. Easterbrook PJ, Doherty MC, Perriens JH, Barcarolo JL, Hirschschall GO (2014) The role of mathematical modelling in the development of recommendations in the 2013 WHO consolidated antiretroviral therapy guidelines. *AIDS* 28 Suppl 1: S85–92.
7. England R (2006) Coordinating HIV control efforts: what to do with the national AIDS commissions. *Lancet* 367: 1786–1789.
8. Amon JJ (2014) The political epidemiology of HIV. *J Int AIDS Soc* 17: 19327.
9. Holmes CB, Sikazwe I, Raelly RL, Freeman BL, Wambulawae I, et al. (2014) Managing multiple funding streams and agendas to achieve local and global health and research objectives: lessons from the field. *J Acquir Immune Defic Syndr* 65 Suppl 1: S32–5.
10. Hipgrave DB, Alderman KB, Anderson I, Soto EJ (2014) Health sector priority setting at meso-level in lower and middle income countries: Lessons learned, available options and suggested steps. *Soc Sci Med* 102: 190–200.
11. IBBS (2013) Integrated Biological-Behavioral Surveillance among Most-at-Risk Groups (MARG) in Indonesia. Jakarta.
12. Knight R, Small W, Pakula B, Thomson K, Shoveller J (2014) A scoping study to identify opportunities to advance the ethical implementation and scale-up of HIV treatment as prevention: priorities for empirical research. *BMC Med Ethics* 15: 54.
13. UNAIDS (2013) Global report: UNAIDS global report on the global AIDS epidemic 2013. Geneva: UNAIDS.
14. UNAIDS (2010) UNAIDS 2011–2015 Strategy Getting to Zero. Geneva: UNAIDS
15. Tanios N, Wagner M, Tony M, Baltussen R, van Til J, et al. (2013) Which criteria are considered in healthcare decisions? Insights from an international survey of policy and clinical decision makers. *Int J Technol Assess Health Care* 29: 456–465.
16. Damar AP, du Plessis G (2010) Coping versus grieving in a "death-accepting" society: AIDS-bereaved women living with HIV in Indonesia. *J Asian Afr Stud* 45: 424–431.
17. Waluyo A, Culbert GJ, Levy J, Norr KF (2014) Understanding HIV-related Stigma Among Indonesian Nurses. *J Assoc Nurses AIDS Care*.
18. Wisaksana R, Alisjahbana B, van Crevel R, Kesumah N, Sudjana P, et al. (2009) Challenges in delivering HIV-care in Indonesia: experience from a referral hospital. *Acta Med Indones* 41 Suppl 1: 45–51.
19. Sasaki Y, Arifin A, Ali M, Kakimoto K (2011) Willingness to undergo HIV testing among factory workers in Surabaya, Indonesia. *AIDS Care* 23: 1305–1313.
20. Mahendradhata Y, Ahmad RA, Lefèvre P, Boelaert M, Van der Stuyft P (2008) Barriers for introducing HIV testing among tuberculosis patients in Jogjakarta, Indonesia: a qualitative study. *BMC Public Health* 8: 385.
21. UNAIDS (2014) The Gap Report. Geneva: UNAIDS.
22. Stigma index (2014). Available: www.stigmaindex.org. Accessed 17 September 2014.
23. Schwartländer B, Stover J, Hallett T, Atun R, Avila C, et al. (2011) Towards an improved investment approach for an effective response to HIV/AIDS. *Lancet* 377: 2031–2041.
24. UNAIDS (2014) Ambitious treatment targets: writing the final chapter of the AIDS epidemic. Geneva: UNAIDS.

25. World Health Organization (2013) Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection. Geneva: World Health Organization.
26. World Health Organization (2012) WHO Consultation on The Strategic Use of Antiretrovirals for Treatment and Prevention of HIV infection. 2nd Expert Panel 2-4 May 2012. Geneva: World Health Organization.
27. Norheim OF, Baltussen R, Johri M, Chisholm D, Nord E, et al. (2014) Guidance on priority setting in health care (GPS-Health): the inclusion of equity criteria not captured by cost-effectiveness analysis. *Cost Eff Resour Alloc* 12: 18.
28. Ministry of Health (2013). Estimation of risk population sizes per district in Indonesia. Jakarta: Ministry of Health.
29. Youngkong S, Baltussen R, Tantivess S, Mohara A, Teerawattananon Y (n.d.) Multicriteria decision analysis for including health interventions in the universal health coverage benefit package in Thailand. *Value Health* 15: 961–970.
30. Byskov J, Marchal B, Maluka S, Zulu JM, Bukachi SA, et al. (2014) The accountability for reasonableness approach to guide priority setting in health systems within limited resources - findings from action research at district level in Kenya, Tanzania, and Zambia. *Health Res Policy Syst* 12: 49.
31. Moret-Hartman M, Reuzel R, Grin J, van der Wilt GJ (2008) Participatory workshops are not enough to prevent policy implementation failures: an example of a policy development process concerning the drug interferon-beta for multiple sclerosis. *Health Care Anal* 16: 161–175.
32. Lewin S, Oxman AD, Lavis JN, Fretheim A, Garcia Marti S, et al. (2009) SUPPORT tools for evidence-informed policymaking in health 11: Finding and using evidence about local conditions. *Health Res Policy Syst* 7 Suppl 1: S11.
33. Brownson RC, Chiqui JF, Stamatakis KA (2009) Understanding evidence-based public health policy. *Am J Public Health* 99: 1576–1583.
34. Azim T, Saidel TJ, Brown T (2010) Essential elements of strategic information systems to guide focused HIV responses in south and south-east Asia. *AIDS* 24 Suppl 3: S54–61.
35. Dionne F, Mitton C, Macdonald T, Miller C, Brennan M (2013) The challenge of obtaining information necessary for multi-criteria decision analysis implementation: the case of physiotherapy services in Canada. *Cost Eff Resour Alloc* 11: 11.
36. Bollinger LA (2008) How can we calculate the “E” in “CEA”? *AIDS* 22 Suppl 1: S51–7.
37. El-Jardali F, Lavis J, Moat K, Pantoja T, Ataya N (2014) Capturing lessons learned from evidence-to-policy initiatives through structured reflection. *Health Res Policy Syst* 12: 2.
38. Adam T, Moat KA, Ghaffar A, Lavis JN (2014) Towards a better understanding of the nomenclature used in information-packaging efforts to support evidence-informed policymaking in low- and middle-income countries. *Implementation sciences* 9: 67.
39. Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE (2012) Knowledge translation of research findings. *Implement Sci* 7: 50.
40. Lavis JN, Lomas J, Hamid M, Sewankambo NK (2006) Assessing country-level efforts to link research to action. *Bull World Health Organ* 84: 620–628.
41. Ellen ME, Léon G, Bouchard G, Lavis JN, Ouimet M, et al. (2013) What supports do health system organizations have in place to facilitate evidence-informed decision-making? A qualitative study. *Implement Sci* 8: 84.
42. Maurits S (2014) Evaluation of MCDA-AFR approach to support the development of 5 years (2014-2018) strategic plan for HIV/AIDS control in West Java province.
43. Claxton DJ, Ritchie RBJ, Zichowsky J (1980) The nominal group technique: It's potential for consumer research. *J of Consumer Research* 7: 308-13.
44. Chitama D, Baltussen R, Ketting E, Kamazima S, Nswilla A, et al. (2011) From papers to practices: district level priority setting processes and criteria for family planning, maternal, newborn and child health interventions in Tanzania. *BMC Womens Health* 11: 46.
45. Maluka S, Kamuzora P, Ndawi B, Hurtig A-K (2014) Involving decision-makers in the research process: Challenges of implementing the accountability for reasonableness approach to priority setting at the district level in Tanzania. *Glob Public Health* 9:

760–772.

46. Wilson D, Halperin DT (2008) "Know your epidemic, know your response": a useful approach, if we get it right. *Lancet* 372: 423–426.
47. World Health Organization (2007) *World Health Organization: Everybody's Business: Strengthening Health Systems to Improve Health Outcomes: WHO's framework for Action*. Geneva: World Health Organization.
48. Viergever RF, Olifson S, Ghaffar A, Terry RF (2010) A checklist for health research priority setting: nine common themes of good practice. *Health Res Policy Syst* 8: 36.
49. Daniels N (2008) *Just Health: Meeting Health Needs Fairly*. Cambridge: Cambridge University Press.
50. Indonesian National AIDS Commission (2014) *National HIV & AIDS Strategy and Action Plan 2015-2019 (draft)*. Jakarta: Indonesian National AIDS Commission.
51. Tantivess S, Teerawattananon Y, Mills A (2009) Strengthening cost-effectiveness analysis in Thailand through the establishment of the health intervention and technology assessment program. *Pharmacoeconomics* 27: 931–945.
52. Sibbald SL, Singer PA, Upshur R, Martin DK (2009) Priority setting: what constitutes success? A conceptual framework for successful priority setting. *BMC Health Serv Res* 9: 43.
53. Worldbank (2012) *Localizing Development: Does Participation Work?* Washington: The World Bank.
54. Kamuzora P, Maluka S, Ndawi B, Byskov J, Hurtig A-K (2013) Promoting community participation in priority setting in district health systems: experiences from Mbarali district, Tanzania. *Glob Health Action* 6: 22669.

CHAPTER 11

Appendix

Summary

Dutch summary | Samenvatting

Acknowledgements | Dankwoord

List of publications

Curriculum Vitae



Summary

Although significant progress has been made in the HIV/AIDS response over the past years, worldwide, still 37 million people were living with HIV/AIDS and 2.0 million were newly infected in 2014. UNAIDS is aiming to end the HIV epidemic in 2030. In the short term, resources are scarce to implement all programs at full scale and therefore priority setting of the right interventions is crucial. To support policy makers, various methods have been developed to guide priority setting of interventions. Cost-effectiveness analysis (CEA) was introduced in the 1980's by economics and aims at value for money. Yet, this approach falls short as clearly cost-effectiveness is not the only criterion involved in decision-making. Ethical criteria, like giving priority to the worst of populations and feasibility criteria, like an intervention's political acceptability and its requirements in terms of health care workers' capacity are also often considered by policy makers. This led to the development of multi criteria decision analysis (MCDA), a method that advances from CEA by incorporating multiple criteria in priority setting. Based on the multi attribute theory, MCDA refers to a set of approaches that provide a systematic process for incorporating multiple criteria in decision making and make transparent the impact (also called 'performance') of interventions on these criteria. While the use of MCDA has rapidly increased, it has also been criticized for being too technocratic and not adequately ensuring a fair priority setting process, which would require involvement of all stakeholders. The Accountability for Reasonableness (AFR) framework provides guidance for a fair priority setting process. It is based on justice theories of democratic deliberation and a leading conceptual framework for the inclusion of ethics.

Rationale of this thesis

In the field of HIV/AIDS control, there is an increased interest for the use of multiple criteria and fair processes for priority setting of interventions. This has been outlined in the guidelines for the strategic use of antiretroviral treatment (SUFA) of the World Health Organization (WHO), which also recommends the use of the AFR framework and implicitly, the use of MCDA for priority setting of health interventions. In addition, the research community has called for the use of multiple criteria and fair processes in priority setting and we more specifically in the context of HIV/AIDS control in Indonesia and South Africa. However, at this moment, it is unclear in which way countries are currently setting priorities in HIV/AIDS control, which criteria are considered important among stakeholders, and how interventions perform on various criteria for priority setting. Moreover, it is unknown how the use of multiple criteria and fair processes can be implemented in a country's health system.

The main research question of this thesis is:

How can priority setting in HIV/AIDS control in Indonesia and South Africa be improved with use of multiple criteria and fair processes?

The sub-questions of this thesis are:

■ **Sub-question 1:**

What is the current priority setting process in HIV/AIDS control in Indonesia?
(Chapter 2)

■ **Sub-question 2:**

Which criteria are important for priority setting in HIV/AIDS control?
(Chapter 3,4)

■ **Sub-question 3:**

What is the performance of HIV/AIDS interventions on criteria for priority setting?
(Chapter 5-7)

■ **Sub-question 4:**

Can the integrated MCDA-AFR approach be used to support strategic planning processes in HIV/AIDS control?
(Chapter 8,9)

While the focus of this thesis is on Indonesia, we also conducted two studies on South Africa. **Indonesia** is among the few countries in the world not on track for controlling its HIV epidemic. The country faces a concentrated epidemic (with exception of Papua) with an estimated 640,000 people living with HIV/AIDS (PLWHA) in 2013. This number will increase to 1.5 million in 2020 unless the right actions are taken. The estimated HIV prevalence is high among people who inject drugs (PWID) (36.4%), female sex workers (FSW) (7.2%), and men having sex with men (MSM) (8.5%) and remains low in the general population (0.3%). Coverage of some HIV/AIDS interventions is low. For example 18% of those eligible is receiving antiretroviral treatment (ART). The research described in this thesis was conducted in West Java province (44 million inhabitants) and has a comparable picture with the national epidemic.

South Africa is home to the largest HIV-infected population worldwide with 6.3 million people living with HIV/AIDS in 2013. The country has a generalized epidemic, with an HIV/AIDS prevalence rate of 19.2% among adults between 15-49 years. The country also has the largest ART program worldwide. In 2011, it provided treatment to about 80% (2.0 million people) of all eligible people in 2012. Although South Africa is quickly scaling up ART a significant treatment gap of about half a million people remains.

Current practices in HIV/AIDS priority setting

Chapter 1 provides a general introduction to this thesis. In **chapter 2**, we evaluated the current priority setting process in HIV/AIDS control in Indonesia (Bandung city and West Java province) against the four conditions of the accountability for reasonableness framework. We found that although multiple criteria were used in priority setting, they were only used implicitly. Strategic documents contained a long list of interventions and no explicit priorities were set. Many stakeholders were invited to participate in the decision making process, however their

quality of involvement could be improved. The use of appeal and publicity mechanisms for decision making could be more transparent and formally stated. Public regulations were not yet installed to ensure fair priority setting processes.

Criteria for priority setting of interventions

In **chapter 3**, we mapped thirty-one criteria for priority setting of health interventions based on literature reviews and according to the health systems' framework of the World Health Organization. Criteria were divided among five categories that reflect the goals of a health system (i.e. to improve level of health, fair distribution of health, responsiveness, social & financial risk protection, and efficiency) and one category that reflects feasibility of interventions based on the health system building blocks (i.e. service delivery, health care workforce, information, medical products, vaccines & technologies, financing, and leadership/governance). This conceptual mapping of criteria may further assist decision makers in the identification of multiple criteria for selection of health interventions. In **chapter 4**, we surveyed the importance of criteria for HIV/AIDS priority setting among four stakeholder groups (policy makers, health care workers, general population, and people living with HIV/AIDS) in West Java province in Indonesia. Stakeholders perceived an intervention's impact on the HIV epidemic; its impact on HIV related stigma in society, its quality of care, and its feasibility related to the health system infrastructure (i.e. health care workers, service, and information requirements) as highly important. Most criteria related to equity (i.e. prioritizing groups on the basis of their gender or socio-economic status) were considered least important. There were no significant differences between stakeholder groups.

Performance of HIV/AIDS interventions

In **chapters 5-7**, we analyzed the performance of interventions on various criteria, namely, unit costs, cost-effectiveness, and equity criteria. In **chapter 5**, we described a costing analysis of antiretroviral treatment (ART) in Indonesia. It shows that before ART initiation, costs were dominated by laboratory tests (>65%), and after initiation by antiretroviral drugs (≥60%). Average treatment costs per patient decreased with time on treatment. Higher CD4 cell counts at initiation resulted in lower laboratory and opportunistic infection treatment costs. Transportation cost dominated the costs of patients for seeking and undergoing care (>40%). Costs of providing ART are highest during the early phase of treatment. Efficiency gains can likely be realized by early treatment initiation and applying alternative laboratory tests. **Chapter 6** describes a cost-effectiveness analysis of scaling up community-based voluntary counseling and testing in West-Java province. Based on evaluation using the Asian Epidemic model, we found that scaling up voluntary counseling and testing (VCT) costs US\$248 per HIV infection averted and US\$9.17 per disability adjusted life years (DALY) saved. According to international thresholds put forward by WHO, 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). However, in order to prioritize VCT in HIV/AIDS control in West Java, issues of budget availability and organizational

capacity should be addressed. **Chapter 7** describes a systematic review of the literature on equity in utilization of ART in South Africa. Twelve studies met the inclusion criteria. It seems that men, young people, those living in certain provinces or rural areas, people who are unemployed or with a low educational level, and those being unmarried have less access to ART. As studies stem from different contexts and use different methods conclusions should be taken with caution.

Implementation of the use of multiple criteria and fair processes

Chapter 8 describes the development of programmatic guidance for priority setting in HIV/AIDS control in South Africa by integrating the MCDA and AFR frameworks. This approach outlines how to include a better evidence base on feasibility, efficiency, and equity criteria and how to ensure fair policy process in priority setting for HIV treatment. The approach consists of 5 steps: 1) formation of a consultation panel involving all relevant stakeholders, 2) definition of a relevant set of criteria, 3) assessment of the performance of programmes, 4) arrangement of a deliberative process on priorities, 5) implementing rationing decisions and evaluation. **Chapter 9** describes the first time implementation of the integrated MCDA-AFR approach as proposed in chapter 8 in the context of the development of the 5 years (2014-2018) HIV/AIDS strategy for West Java province in Indonesia. The consultation panel agreed that HIV testing and treatment packages were the most attractive intervention to scale up while mitigation activities were least attractive. Preliminary results of an independent evaluation through interviews with consultation panel members revealed that the MCDA-AFR approach was considered useful, that stakeholders felt they were better involved, and that the plan was considered more scientifically based. They also expressed that it was easier to give comments and all had learned from the process. Concerns were raised on the duration of the process, intervals between meetings, and the high turnover and low attendance of members in meetings. Most members were also concerned about the commitment of West Java district governments to act for HIV/AIDS and whether the strategic document would be used for budget allocation decisions. Main challenges reported by the researcher for the implementation were the availability of data and existing structures like the influence of donors and a missing direct link to funding of the prioritized interventions. To further improve the combined MCDA-AFR approach, we propose to incorporate a situational analysis, to select context specific appeal and publicity mechanisms, and to develop better methodological guidelines for its application.

Limitations of this thesis and recommendations for further research

In **Chapter 10** we discussed the limitations of this thesis and provide recommendation for further research.

We see three important limitations of this thesis. First, the researchers may have influenced the findings of chapter 9, as they were strongly involved in the implementation of the MCDA/AFR approach. The approach allows for much freedom and other researchers might have used

different methods to facilitate discussions among stakeholders and to communicate the performance matrix results to the consultation panel. Second, most of the research was conducted in the West Java province in Indonesia and findings should be generalized with caution. The organization of HIV/AIDS control and the acceptance and understanding of stakeholders for the integrated MCDA-AFR approach may differ in other settings. Third, the implementation of the MCDA-AFR approach could only be partly evaluated through observations during the implementation and by interviews with the stakeholders afterwards. The long-term impact on for example funding streams and implementation of interventions remains unknown.

This thesis outlines several topics for further research related to the use of multiple criteria and fair processes for priority setting in HIV/AIDS control. First, improved evidence is needed on the performance of HIV/AIDS interventions on multiple criteria. Second, knowledge is needed on how to operationalize multiple criteria for priority setting of HIV/AIDS interventions. Third, methodological guidelines need to be developed on the optimal implementation of the MCDA-AFR approach to support HIV/AIDS control. Fourth, evaluations need to be conducted on the impact of priority setting methods and on the barriers and enablers of the implementation of the integrated MCDA-AFR approach. And last, better understanding is warranted on how multiple criteria and fair processes can be introduced at larger scale and in various settings.

Dutch summary | Samenvatting

De hiv/aids-bestrijding heeft wereldwijd de laatste jaren grote vooruitgang geboekt. Desondanks werden er in 2014 twee miljoen mensen geïnfecteerd met het hiv-virus en leefden er in totaal 37 miljoen mensen met hiv/aids. UNAIDS heeft als doel gesteld om de hiv/aids-epidemie in 2030 wereldwijd te beëindigen. Er zijn op dit moment echter onvoldoende financiële middelen beschikbaar om alle hiv/aids-interventies op grote schaal te implementeren. Het maken van keuzes en het daardoor stellen van prioriteiten in de hiv/aids-bestrijding is daarom van essentieel belang.

Er bestaan verschillende methoden om beleidsmakers te ondersteunen bij het maken van keuzes in de zorg. In de jaren tachtig introduceerden economen kosten-effectiviteitsanalyse om inzicht te krijgen in de kosten en de gezondheidswinst van interventies. Deze benadering schiet echter tekort omdat in beleidsprocessen ook vaak andere overwegingen (ook wel criteria genoemd) een rol spelen. Voorbeelden hiervan zijn ethische overwegingen en verwachte barrières voor het implementeren van interventies. Vanwege rechtvaardigheidsprincipes kan men een voorkeur hebben voor interventies die de zorg voor kwetsbare groepen in een samenleving verbeteren. Mogelijke barrières, zoals de politieke en maatschappelijk acceptatie van interventies of het aantal benodigde gezondheidswerkers, spelen ook vaak een rol in beslissingen. Dit begrip leidde tot de ontwikkeling van de methode *multi criteria decision analysis* (MCDA). Deze methode is gebaseerd op de “multi-attribuu-utiliteitstheorie”. Het biedt hulp bij het in kaart brengen van de criteria en het systematisch vergelijken van interventies op basis van deze criteria en het bijbehorende wetenschappelijk bewijs. Op deze manier kunnen keuzes worden gemaakt op basis van multiple criteria. MCDA is al veelvuldig toegepast in de gezondheidszorg maar wordt ook bekritiseerd vanwege het technocratische karakter en het niet waarborgen van een fair besluitvormingsproces. De principes van Accountability for Reasonableness (AFR), bieden kaders voor het vormgeven van een fair besluitvormingsproces. Het vereist dat alle relevante partijen in het proces betrokken zijn en dat bezwaarprocedures voor beslissingen vastliggen. Het is gebaseerd op deliberatieve democratie en vormt een belangrijk theoretisch kader voor het opnemen van ethische overwegingen in de besluitvorming.

De rationale van dit proefschrift kan als volgt samengevat worden. De interesse voor het gebruik van multiple criteria en principes van fairness bij het maken van keuzes in de hiv/aids-bestrijding neemt toe. Dit wordt ondermeer duidelijk in de richtlijnen van de Wereldgezondheidsorganisatie voor het opschalen van antiretrovirale therapie (ART). Het gebruik van het AFR-raamwerk en multiple criteria wordt daarin aanbevolen voor het maken van keuzes. Ook wetenschappers hebben aanbevolen om het gebruik hiervan te onderzoeken en dan met name binnen de hiv/aids-bestrijding in Indonesië en Zuid-Afrika. Op dit moment is het echter nog onduidelijk hoe landen keuzes maken binnen de hiv/aids-bestrijding, welke criteria belangrijk worden gevonden door de verschillende betrokken partijen en wat het weten-

schappelijk bewijs is voor verschillende interventies op basis van deze criteria. Bovenal is het onbekend hoe het gebruik van multiple criteria en principes van fairness past binnen het gezondheidszorgsysteem in een land.

De hoofdvraag van dit proefschrift luidt als volgt:

Hoe kunnen keuzes in de hiv/aids-bestrijding verbeterd worden in Indonesië en Zuid-Afrika door het gebruik van multiple criteria en principes van fairness?

Deze hoofdvraag is opgesplitst in vier deelvragen:

■ **Deelvraag 1:**

Wat is het huidige besluitvormingsproces binnen de hiv/aids-bestrijding in Indonesië.
(Hoofdstuk 2)

■ **Deelvraag 2:**

Wat zijn belangrijke criteria voor het maken van keuzes in de hiv/aids-bestrijding?
(Hoofdstuk 3,4)

■ **Deelvraag 3:**

Wat is het wetenschappelijke bewijs van verschillende hiv/aids-interventies op deze criteria?
(Hoofdstuk 5-7)

■ **Deelvraag 4:**

Kan een geïntegreerde benadering van *multi criteria decision analysis* en *accountability for reasonableness* gebruikt worden voor de ontwikkeling van strategische plannen binnen de hiv/aids-bestrijding?
(Hoofdstuk 8, 9)

Dit proefschrift bevat voornamelijk studies uit Indonesië. Twee hoofdstukken gaan over Zuid-Afrika.

Indonesië is een van de weinige landen in de wereld die er niet in slaagt de hiv/aids-epidemie in te dammen. De epidemie is geconcentreerd (met uitzondering van de provincie Papua) en in 2013 leefden ongeveer 640,000 mensen met hiv/aids. Als Indonesië niet de juiste maatregelen neemt zal dit stijgen tot 1,5 miljoen mensen in 2020. De hiv prevalentie is voornamelijk hoog in risico groepen zoals injecterende drugs gebruikers (36,4%), sekswerkers (7,2%) en mannen die seks hebben met mannen (8,5%). In de algehele populatie is de hiv-prevalentie slechts 0,3%. De toegang tot hiv/aids-interventies is gebrekkig. Op dit moment heeft bijvoorbeeld maar 18% van de patiënten die in aanmerking komt toegang tot hiv-medicijnen.

In Zuid-Afrika leeft het grootst aantal mensen met hiv/aids ter wereld: in 2013 waren dat er 6,3 miljoen. De epidemie is gegeneraliseerd en de hiv-prevalentie is 19,2% onder volwassen tussen de 15 en 49 jaar. Zuid-Afrika heeft wereldwijd het grootste programma voor antivirale therapie. In 2011 werd 80% (2 miljoen) van de patiënten die in aanmerking kwam voorzien van hiv-medicijnen. Hoewel Zuid-Afrika er in is geslaagd om antivirale therapie snel op te schalen, heeft nog altijd een half miljoen patiënten geen toegang tot deze zorg.

Huidige besluitvorming in de hiv/aids-bestrijding

Hoofdstuk 1 beschrijft de algehele introductie van dit proefschrift. In **hoofdstuk 2** evalueren we met behulp van het AFR-raamwerk het huidige proces van het maken van keuzes in de hiv/aids-bestrijding in Indonesië (met name in de stad Bandung en de provincie West-Java). Uit deze evaluatie blijkt dat meerdere criteria een rol spelen, maar dat ze alleen impliciet worden gebruikt. Er is een groot aantal partijen betrokken bij de besluitvorming, maar de kwaliteit van hun deelname kan worden verbeterd. Het blijkt dat de mogelijke bezwaarprocedures en maatregelen om transparantie van de besluitvormen te verbeteren niet formeel zijn vastgelegd. Bovendien zijn er geen officiële richtlijnen voor het waarborgen van een fair besluitvormingsproces.

Criteria voor het maken van keuzes in de hiv/aids-bestrijding

In **hoofdstuk 3**, hebben we op basis van de literatuur een overzicht gemaakt van 31 criteria die mogelijk een rol zouden kunnen spelen bij het maken van keuzes tussen de verschillende gezondheidszorginterventies. De criteria zijn gecategoriseerd op basis van het gezondheidssysteem raamwerk van de Wereldgezondheidsorganisatie. In totaal zijn er vijf categorieën die de doelen (hoog gezondheidsniveau en gelijke verdeling van gezondheid (equity)), responsiviteit, sociale en financiële bescherming en efficiëntie) weergeven van een gezondheidszorgsysteem. Een categorie geeft de uitvoerbaarheid van een interventie aan en deze is onderverdeeld in de zes bouwstenen van een gezondheidszorgsysteem (i.e. service delivery, capaciteit van het gezondheidszorgpersoneel, informatievoorziening, medische producten/vaccins/technologieën, financiering en leiderschap/governance). Deze conceptuele indeling biedt mogelijk ondersteuning aan beleidsmakers bij het maken van keuzes in de zorg. In **hoofdstuk 4** hebben we een survey-onderzoek uitgevoerd onder vier belanghebbende partijen in de hiv/aids-bestrijding in de provincie West-Java in Indonesië. Dit waren beleidsmakers, gezondheidswerkers, de burgers en mensen die leven met hiv/aids. Uit deze survey blijkt dat deze partijen de impact op de hiv epidemie, de impact of stigma in de samenleving, de kwaliteit van zorg en de uitvoerbaarheid van een interventie (in termen van capaciteit van het gezondheidszorg personeel, service en informatievereisten) het belangrijkste vinden. De meeste criteria gerelateerd aan equity (zoals voorkeur geven aan interventies die zich richten op kwetsbare groepen in de samenleving) werd het minst belangrijk ondervonden. Er waren geen grote verschillen in de uitkomsten tussen de verschillende partijen.

Wetenschappelijk bewijs voor hiv/aids-interventies

In **hoofdstuk 5 tot en met 7** hebben we bekeken hoe hiv/aids-interventies scoren op verschillende criteria, namelijk de kosten, kosteneffectiviteit en equity overwegingen. **Hoofdstuk 5** beschrijft een kostenanalyse van antivirale therapie. Het laat zien dat voor de start van een behandeling de kosten voornamelijk werden bepaald door laboratoriumtesten (>65%) en na de start van behandeling door de hiv-medicijnen (>60%). De gemiddelde kosten per patiënt namen af naarmate de tijd onder behandeling toenam. Hoge CD4-celwaarden bij de start van

een behandeling resulteerden in lage laboratoriumkosten en behandelkosten voor opportunistische infecties. De kosten voor transport domineerde in de kosten die gemaakt werden door patiënten die antivirale therapie ondergingen (>40%). De kosten waren het hoogste tijdens de vroege fase van de hiv-behandeling. Kosten kunnen waarschijnlijk bespaard worden door vroege start van hiv-behandeling en alternatieve laboratoriumtesten. **Hoofdstuk 6** beschrijft de analyse van de kosteneffectiviteit van het opschalen van het voorlichten en testen van mensen op hiv en dan specifiek op gemeenschapsniveau in de provincie West-Java. Op basis van een evaluatie met het Asian Epidemic Model vonden we dat de interventie US\$248 dollar per voorkomen hiv-infectie en US\$ 9,17 per gewonnen “disability adjusted life year (DALY)” kost. Volgens de internationale richtlijnen van de Wereldgezondheidsorganisatie lijkt deze interventie zeer kosteneffectief omdat het binnen de marge van drie keer het bruto nationaal product van Indonesië valt (US\$ 2.963 in 2010). Bij het daadwerkelijk opschalen van het voorlichten en testen van mensen op hiv moet men echter wel rekening houden met het beschikbare budget en de organisatie van de zorg. **Hoofdstuk 7** beschrijft een systematisch review van de literatuur naar gelijkheid in het gebruik van antivirale therapie in Zuid-Afrika. Twaalf studies voldeden aan de inclusiecriteria. Het lijkt erop dat mannen, jonge mensen, mensen die in bepaalde provincies of rurale gebieden leven, mensen die werkeloos zijn, een laag opleidingsniveau hebben en ongetrouwd zijn minder toegang hebben tot hiv-behandeling. Omdat de studies plaatsvonden in verschillende settings en verschillende methodes gebruikten moeten de resultaten voorzichtig geïnterpreteerd worden.

Implementatie van het gebruik van multiple criteria en principes van fairness

Hoofdstuk 8 beschrijft de ontwikkeling van een theoretisch kader voor het maken van keuzes in the hiv/aids-bestrijding in Zuid-Afrika door het integreren van de MCDA- en AFR-raamwerken. Deze benadering laat zien hoe er beter gebruik kan worden gemaakt van wetenschappelijk bewijs op het gebied van uitvoerbaarheid, kosteneffectiviteit en equity en hoe fairness in een besluitvormingsproces gewaarborgd kan worden. De benadering bestaat uit 5 stappen: 1) het vormen van een ‘consultation panel’ met alle relevante partijen, 2) het selecteren van een relevante set van criteria, 3) het verzamelen van wetenschappelijk bewijs en het analyseren van de performance van interventies, 4) het organiseren van een deliberatief proces over de keuzes, en 5) de implementatie van de gemaakte keuzes en evaluatie. **Hoofdstuk 9** beschrijft de eerste implementatie van de geïntegreerde benadering (beschreven in hoofdstuk 8). Dit werd toegepast tijdens de ontwikkeling van de 5-jaren strategie (2014-2018) voor de hiv/aids-bestrijding van de provincie West-Java in Indonesië. Het ‘consultation panel’ kwam uiteindelijk overeen dat het pakket van interventies rondom het hiv testen en behandelen het meest aantrekkelijk is en opgeschaald zou moeten worden in West-Java. De ‘mitigation’ interventies werden als minst aantrekkelijk bevonden en verdiende de laagste prioriteit. Voorlopige resultaten van een onafhankelijke evaluatie van de implementatie (door middel van interviews met deelnemers van het ‘consultation’ panel) laten zien dat de geïntegreerde benadering als waardevol werd beschouwd. De deelnemers gaven aan dat ze beter betrokken waren bij het beleid en dat het

plan beter gefundeerd was met wetenschappelijk bewijs. Ze gaven ook aan dat het makkelijk was om commentaar te geven binnen het besluitvormingsproces en dat ze er allemaal van geleerd hadden. Ze spraken hun zorgen uit over de lange duur van het proces, de lange tijd tussen de vergaderingen en de lage opkomst. De meesten deelden ook hun twijfels over de toewijding van de districten voor de hiv/aids problematiek en of het strategische plan financieringsstromen kon beïnvloeden.

De grootste uitdagingen die de onderzoekers ondervonden waren de beschikbaarheid van data en huidige structuren zoals de invloed van donoren en een ontbrekende link tussen het proces en de financiering voor hiv/aids-interventies. Om de toepassing van de geïntegreerde benadering te verbeteren bevelen we het volgende aan: een “situational analysis”, het selecteren van context specifieke bezwaarprocedures en transparantie maatregelen en betere methodologische richtlijnen.

Beperkingen van dit proefschrift en aanbevelingen voor toekomstig onderzoek

In **hoofdstuk 10** bespreken we de tekortkomingen van dit proefschrift en aanbevelingen voor toekomstig onderzoek. We zien drie belangrijke beperkingen van dit proefschrift.

Ten eerste hebben onderzoekers mogelijk een belangrijke rol gespeeld omdat ze de geïntegreerde MCDA/AFR-benadering implementeerden. Andere onderzoekers zouden mogelijk andere keuzes gemaakt hebben wat betreft het faciliteren van discussies en het communiceren van de bevindingen van het wetenschappelijk bewijs en de ‘performance matrix’ naar het ‘consultation panel’. Ten tweede voerden we het merendeel van het onderzoek uit in de provincie West-Java in Indonesië. Resultaten kunnen daarom maar tot op zekere hoogte gegeneraliseerd worden en vertaald worden naar andere settings. De organisatie van de hiv/aids-bestrijding en de acceptatie van de geïntegreerde aanpak door belangrijke partijen kan verschillen in andere settings. Ten derde kon de implementatie van de geïntegreerde MCDA/AFR-benadering alleen beperkt geëvalueerd worden door middel van observaties tijdens de implementatie en interviews met het ‘consultation’ panel. De langetermijneffecten, bijvoorbeeld op het gebied van financieringsstromen zijn op dit moment onbekend.

Dit proefschrift geeft een aantal aanbevelingen voor verder onderzoek op het gebied van multiple criteria en fairness voor het maken van keuzes binnen de hiv/aids-bestrijding. Ten eerste onderzoek is nodig naar de operationalisering van criteria voor het maken van keuzes binnen de hiv/aids-bestrijding. Ten tweede is het essentieel om methodologische richtlijnen te ontwikkelen voor een optimale implementatie van de geïntegreerde MCDA/AFR-benadering binnen de hiv/aids-bestrijding. Ten derde moet de impact van methodes voor het maken van keuzes in de zorg beter geëvalueerd worden. In het bijzonder moet er onderzocht worden wat de barrières en facilitators zijn van de implementatie van de geïntegreerde MCDA/AFR-benadering. Tot slot is er behoefte naar meer kennis over hoe het gebruik van multiple criteria en principes van fairness plaats kan vinden op een grotere schaal (bijvoorbeeld in meerdere districten in Indonesië) en in andere settings. ■

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Met dit proefschrift wil ik een bijdrage leveren aan de wetenschap en de verbetering van het hiv/aids beleid, met name in Indonesië. In de afgelopen jaren heb ik veel geleerd over wetenschappelijk onderzoek, de hiv/aids-bestrijding en het maken van keuzes in de zorg. Daarnaast heb ik tijdens mijn tijd in Indonesië ook veel geleerd over het leven en werken in een ander land en cultuur, de verschillen tussen arm en rijk, de rol van geloof in een samenleving, het leven in een stad met 3 miljoen inwoners, traffic jams, geduld bewaren en de waarde van familie en vrienden in mijn leven. Deze extra ervaringen zijn voor mij ook van grote waarde.

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List of publications

Peer reviewed publication, relevant to the thesis

Tromp N, Michels C, Mikkelsen E, Hontelez J, Baltussen R. Equity in utilization of antiretroviral therapy for HIV-infected people in South Africa: a systematic review **(2014)** International Journal for Equity in Health; 13(1) 60

Tromp N, Prawiranegara R, Sunjaya S, Riparev H, Siregar A, Sunjaya D, Baltussen R. Priority setting in HIV/AIDS control in West Java Indonesia: an evaluation based on the accountability for reasonableness framework **(2014)** Health Policy and Planning; 30(3): 345-55

Venhorst K, Zelle S, **Tromp N**, Lauer J. Multi criteria decision analysis of breast cancer control in low- and middle- income countries: the development of a policy tool **(2014)** Cost Effectiveness and Resource Allocation; 12 (13)

Baltussen R, Mikkelsen E, **Tromp N**, Hurtig A, Byskov J, Olsen O, Baerøe K, Hontelez J, Singh J, Norheim O. Balancing efficiency, equity, feasibility of HIV treatment in South Africa – development of programmatic guidance **(2013)** Cost Effectiveness and Resource Allocation; 11(1)

Tromp N, Siregar A, Leuwol B, Komarudin D, Van der Ven A, Van Crevel R, Baltussen R. Cost-effectiveness of scaling up voluntary counseling and testing in West-Java, Indonesia **(2013)** Acta Medica Indonesia; 45(1):17-25

Tromp N, Baltussen R. Mapping of multiple criteria for priority setting of health interventions: an aid for decision makers **(2012)** BMC Health Services Research 13 (12): 454

Youngkong S, **Tromp N**, Chitama D. The EVIDEM framework and its usefulness for priority setting across a broad range of health interventions **(2011)**. Cost Effectiveness and Resource Allocation; 26(9):16

Tromp N, Mikkelsen E, Baltussen R. Embedding multi criteria decision analysis in priority setting policy processes – experiences from low and middle income countries **(Forthcoming)**

Viergever R, Gouglass D, **Tromp N**. The role of multi criteria decision analysis in health research priority setting **(Forthcoming)**

Tromp N, Prawiranegara R, Siregar A, Sunjaya D, Baltussen R. Stakeholders' views on the importance of multiple criteria for priority setting in HIV/AIDS control in Indonesia **(Submitted)**

Siregar A, **Tromp N**, Komarudin D, Wisaksana R, Van Crevel R, Van der Ven A, Baltussen R. Costs of HIV/AIDS treatment in Indonesia by time on treatment and stage of disease. BMC Health Services Research (**Forthcoming**)

Tromp N, Prawiranegara R, Siregar A, Wisaksana R, Pinxten L, Pinxten J, Zahra A, Lesmana A, Pantjawidi, Sunjaya D, Baltussen R. Priority setting in HIV/AIDS control in Indonesia: implementation of the integrated multi criteria decision analysis and accountability for reasonableness approach. (**Submitted**)

Other peer reviewed publications by the author

Spaan E, Mathijssen J, **Tromp N**, McBain F, Ten Have A, Baltussen R. Impact of health insurance in Africa and Asia: systematic review (**2012**) Bulletin of the World Health Organization; 90(9): 685–92

Krabbe P, **Tromp N**, Ruers T, Riel P. Are patients' judgments of health status really different from the general population? (**2011**) Health and Quality of Life Outcomes; 9(31)

Curriculum Vitae

Noor Tromp was born on the 25th of September in 1985 in Nijmegen, the Netherlands. In 2003, after her high school graduation at the Nijmeegse Scholengemeenschap Groenewoud, she started her bachelor Biomedical Sciences at the Radboud University Medical Center (Radboudumc). After her bachelor graduation in 2006, she decided to volunteer in various projects in India and Thailand before she would start her master's degree. During this year she developed a special interest in Global Health.

In 2007, she started her Master Health Technology Assessment at the Radboudumc. As part of this master's degree she followed a minor in Global Health and a minor in Fundamentals of Business and Economics (Utrecht University). She accomplished three internships. During the first internship she worked on a systematic review on the impact of health insurance in low and middle income countries (LMICs) for the Dutch Platform for Health Insurance for the Poor. During the second internship she advised Oxfam Novib and Cordaid on the potential synergy between microfinance and health insurance institutions in LMICs. Her final internship took place in Indonesia, where she conducted a cost-effectiveness analysis on voluntary counseling and testing for HIV/AIDS control. This was awarded the best Master's thesis Biomedical Sciences 2009/2010.

In the last phase of her master's degree, she received a personal grant from the Radboudumc for her PhD proposal that led to this thesis. During her PhD project she worked for more than two years at the Padjadjaran University in Bandung in Indonesia. After conducting various studies, she and her Indonesian colleagues eventually supported the provincial AIDS commission to develop the 5 years (2014-2018) HIV/AIDS strategy for the West Java province (population 46 million). Over the years, she was actively involved in the PhD council of the Radboud Institute for Health Sciences, several projects for street children in Indonesia (as part of the Doctors for Homeless Foundation) and Uniting Streams, a working group for young researchers in Global Health (as part of the NVTG, the Netherlands Society for Tropical Medicine & International Health).

Since December 2014, she works as a post-doc researcher in the research group Global Health at the department of Health Evidence at the Radboudumc. ■

